D.T2.1.1 Analysis report of existing advanced tools and techniques

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Deliverable D.T2.1.1:

Analysis report of existing advanced tools and techniques

Work package T2:
Developing tools to improve competences in food sector

Activity:
Identification of existing advanced techniques and tools

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1. Introduction (CBHU)

The objective of Task 2 of the I-CON project is to improve competences and skills of food related SMEs through cross-sector related tools and techniques. The target groups of the task are relevant national and regional ministries, universities, private and public R+D departments, chambers, clusters, innovation centers, SMEs and large companies.
Within Task 2 the first sub-task is the *Identification of existing advanced techniques and tools* to support SMEs in the areas of mechatronics, food safety, quality and labelling, and food design.

Deliverable D.T2.1.1 is about the analysis of the collected existing advanced tools and techniques.

2. Methods (CBHU)

2.1. Used information and results

During the first task (Food sector related knowledge integration) of the project the needs, challenges and barriers of the food industry, especially the SMEs were collected and analyzed with the application of different methods:

- Each regional and knowledge partner carried out meetings with the relevant authorities;
- A Food sector global market trend analysis report was developed by the knowledge partners collecting the main trends and innovations of the European food sector in all three cross-sector areas (food safety, quality and labelling; mechatronics; and food design) of the project.
- Regional sector reviews were implemented by regional partners including the review of regional RIS3 strategies, schemes and supportive environments;
- SMEs critical factors diagnosis reports were prepared also by regional partners on the basis of bottom-up approach, where they will meet food related SMEs and identify critical factors for their development.

These information and knowledge of the project partners were considered during the development of the templates (see details below).

2.2. Content of the developed templates

For the identification of existing advanced techniques and tools in the disciplines of Food safety, quality and labelling; Mechatronics and Food design templates were developed by CBHU, which were discussed with the partners and the agreed versions were filled by regional and knowledge partners.

For each tool/technique a separate template was filled by the partners.

Each template contains 9 similar questions:

1. **Specific need or problem being addressed by the tool/technique**

Specific need or problem of the food related SMEs for which the technique and/or tool can be used in order to improve competences and skills.

2. **Name of the technique and/or tool**

3. Additional information if it is available

Website, longer description, publication, etc.

4. Short description of the technique and/or tool

Description of the technique and/or tool considering the following aspects:

- *Nature and intended use of the tool. What is the problem, which was solved? What activities the tool is intended to assist?*
- *Scope/area of the application (including indications of the limits of applicability of the tool). What are the potential areas, where the technique/tool can be used?*
- *How the new solution works (brief explanation)? How to use it? Circumstances and ranges of use.*
- *Target users/segments. Who the model is intended to be used? (by researchers or industry, regulatory authorities, standardization authorities, product developers, risk assessors, production engineers etc.).*

5. Availability, accessibility of the technique and/or tool

Details where the technique/tool is available and how to access it.

6. Pre-requisite/s of the application

Describe the pre-requisites (facilities, equipment, etc.) of application of the tool/technique- as appropriate.

7. Cost-estimation

How much does the tool/technique cost to the SMEs? Is it publicly available? Free to use? Annual, monthly fee, etc.

8. Novelties, benefits and added value

What are the benefits or drawbacks of the technique/tool?

Please mark the relevant option + (affirmative) or - (negative/no effect) from the following possibilities!

Please also note that a tool/technique may have more than one benefit/drawback.

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency		
	Improving quality and its assessment		
	Improving risk assessment and risk management		
	Regulations compliance and its assessment		
	Product performance and its assessment		
	Information for users		
	User satisfaction and its assessment		
	User's feedback and reaction		
	Other Please specify:		

9. Lessons learned from the tool/technique

Experiences from the tool/technique that should be actively taken into account in future projects. Frequently, highlight strengths or weaknesses in preparation, application and implementation that affect performance, outcome, and impact.

The experience may be positive, as in a successful story, or negative, as in failure.

2.3. Method of the tools and techniques collection

Six types of templates were developed by CBHU considered the relevant disciplines and the responsibilities of the regional and knowledge partners in Task 2.1.

Each regional partner should collect possible tools and/or technics in their region, in each disciplines (food safety, quality and labelling; mechatronics and food design).

The following templates were developed for the Regional partners (CNA, CCIS-CAFE, STRIA, PTP, SCCI, and KIGPSIO)

- Template 1.a Food safety, quality and labelling – input of regional partner
- Template 1.b Mechatronics – input of regional partner
- Template 1.c Food design – input of regional partner

Knowledge partners should provide similar contribution within the discipline for which the partner is responsible.

- Template to be filled in by CBHU and UHOH:
  - Template 1.d Food safety, quality and labelling – input of knowledge partner
- Template to be filled in by BIZ-UP:
  - Template 1.e Mechatronics – input of knowledge partner
- Template to be filled in by UNISEF:
  - Template 1.f Food design – input of knowledge partner

The templates were sent to the project partners for reviewing and commenting. Based on the comments and the first experiences finally the 4th version of the templates was accepted as final.

The filled in templates were collected by CBHU in two rounds.

The following partners sent their contributions:

- Knowledge partners:
  - BIZ-UP
  - CBHU
  - UHOH
  - UNISEF
- Regional partners:
  - CCIS-CAFÉ
  - PTP
  - CNA-ER
  - SCCI
  - STRIA
  - KIGPSIO

3. Collected existing advanced tools and techniques (CBHU)

3.1. Food safety, quality and labelling

3.1.1. List of collected tools and techniques

The following tools and techniques were collected by the project partners in the area of food safety, quality and labelling:

3.1.2. Descriptions of collected tools and techniques

1) A SUSTAINABLE NETWORK IN FOOD SAFETY

ID number of the tool/technique	3.1.1.1.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x						

Collected by: CCIS-CAFE, PTP

1. **Specific need or problem being addressed by the tool/technique**

Food spoilage by microbes can occur at many places in the food supply chain. To address this mounting challenge, a pan-European consortium worked to develop a sustainable network. The 'Food safety and hygiene networking within new Member States and Associated Candidate Countries' (Safoodnet) project also set up an expert group for food safety.

2. **Name of the technique and/or tool**

A sustainable network in food safety.

3. **Additional information if it is available**

Website: http://safoodnet.vtt.fi/

4. **Short description of the technique and/or tool**

The ultimate aim was to build up a sustainable network in food safety. For this purpose it sought to disseminate knowledge to prevent risks related to microbial hazards, to find future Research and technological development (RTD) needs and to apply for RTD funding in food processing and packaging safety.

The objectives were to:
1. disseminate knowledge from national and international food safety projects in open seminars, workshops, practical exercises, RTD activities and pilot actions resulting in new research projects for food industry;
2. establish an Expert group (EG) in which authorities, scientists, industrial representatives would build up or strengthen existing networks and identify specific needs for future RTD activities in food safety;
3. bridge networks within the European Union (EU) and foster scientific cooperation and knowledge transfer in food safety.

The main achievements of the project where the following:

1. Three open seminars in microbial contamination routes and on risk assessment and management were held, namely 'Microbial contaminants and contamination routes in food industry', 'Risk assessment of microbiological problems and preventive actions in food industry' and 'Risk management by hygienic designs and efficient cleaning and disinfection programmes', correspondingly, to disseminate safety issues to a targeted audience of industrial, research and authority people.

2. Two workshops including practical exercises in microbial risk assessment and management to disseminate methodologies and methods were held.

3. Nine pilot actions on practical food safety issues together with industries were performed. Common conclusions based on the outcomes of finalized pilot cases were published in the final seminar proceedings 'Risk management by hygienic design and efficient sanitation programmes'. The following pilot cases were performed:
(a) risk assessment in Cypriot food factors;
(b) microbial process hygiene surveys in Estonian dairies;
(c) modelling of food safety of ready-to-eat meals;
(d) training and education needs in food hygiene;
(e) hygiene survey in Romanian bakeries;
(f) hygiene survey in Slovene poultry production;
(g) hygiene survey in Turkish food companies;
(h) hygiene survey in Finnish gulf surroundings; and
(i) detection of certain food pathogens using the Matrix-assisted laser desorption/ionization time-of-flight (MALDI-TOF) mass spectrometry.

4. An EG was established. These members suggested and evaluated the pilot actions for the needs in RTD activities concerning the food processing and packaging hygiene and end-product safety at the final EG meeting.
A substantial network was built to strengthen existing networks between SME's because knowledge sharing has to lead to a prevention of risks related food microbiological hazards and identify key areas for future EU RTD.

5. Availability, accessibility of the technique and/or tool

The substantial network in food safety was established to generate sustainable networking between junior employees in food companies and young food safety researchers.

6. Pre-requisite/s of the application

No pre-requisite is necessary.

7. Cost-estimation

Cost estimate is not specified.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment		-
	Product performance and its assessment		-
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify:		

9. Lessons learned from the tool/technique

A sustainable network was built in food safety that aimed at knowledge sharing to prevent risks related to microbial hazards, to find future RTD needs and apply for RTD funding in food processing and packaging safety. The action was focused towards pilot actions, seminars, and workshops on process hygiene and end product safety.

2) AIR FRYER

ID number of the tool/technique	3.1.1.2.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x	x	x				

Collected by: UHOH

1. Specific need or problem being addressed by the tool/technique

Deep frying oil can reach temperatures of over 400 °F. When cooking at this temperature, extreme safety measures should be taken to prevent burning oneself or starting a fire. Like other oils, cooking oil is a highly flammable liquid. To prevent flare-ups and house fires, avoid letting oil contact direct flames.
On the other hand, long-term research has shown that weight gain and being overweight or obese due to fried foods are important risk factors for type 2 diabetes, cardiovascular diseases, certain types of cancers, and premature death[1,2].

2. Name of the technique and/or tool

Air fryer

3. Additional information if it is available

https://www.youtube.com/watch?v=DkCOwfuDxCs

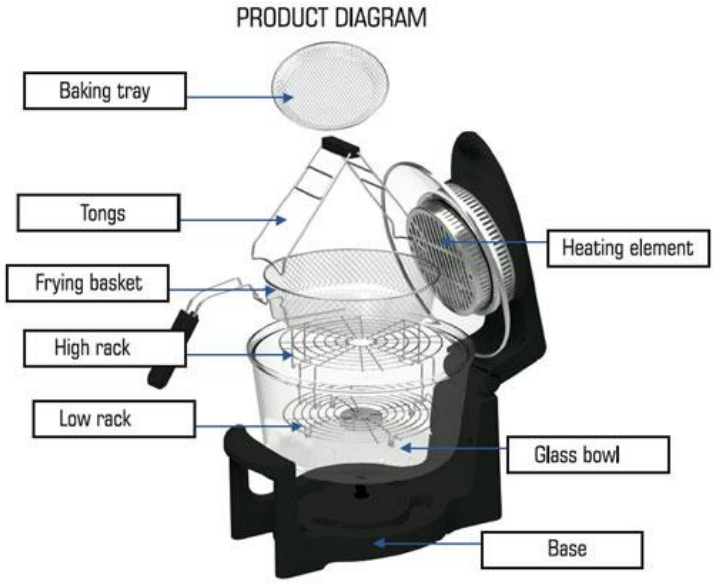
4. Short description of the technique and/or tool

By circulating air up to 200 Celsius or 392 degrees Fahrenheit this appliance fries several foods like potato chips, chicken, fish or pastries and it uses less oil than traditional fryer. Because air fryers use less oil to fry, it is supposed that they may be a healthier alternative to traditionally deep fried foods.
Various brands of air fryers claim to save as much as 80% cooking oil in comparison to traditional fryers. While most models of air fryers require that the basket be periodically shaken to ensure even cooking throughout, some models incorporate a food agitator that continuously churns the food during the cooking process [3]

[1] Hruby,A., Manson, J., Qi, L., Malik, V., Rimm, E., Sun, Q., Willett, W., Hu, F. (2016). Determinants and Consequences of Obesity. American Journal of Public Health. 106 (9), 1656-1662.

[2] Davis, R., Health Risks of Fried Foods May Be Overblown. Retrieved from: http://healthland.time.com/2013/09/24/dont-be-so-quick-to-shun-the-french-fry/

[3] Airfrying.net (2016). What is an Air Fryer? Retrieved from: http://airfrying.net/what-is-an-air-fryer/



5. Availability, accessibility of the technique and/or tool

The tool is available to the market with different prices and features, depending on the specific requirements of the user.

6. Pre-requisite/s of the application

No special pre-requisites for air fryer use, excepting a source of energy to plug it.

7. Cost-estimation

Information not available

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other		

9. Lessons learned from the tool/technique

An air fryer has a removable tray similar to the one found in a rice cooker, and within few minutes, a hot and crispy aliment is served up. Any cook you cook using the air fryer may appear fried due to its light and crunchy quality, but such foods are not only healthier but also have low amount of calories. There is almost no type of food that requires using oil to cook them that cannot be made healthier using an air fryer[4].

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3) AIRFLOW PUFFING

ID number of the tool/technique	3.1.1.3.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x	x	x				

Collected by: UHOH

1. Specific need or problem being addressed by the tool/technique

When grains such as rice, paddy, corn, gram, etc. and the nuts such as gorgon nut are heated, vapor pressure of water that is present inside the grain or nut increases. At certain temperature, pressure becomes so high that it breaks the structure of kernel with a typical popping sound. The process is known as puffing. In case of gorgon nut, an external force is applied for breaking the hard shell of the nut.
In order to get puffed product, its major constituents must be starch. Pre-gelatinized starch gives uniform and regular sized puffed product. For puffed paddy or corn, the grains need not to be gelatinized, and as a result, irregular and non-uniform shaped puffed product are obtained[5].

2. Name of the technique and/or tool

Airflow puffing

3. Additional information if it is available

https://www.youtube.com/watch?v=WRTlC9UrjSk

4. Short description of the technique and/or tool

Airflow puffing technology removes part of the water from fruit and vegetable materials in advance, then the fruit and vegetables are heated inside a pressure tank to achieve a

[4] Rosewood, B. (2017). Air Fryer Cookbook: The Complete Guide To Air Frying Plus Delicious Recipes To Bake, Fry, Grill And Roast For Healthy Eating. Publish Drive.

[5] Das, H. (2005). Food processing operation analysis. Asian books private limited. New Delhi

relatively low temperature but high pressure state. After insulating the target temperature for a certain period of time, release the pressure instantly so that the water inside the materials produces the effect of "flash evaporation". In this way, a puffing effect is achieved.

The fruit and vegetable puffed crispy product is produced by continuous dehydration under vacuum. The equipment for airflow puffing is composed of expansion tanks, heating elements, rotating, safety and vibration damping devices, frame and a base. A certain amount of material is loaded into the cover-sealed steel tanks, heated by gas, and rotated continuously at a certain speed. When the tank temperature reaches above 100°C, moisture on the surface of the material vaporizes, resulting in the increase of pressure inside the tank. When the pressure reaches 0.8 - 1.25 Mpa, the lid of the tank is suddenly opened and the pressure is released. The volume of the material then increases by nearly ten-fold. Compared with hot air drying and freeze drying, the airflow puffed drying processing have the advantages of energy saving, high drying efficiency, and could be applied to large-scale production[6].

5. Availability, accessibility of the technique and/or tool

http://www.snacksfoodproject.com/automatic-air-flow-puffing-machine.html

6. Pre-requisite/s of the application

When processed with airflow puffed processing equipment only, the pressure of produced vapor is too low, and hence there is the possibility that may not achieve the expected puffing effect. However, before the airflow puffing process, if there is a pretreatment by the vacuum microwave puffing processing method, the expected puffing state of the product can be achieved.

7. Cost-estimation

Information not available.

[6] Mu, T., Li, P., Sun, H. (2016). Bakery products and snacks based on sweet potato. Tropical roots and tubbers: Production, processing and technology. Wiley Blackwell. Chenai

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify:		

9. Lessons learned from the tool/technique

Puffing temperature, vacuum drying temperature and vacuum drying time have significant influences on the hardness index and crispness index. The puffing temperature had significant effects on the lightness of sweet potato chips, while the effects of vacuum drying temperature and vacuum drying time are not significant.

4) ANTI-TAMPERING SMART LABELS

ID number of the tool/technique	3.1.1.4.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
		x	x	x	x	x		x

Collected by: CBHU

1. Specific need or problem being addressed by the tool/technique

Food tampering involves the deliberate altering or adulteration the product or its package. Tampering attempts may be made at any phases of distribution, logistics or sale. Modes include Economically Motivated Adulteration (to gain an increased income from selling a foodstuff in a way which deceives customers and consumers) and Tampering (when a malicious person alters or interferes with a food item and introduces a food safety agent).
Needs for preventing intentional contamination will raise with the evolution of food safety system to a more pro-active mode as requested by retailers' standards like IFS and BRC as well as the recent US Food Safety Modernization Act.
No single solution can be considered as "tamper proof" if sufficient time and tooling is available recreate the impression of product and packaging integrity. Often multiple levels of security need to be addressed to reduce the risk of tampering.

2. Name of the technique and/or tool

Anti-tampering smart labels

3. Additional information if it is available

A presentation on smart label technology and examples on capabilities is available at: http://www.bumaga.nl/about-us/events/20150915-actinpak-aveiro/20150915-actinpak-aveiro/9-mika-vaha-nissi

4. Short description of the technique and/or tool

Packaging primarily serves to protect the food from contamination, loss of volatile components and other environmental factors (e.g. oxygen or light). For pre-packaged foods, legislation also demands the packaging to provide additional integrity to the food item in a way that the contents cannot be altered without opening or changing the packaging. Extending this principle to food raw materials and additives, it is the common interest of both the manufacturer and the user to maintain full food safety by ensuring that the packaging provides adequate protection but also reliable ways to detect if the integrity has been compromised.
Methods to detect and indicate the user the opening of food packaging are numerous. Industrial users are seeking for solutions which combine multiple information carrying criteria with easy and cheap application. "Smart labels" are printed paper or plastic labels with touch-free electronic readout capability. Such smart labels or tags can

carry pre-programmed information (e.g. unique traceability code), monitor their own environment (e.g. registering time or maximum temperature since activation) and/or offer additional features like electronic tamper evidence, all this readable electronically through standardised industrial methods, e.g. RFID.
Roll-to-roll paper labels' text and circuit conductors can be flexo printed, passive electronics screen printed and finally assembled with active components. Labels have an adhesive backing that allows secure application on the exposed part of the packaging.

5. Availability, accessibility of the technique and/or tool

Smart labels are under development by VTT:
VTT Technical Research Centre of Finland Ltd
Biologinkuja 7, Espoo, P.O. Box 1000, FI-02044 VTT, Finland, Tel. +358 40 530 8472
www.vtt.fi

6. Pre-requisite/s of the application

Smart labels can be applied with regular labeling equipment. Additional features of the label, like contents of the stored digital information, machine or human readability requirements, has to be agreed with the manufacturer.

7. Cost-estimation

The price of the solution as well as that of the individual labels depends on the label size and the information handling (input/output) capabilities.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options: + affirmative or - negative/no effect!	Improving cost efficiency		-
	Improving quality and its assessment		-
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users	+	
	User satisfaction and its assessment	+	
	User's feedback and reaction		-
	Other: Food Defense	+	

9. Lessons learned from the tool/technique

When used within a supplier partnership, smart labels permit automatic processing of hundreds of incoming items per hour individually reporting their status and condition on the push of a button or through a radio interface. Supplier and user will have the capability to accurately and unanimously identify the product and its unopened status. The printing technology developed by VTT allows cheap, mass manufacture of smart labels with a human or machine readable interface.

5) BEST PRACTICE GUIDE ON FOOD TRANSPARENCY AND INVENTORY OF BEST PRACTICES ON FOOD TRANSPARENCY

ID number of the tool/technique	3.1.1.5.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
	x	x	x	x	x	x		

Collected by: CBHU

1. Specific need or problem being addressed by the tool/technique

Nowadays the consumer is in a physical distance from the place of the food production, processing and handling in the food chain in the vast majority of cases. Therefore he has less and less direct information and overview about the way how the different food products are produced and supplied to the place of purchase and he has very limited opportunities to get this information without the assistance of the organisations acting in the supply chain of a specific food product. Thus the buying decisions of the consumers are based on the combination of directly measurable properties, perceived through their senses, on the information provided with the products, and on the trust that the product will comply with those characteristics, what are claimed to be associated with it.
Food scares, scandals but even the personal perception that the claims on the properties of a food product purchased may not be valid creates the feeling of uncertainty in consumers, and perception of loss of control over the safety, quality or characteristics important for purchase decisions.
Therefore there is an increasing demand for additional information on the product, the process, the food chain members, the production environment, including the cultural background of the geographical area, where the food is produced, processed and handled along the food chain, which prove the validity of claims. Transparency means measures through which the weakening of trust in fair and competent behaviour of businesses can be balanced and the credibility of claims on safety of food, attractive product characteristics and fair pricing can be established in particular for those cases, where the claims and statements can't be confirmed by direct measurements. The verity of the claims can be demonstrated only than, when the traceability of the unit of the food product (batch, lot, etc.) is ensured.
Food businesses need systems to provide the relevant information for transparency to improve consumers'trust, and they need support for establishing and operating such systems.

2. Name of the technique and/or tool

Best Practice Guide on Food Transparency and Inventory of best practices on Food transparency

3. Additional information if it is available

Publicly available best practice guide and an inventory of best practices in D6.2: Analysis of selected experiences of 'best practice transparency solutions' in enterprises and food chains of the Transparent_Food FP7 project.
Best Practice Guide on Food Transparency: http://www.transparentfood.eu/ under Activities/Public documents/
D6.2: Analysis of selected experiences of 'best practice transparency solutions' in enterprises and food chains: http://www.transparentfood.eu/ under Activities/Deliverables

4. Short description of the technique and/or tool

There is a Guide on Food transparency, which contains the description of some tools for building up transparency systems. These include a procedure for building up a transparency system and a tool for analysis and designing information flow in transparency systems. In the Appendix I. short descriptions of some successful cases are provided.
Transparency is a set of measures for building up credibility for consumers and customers, through openness and accountability on activities along the food chain, by underpinning the verity of messages and by generating the perception of being informed to allow informed decisions.
This is achieved by making appropriate signals/information available and understandable on the verity of messages (claims, statements) on

- specific characteristics of products, processes, production environment, activities of actors and the cultural and legal background of the production, having either of a positive enhancement or a negative, risk reduction nature.
- which can't be substantiated by the usual quick and simple methods.

The guideline describes the recommended priorities for development and operation of an effective transparency information system built on two basic processes:

- the process of realisation of transparency, which covers the delivery of the requested information to the right place, to the right recipients at the right time in the appropriate format;
- the process of formulation of the right content.

Process of realisation of transparency

- Techniques of collection of information
- Processing of information, transformation information into signals
- Communication of information
- Utilization of information

Process of formulation of the content of transparency information

- Communication of the content
- Quality of information
- Clarity of information, understandability
- Nature of information
- Verification

It describes also some recommended sub-domain specific transparency practices for food safety and quality concerns, environmental concerns, ethical concerns and social concerns.

It includes also a procedure for building up a transparency system, a tool for analyzing and designing information flow in a transparency system. The guide is designed to support food businesses, particularly SMEs for developing and operating their own transparency systems. It provides guidance to regulatory authorities and food control authorities.

5. **Availability, accessibility of the technique and/or tool**

Best Practice Guide on Food Transparency: http://www.transparentfood.eu/ under Activities/Public documents/
Inventory of successful cases in D6.2: Analysis of selected experiences of 'best practice transparency solutions' in enterprises and food chains: http://www.transparentfood.eu/ under Activities/Deliverables

6. **Pre-requisite/s of the application**

There is no specific pre-requisite for application. The typical communication tools of food businesses, web-site, computer, videos, etc. are satisfactory.

7. **Cost-estimation**

The guide and the inventory are publicly available at no cost.

8. **Novelties, benefits and added value**

What are the benefits or drawbacks of the technique/tool?
Please mark the relevant option (affirmative or negative/no effect) from the following possibilities!
Please also note that a tool/technique may have more than one benefit/drawback.

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency		-
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users	+	
	User satisfaction and its assessment	+	
	User's feedback and reaction		-
	Other Please specify:		

9. **Lessons learned from the tool/technique**

There are several successful examples on systems, solutions, providing information for transparency. A set of short description of 7 successful cases is provided in the Appendix I of the Guide. In addition short descriptions of 69 additional successful practice cases are provided in the inventory. Food businesses can use simple transparency systems to increase consumer/customer trust and satisfaction and foster the attractiveness of their products and services.

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6) BIOMETRIC IDENTIFICATION AND ACCESS CONTROL

ID number of the tool/technique	3.1.1.6.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
	x	x	x					x

Collected by: CBHU

1. **Specific need or problem being addressed by the tool/technique**

All businesses, whether small, medium or large, have assets that need to be protected. Site security is a key component of Food Defense. Needs for site related risks prevention will raise with the evolution of food safety system to a more pro-active mode as requested by retailers' standards like IFS and BRC as well as the recent US Food Safety Modernization Act.
It is common in buildings that are secured by locks and keys for doors to be left unlocked all day. This opens up the possibility of opportunist theft and malicious damage. Access control can also offer flexible control over users' access rights, like all staff can gain access through the main door of a building, but access to internal areas may be restricted to those who have a specific need to be there. Access may also be restricted by time, only granting access to particular users at certain times of day or night.

2. **Name of the technique and/or tool**

Biometric identification and access control

3. **Additional information if it is available**

http://www.cssgplc.com/biometrics/

4. **Short description of the technique and/or tool**

Fingerprints or the patterns of the iris are unique to each individual, as are other biometric data such as blood vessel patterns. As they scan, they capture the unique presence of ridges of the finger, colour streaks of the iris or veins as they branch

through the hand. Unlike some biometric systems, blood vessel patterns are almost impossible to counterfeit because they are located beneath the skin's surface. Vascular scanners do not require contact with the scanner, and since the information they read is on the inside of the body, skin conditions do not affect the accuracy of the reading.
Vascular scanners are ideal in areas where strict hygiene requirements are in force and non-contact identification is preferred. Uses may include access control (only staff permitted but no outsiders, e.g. truck drivers are not allowed in the plant) and selective access control (only staff with higher credentials are allowed, e.g. only those working in the high hygiene area are allowed to enter).
Using vascular scanners, the number of objects a person needs to carry along like swipe cards or keys, can be minimised thus the risk for foreign objects reduced.

5. **Availability, accessibility of the technique and/or tool**

Vascular scanners can be integrated into existing entry control systems and replace or improve the security of a card access system.

6. **Pre-requisite/s of the application**

To maximise its potential, a risk analysis on the premise is made and selective access areas and the respective gates or doors have been identified prior to introducing biometric identification.

7. **Cost-estimation**

Biometric identification systems are a one-off investment with low maintenance cost as the system can be extended easily with new areas, people or access policy.

8. **Novelties, benefits and added value**

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency		-
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment		-
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other: Food Defense	+	

9. **Lessons learnt from the tool/technique**

Biometric identification and access control has already found application in a variety of industries where extreme requirements are present. With its deployment cost falling, it has the potential to enter into food manufacturing where its non-contact benefits are a positive advantage.

7) BIOSENSOR SYSTEM (LACTATE BIOSENSOR) THAT ENSURES QUALITY AND EFFICIENCY IN THE FRUIT JUICE INDUSTRY

ID number of the tool/technique	3.1.1.7.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x						

Collected by: CCIS-CAFE, PTP

1. Specific need or problem being addressed by the tool/technique

Initiative for the development of biosensor system was to ensure quality and efficiency in the fruit juice industry. European small and medium-sized fruit juice producers must contend with the problem of contamination daily. Lactate-fermenting bacteria trigger unwanted fermentation that can cost companies millions in lost revenue. The problem, however, is that their presence may remain unnoticed for days before tests can identify them.

2. Name of the technique and/or tool

Biosensor system (lactate biosensor) that ensures quality and efficiency in the fruit juice industry.

3. Additional information if it is available

Website to the project QUALI JUICE (Contract No.: COLL-CT-2005-012461):
http://cordis.europa.eu/project/rcn/81607_en.html
http://cordis.europa.eu/news/rcn/29587_en.html

Publications:
Przybyt M., Iciek J., Papiewska A., Biernasiak J. 2010. Application of biosensors in early detection of contamination with lactic acid bacteria during apple juice and concentrate production, Journal of Food Engineering, 99: 485–490

NIKOLAUS N., STREHLITZ B. QUALI-JUICE – Quality Assurance and Development of an Early Warning System for Microbial Spoilage for the European Fruit Juice Industry

4. Short description of the technique and/or tool

European Small and Medium (SME) fruit juice producers face the problem of contamination of their products by lactate fermenting bacteria, provoking undesired fermentation processes and causing enormous financial losses for the afflicted companies. Responsible for these contaminations are an insufficient raw material quality (influenced by storage and climatic conditions), constructional deficits or insufficiently trained technical personnel.

The primary objective was to develop and validate an efficiently sensitive early warning system, which indicates a critical undesired bacterial spoilage during fruit juice production. The methodology was developed for all the European juice producers for detection of microbial contamination with lactate producing bacteria because early detection of fermentation processes is beneficiary in several ways: Firstly, it helps to identify critical points in fruit processing. Hence, a substantial basis is given for decision-making towards repeated preservation measures (pasteurization) in order to keep the juice suitable for human consumption. Thus, potential for saving raw material and production costs can be explored, increasing the productivity.
Biosensors were developed within the QUALI-JUICE project. The researchers' efforts substantially minimized the amount of produce lost to quality deterioration, and aimed to improve the productivity of the fruit juice industry by around 80%.
Online sensor systems were tested too, however juice manufacturers clearly prefered the offline system because installation is easier.
As a project result, a QUALI-JUICE prototype, equipped with adequate software, will give an alert in case of increasing lactate concentration, thus detecting spoilage in the juice at an early stage. Using this tool, fruit juice producers are able to perform pasteurization only when necessary, thereby saving energy and preventing vitamin loss of the juice. Furthermore, biosensor measuring methods resign from the use of hazardous chemicals like organic solvents, and do not accumulate environmentally hazardous wastes.
The bacteria have the potential to spread and infect countless volumes of fruit juice throughout the production line. When the bacteria are detected, it is too late for pasteurization due to the organoleptic properties of the juice, thereby rendering it unfit for human consumption.
However, if producers are made aware of contamination at an earlier stage, manufacturers can pasteurize the juice and then send it to market. Since this measure consumes energy - thereby raising production costs - it should only be introduced when there is an acute risk of spoilage. In this way, quality assurance which can be offered at a fair price to the customer is guaranteed since efficient production with minimum waste means optimized costs for the manufacturer.

5. Availability, accessibility of the technique and/or tool

Application of lactate biosensors in food and beverage production described in literature is still limited mainly to dairy products and wine. The results of the QUALI_JUICE project proved that commercial biosensors dedicated for assay of L-lactate in blood could be used without any changes in construction for analysis of fruit juices and other products. There is only a need of some simple sample preparation (absorption of interferants by polyamide 6) and some changes in operation protocols (frequency of calibration). These results open the opportunity for much broader use of lactate biosensors in food and beverage industry.

6. Pre-requisite/s of the application

The commercial lactate biosensors could be used to measure lactate concentration in juices during production of juice concentrate and in juices. The final choice of the device (biosensor) by the future user (juice producing company) is defined by its

particular demands (simplicity of the measurements, possibility of usage at line) and economic impact (price of the device and consumables).

7. Cost-estimation

Since construction features lead to significant differences in performance, power consumption and price, the choice of a suitable sensor system is a core challenge. The cost for a sensor system varies from 500 to 7000 Euro, for example. The assay can be made by unskilled personnel after short training, and the measurements can be done at the production site.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment		
	Product performance and its assessment		-
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other:		

9. Lessons learned from the tool/technique

The aim of an early warning system for microbial spoilage for the European fruit juice industry was the application of lactate biosensor at juice producing plants (especially from apples) to control the production process and quality of the final product. Small and medium fruit juice producers face the problem of contamination with lactic acid bacteria, provoking undesired fermentation processes leading to juice spoilage and causing financial losses for the affected companies and environmental problems.
The use of the biosensors for these purposes could be the alternative for standard methods like enzyme kits and chromatography.
The main advantages of the lactate biosensor use are as follows:
• Shortening the time of analysis,
• The assay can be made by unskilled personnel after short training,
• The measurements can be done at the production site,
• The cost of analysis is lower as compared with standard methods.
The disadvantages of the biosensor use in food and beverage industry are:

- the fact that the measurement with biosensors is not included in standards and legislation and the lack of commercial biosensors devoted for lactate assay in food except YSI 2700 SELECT™ Biochemistry Analyzer (YSI Inc., USA). Only for the wine industry, the market offers specific biosensors for complex analysis of wine production and quality.

8) CHAIN MANAGEMENT FOR SMES

ID number of the tool/technique	3.1.1.8.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x						

Collected by: CCIS-CAFE, PTP

1. Specific need or problem being addressed by the tool/technique

Building the capacity of institutions supporting innovation in the food sector and promoting public awareness on benefits of innovation, making the sectoral innovation easier through transnational cooperation of the national food technology platforms and related institutions.

2. Name of the technique and/or tool

Chain management for SMEs.

3. Additional information if it is available

Project website:
www.capinfood.eu

Publication:
Joachim Schouteten et al. The European Food Prices Monitoring Tool as a Prerequisite for more Price Transparency in the Food Chain

4. Short description of the technique and/or tool

The industry/SME is the one of the main clients of research activities. If research results are not implemented in the practice, why we invest time and money into research? If we want to achieve that research results should be exploited by the SMEs for new products, processes, services, systems, markets we need to convince the SMEs about the benefits and feasibility for investing time, efforts and money into the application of these results in the R&D activities.

5. Availability, accessibility of the technique and/or tool

National Technology Platforms.

6. Pre-requisite/s of the application

No pre-requisite needed.

7. Cost-estimation

Not specified.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment		-
	Product performance and its assessment		-
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other:		

9. Lessons learned from the tool/technique

Creating sustainable competitive advantage based on chain competencies,
Improving the efficiency of:

- using resources along the food chain from suppliers to consumers,
- flow of material, information, labour, money,
- accessing capabilities of chain partners,

Improving access to market,
Improving delivery of sales and services to customers and
Assistance to design effective collaboration between value chain partners, peers.

9) CODE OF BEST PRACTICES FOR CLEANING AND DISINFECTION OF MINIMALLY PROCESSED VEGETABLES

ID number of the tool/technique	3.1.1.9.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x		x	x					

Collected by: CBHU

1. Specific need or problem being addressed by the tool/technique

Chlorine is widely used for MPV, but it produces unhealthy by-products and its efficiency in disinfection is largely reduced by the presence of organic matter. In addition, chlorine and its derivatives have received more and more focus for environmental concerns.
The consumption of water and chemicals for decontamination of raw green leafy vegetables and for sanitation of equipment and installations are key indicators of environmental performance of the Minimally Processed Vegetable (MPV) industry.
The SMEs have limited information about the alternative environmental performance of sanitation and decontamination techniques.

2. Name of the technique and/or tool

"Code of Best Practices for cleaning and disinfection of Minimally Processed Vegetables"

3. Additional information if it is available

The guideline can be found on the website of www.susclean.eu (project name: Sustainable Cleaning and Disinfection in Fresh Cut Food Industries (SUSCLEAN).

4. Short description of the technique and/or tool

Nature and intended use: On one hand the guideline helps to develop sustainable cleaning and disinfection strategies and techniques, to propose recommendations the Integrated Pollution Prevention Control (IPPC) to renew the best available processing techniques. In addition it can be useful for the MPV machinery producers to design cleaning-suited equipment.
Scope: The scope / area of the application of the guideline is the MPV industry.
Brief explanation: The guideline first gives an overview of the of the product and process parameters that can influence the shelf life of MPVs. Than the alternative chemical methods (like phytochemicals, chlorine dioxide, ozone, hydrogen peroxide, organic acids, enzymes, copper and silver) and the alternative physical decontamination treatments (like pulsed UV light, pulsed electric fields, Electrolyzed Oxidising Water (EOW), ultrasound) are discussed and characterised (advantages, disadvantages, treatment of equipment and product). There are also results and information related to the ozone combined with ultraviolet irradiation, as an advanced oxidation techniques. The next section of the guideline shows the results

and main conclusions of the industrial scale tests of NEOW, with focusing into the reduction of chlorine consumption during the sanitizing tank water disinfection.
Target users: The guideline is intended to use by the fresh cut produce industry (who are involved in producing the minimally processed fresh green leafy MPVs), by the machinery designer and by the regulatory authorities.

5. **Availability, accessibility of the technique and/or tool**

See on the website of SUSCLEAN: www.susclean.eu .

6. **Pre-requisite/s of the application**

The guideline gives a short set up of equipment (like NEOW generator, water softener and holding tank containing high-grade quality salt used to create the saline solution, holding tanks, device for measuring free chlorine, pH measurement, etc.). This set up can be useful to organize similar experiments.

7. **Cost-estimation**

The guideline can be free downloaded from the website of SUSCLEAN (www.susclean.eu).

8. **Novelties, benefits and added value**

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment		-
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment		-
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify:		

9. **Lessons learned from the tool/technique**

The guideline overviews the alternative chemical and physical methods to chlorine of green leafy vegetable and equipment decontamination (advantages, disadvantages, treatment of equipment and product), gives information of technology tested within the SUSCLEAN project aimed to reduce the consumption of water and chlorine in the decontamination raw vegetables and in the wash water disinfection.

10) DIFFERENTIATING BETWEEN FRESH AND FROZEN-THAWED MEAT

ID number of the tool/technique	3.1.1.10.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
	x		x	x	x			

Collected by: CBHU

1. **Specific need or problem being addressed by the tool/technique**

As the EU Food Information to Consumers Regulation comes ever-closer to being implemented in December 2014, labelling will change for fresh and frozen-thawed meat. The term 'defrosted' will be required to accompany the name of defrosted foods where freezing has an effect on safety or quality. This will be useful as frozen-thawed meat has a tendency to have a shorter shelf life than fresh meat, and any meat that is not labelled correctly has the potential to be passed off by rogue traders as 'fresh' when it has in fact been frozen.

2. **Name of the technique and/or tool**

Differentiating between fresh and frozen-thawed meat

3. **Additional information if it is available**

N/A.

4. **Short description of the technique and/or tool**

A method was put in place to distinguish between meat that is fresh and meat that has been frozen-thawed by using a mitochondrial enzyme, beta-hydroxyacyl-CoA dehydrogenase (HADH), which is released when meat is frozen. For example, two meat samples were tested - one which was frozen and thawed, and another which was analyzed without freezing. HADH activity was measured in meat press juice extracted from the samples. It was found that HADH activity was much higher in the meat that was frozen-thawed, and so using this as a measure provides a means of determining the authenticity of "fresh" meat with respect to freezing.

5. **Availability, accessibility of the technique and/or tool**

Visit https://www.campdenbri.co.uk/news/labelling-fresh-frozen-thawed-meat.php

6. **Pre-requisite/s of the application**

N/A.

7. Cost-estimation

It is basis on individual offer.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency		-
	Improving quality and its assessment	+	
	Improving risk assessment and risk management		-
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users	+	
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify:		-

9. Lessons learned from the tool/technique

It support the transparency and accuracy
Risk Assessment is widely used by the food industry. Although it may work well for microbiological hazards, many sectors of the food industry do not understand the concept of risk in relation to other hazards such as economic fraud, chemical hazards or allergen management. In addition to requirements to perform risk assessment defined by industry and legislative standards, it could be a useful tool to help companies develop testing schedules as part of their quality assurance schemes. Analytical testing of products or raw materials is an expensive part of a company's QA scheme. The requirement to include checks for raw material and product authenticity has become important.
The method for differentiating between fresh and frozen-thawed meat can be a good support for the manufacturers and retailers, other potential users.

11) EDUCATION AND TRAINING PATHS

ID number of the tool/technique	3.1.1.11.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x	x	x	x	x		

Collected by: CNA-ER

1. **Specific need or problem being addressed by the tool/technique**

Supporting the capacity building process by trainings for competences and skills of food related SMEs.

2. **Name of the technique and/or tool**

Education and training paths

3. **Additional information if it is available**

N/A

4. **Short description of the technique and/or tool**

Nature and intended use of the tool: improving managerial skills and competences in SMEs.
Target users/segments: managers and employees (by researchers or industry, regulatory authorities, standardization authorities, product developers, risk assessors, production engineers etc.).

The table here below describes education and training paths 2017 (20 hours each), focused on agri-food connected with innovation and internationalization.

	TITLE	Specialization Area S3	SECTOR/Production system/supply chain	Lesson hours	No. of students
Export and Internationalization strategies for the companies of the Agri-food system of Emilia Romagna	Selling food products abroad: contractual caution and regulatory references	Agri-food	Agri-food	20	10
	Selling food products abroad: contractual caution and regulatory references	Agri-food	Agri-food	20	10
	Incoterms, shipping and insurance	Agri-food	Agribusiness Mechanic industry	20	10
	Export strategy to consolidate presence abroad	Agri-food	Agribusiness Mechanic industry	32	8
	Commercial and marketing development abroad of food products	Agri-food	Production of cured meats	20	8
	E-commerce solutions within the agri-food industry: restrictions and opportunities	Agri-food	Agribusiness	24	10
	E-commerce solutions within the agri-food industry: restrictions and opportunities	Agri-food	Agribusiness	24	10
	E-commerce solutions within the agri-food industry: restrictions and opportunities		Agri-food	24	10
	Products labelling	Agri-food	Agri-food Agribusiness	20	10
	Food certifications to sell Made in Italy products abroad		AGRI-FOOD SYSTEM	20	8
Sustainable development and production sustainability in the Agri-food sector	Sustainable development: energy efficiency and innovation of production and management processes	Agri-food	Craft companies; meat processing; pasta, baked products, production of piada, etc.	30	10

	Food miles, Organic products and certification systems	Agri-food	Craft companies; meat processing; pasta, baked products, production of piada, etc.	30	10
	Second Life: from food swarf to precious resources of the Agri-food supply chain	Agri-food		64	12
	Social business sustainability and product traceability to protect the supply chain and the end user	Agri-food		54	12
Eco-sustainability and efficiency in production processes within SMEs	Lean thinking: eco-sustainability and efficiency of production process	Mechatronic and engine manufacturing / Agri-food	agro	32	8
	Lean thinking: eco-sustainability and efficiency of production process	Mechatronic and engine manufacturing/ Agri-food	agro	32	8
	Lean thinking: eco-sustainability and efficiency of production process	Mechatronic and engine manufacturing / Agri-food	agro	32	8
	Lean thinking: eco-sustainability and efficiency of production process	Mechatronic and engine manufacturing / Agri-food	agro	32	8
	Lean Six Sigma	Mechatronic and engine manufacturing / Agri-food	agro	20	8
	Innovation for a sustainable development	Mechatronic and engine manufacturing / Agri-food	agro	20	8
	EFFICIENCY IMPROVEMENT OF PRODUCTION PROCESS	Mechatronic and engine manufacturing / Agri-food	agro	20	12
	Materials and innovative solutions for renewable energies – Models of Company – Research Labs Integration	Mechatronic and engine manufacturing / Agri-food	agro	20	8

	New materials in sustainable production – Models of Integration of University and Business	Mechatronic and engine manufacturing / Agri-food	agro	20	8
	Domotic systems for a sustainable development Company – Research Labs Integration Models	Mechatronic and engine manufacturing / Agri-food	agro	20	8
	Design for all - Integration models of University and Business	Mechatronic and engine manufacturing / Agri-food	agro	20	8

5. Availability, accessibility of the technique and/or tool

Funded by efs, cna er planned several training paths for entrepreneurs and employees in order to improve competences even in the discipline of food **safety, quality and labelling,** to be implemented by its organization for training and education**.**

6. Pre-requisite/s of the application

Funding opportunities availability; mapping of training and educational companies' needs availability; s3 strategy framework. to be provided, trainings need classrooms (equipped) and experts as coach/mentor/teacher.

7. Cost-estimation

N/A

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users	+	
	User satisfaction and its assessment	+	
	User's feedback and reaction		-
	Other Please specify:		-

9. Lessons learned from the tool/technique

Need of managerial training within SMEs.

12) EHEDG DOCUMENTS 8, GUIDE TO THE "HYGIENIC EQUIPMENT DESIGN CRITERIA"

ID number of the tool/technique	3.1.1.12.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
	x	x	x		x			

Collected by: CBHU

1. Specific need or problem being addressed by the tool/technique

The good hygienic design and manageability during the operation of equipment is a key element of safe and hygienic food production in the entire food production process from the farm up to the consumer. A poorly designed equipment, manufacturing process is not only a threat to food safety, but significantly increases the risk of formation of waste products as well.
The European Hygienic Engineering and Design Group (EHEDG) is a consortium of equipment manufacturers, food Industries, research institutes and public health authorities, founded in 1989 with the aim to promote hygiene during the processing and packing of food products. EHEDG provides a balanced forum for food processing equipment manufacturers, users and legislators to discuss issues concerning hygienic design and to stimulate food safety and quality by identifying areas where knowledge of hygienic design is insufficient, filling the existing gaps and lack of know-how by practical guidelines and education and in particular preparing scientific and technical guidelines on all aspects of state-of-the-art hygienic design requirements in accordance to EU legislation.
The goal of EHEDG is the promotion of safe food by improving hygienic engineering and design in all aspects of food manufacture.
EHEDG actively supports European legislation, which requires that handling, preparation processing and packaging of food is done hygienically using hygienic machinery and in hygienic premises according to the food hygiene directive, the machinery directive and the food contact materials directive (see EC Directive 2006/42/EC for Machinery, EN 1672-2 and EN ISO 14159 on Hygiene requirements for the design of machinery).

2. Name of the technique and/or tool

EHEDG Documents 8, Guide to the "Hygienic Equipment Design Criteria"

3. Additional information if it is available

European Hygienic Engineering and Design Group
Websites: www.ehedg.org

4. Short description of the technique and/or tool

This document describes the criteria for the hygienic design of equipment intended for the processing of foods. The goal is the prevention of the microbial contamination of food products. Such contamination may, of course, originate from the raw materials, but the product may also be contaminated with micro-organisms during processing and packaging. If equipment is of poor hygienic design, it will be difficult to clean. Residues (soil) may be retained in crevices and dead areas, allowing the micro-organisms which they harbour to survive and multiply. These may then cross-contaminate subsequent batches of product. Although a primary objective of design remains that the equipment is able to fulfil its engineering function, sometimes the requirements of hygiene will conflict with this. In seeking an acceptable compromise it is imperative that food safety is never put at risk. Upgrading an existing design to meet hygiene requirements can be prohibitively expensive and may be unsuccessful and so these are most effectively incorporated into the initial design stage. The long-term benefits of doing so are not only product safety but also the potential to increase the life expectancy of equipment, reduce maintenance and consequently lower operating costs.
This document details the principal hygienic design criteria to be met by equipment for the processing of foods. It gives guidelines on how to design, construct and install such equipment so that it does not adversely affect food quality; especially safety. The guidelines apply to durable equipment used for batch and continuous, open and closed manufacturing operations. The susceptibility of the product to microbial activity will determine the balance between normal engineering demands and those of hygiene. For example, dry products do not support the growth of micro-organisms and requirements will be more relaxed than for moist products. However, if the equipment is to be used for products destined for 'at-risk' consumer groups, the hygiene demands on design will be more stringent. Here the designer may need to consult appropriate authorities such that the right balance is achieved.
The guideline helps to the maintenance staff of the food producers to manage their activity and give details on materials of constructions, functional requirements including cleanability, prevention of ingress or growth of micro-organisms and validation. Further details are included such as hygienic design and construction (surfaces and geometry including surface finish/roughness, drainability and lay-out, installation, welding, insulation, etc.) and testing the hygienic characteristics of equipment.

5. Availability, accessibility of the technique and/or tool

Website: https://www.ehedg.org/guidelines/free-documents/

6. Pre-requisite/s of the application

N/A

7. Cost-estimation

This guide is available on the website of European Hygiene Design Group (www.ehedg.org) for a fee.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency		-
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment		-
	Information for users	+	
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify:		

9. Lessons learned from the tool/technique

An easily applicable guide for all producer faced with microbiological contamination problem sourced from poorly designed equipment, mainly for small enterprises without specialists.

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13) EHEDG DOCUMENTS DOC 45 – PART 1 - CLEANING VALIDATION IN THE FOOD INDUSTRY – GENERAL PRINCIPLES

ID number of the tool/technique	**3.1.1.13.**

Novelties, benefits and added value								
a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**	**i.**
	x	x	x		x			

Collected by: CBHU

1. Specific need or problem being addressed by the tool/technique

Physical, chemical and biological cleanliness is a prerequisite for food safety. A variety of hazards can contaminate food such as microorganisms and their toxins, previous products and ingredients active as allergens, residues of cleaning and disinfection agents and lubricants. Therefore, process and ancillary equipment need regular and effective cleaning, with or without disinfection, to ensure the control of such hazards and to prevent the cross-contamination of food products. In the following, "cleaning with or without disinfection" will be shortened to "cleaning".
National and international legislation requires the food industry to put on the market safe food and equipment manufacturers to provide cleanable equipment. The validation of cleaning and/or disinfection operations is necessary to ensure compliance and to provide documented evidence that an approved cleaning

procedure will provide clean equipment, suitable for its intended use. Following a validated cleaning baseline, optimization of the cleaning operation can be undertaken with a subsequent reduction of chemicals, energy, water, labour, downtime and effluents.
Surfaces that are in the scope of cleaning validation are those which are exposed intentionally or unintentionally to the product and surfaces from which splashed product, condensate, liquids or material may drain, drop, diffuse or be drawn into the product or onto product contact surfaces or surfaces that come into contact with packaging materials. They are designated as "Product contact surfaces" in the EHEDG Glossary. Cleaning validation is not necessarily required for potentially non-critical cleaning of floors, walls and the outside of equipment, unless required by hazard evaluation.
Whilst not a food safety issue, the principles of this document can also be used for the validation of cleaning programmes intended to control quality or brand protection issues. For example the removal of meat substances before the production of vegetarian dishes, or the removal of pork residues in meat factories processing a number of animal species. In these cases the detection of DNA residues remaining on surfaces may be undertaken.
The European Hygienic Engineering and Design Group (EHEDG) is a consortium of equipment manufacturers, food Industries, research institutes and public health authorities, founded in 1989 with the aim to promote hygiene during the processing and packing of food products. EHEDG provides a balanced forum for food processing equipment manufacturers, users and legislators to discuss issues concerning hygienic design and to stimulate food safety and quality by identifying areas where knowledge of hygienic design is insufficient, filling the existing gaps and lack of know-how by practical guidelines and education and in particular preparing scientific and technical guidelines on all aspects of state-of-the-art hygienic design requirements in accordance to EU legislation.

2. Name of the technique and/or tool

EHEDG Documents DOC 45 – Part 1 - Cleaning validation in the food industry – general principles

3. Additional information if it is available

European Hygienic Engineering and Design Group
Website: www.ehedg.org

4. Short description of the technique and/or tool

The objective of cleaning validation is to prove that the equipment is consistently cleaned of product, microbial residues, chemicals and soiling, including allergens to an acceptable level, to prevent possible cross-contamination of hazards between products. This document focuses on the overall concept of cleaning validation and is intended as a general guideline for use by food manufacturers and inspectors. It is not the intention to be prescriptive in specific validation requirements. This document serves as general guidance only, and the principles may be considered useful in their application in the production of safe food, and in the development of guidelines for the validation of specialized cleaning or inactivation processes.

Normally cleaning validation would be applicable for critical cleaning such as cleaning of product contact surfaces between production of one product and another, in particular if the food is intended to be consumed by certain high-risk consumers that include pregnant women, neonates, immuno-compromised adults and the elderly or consumers suffering from allergies. Further, cleaning validation is recommended if there is a significant risk of contamination and cross-contamination with hazards such as pathogens, toxins or allergens. It can be used for any type of cleaning operation by food equipment manufacturers, engineering companies, food manufacturers and providers of services and chemical products.
This guide includes relevant information for prerequisites, such as the equipment qualification, hazard evaluation, acceptance criteria, sampling techniques, analytical methods, cleaning procedure and establishing the cleaning validation protocol and details of the cleaning validation process.

5. Availability, accessibility of the technique and/or tool

Website: https://www.ehedg.org/guidelines/free-documents/

6. Pre-requisite/s of the application

N/A

7. Cost-estimation

This guide is available on the website of European Hygiene Design Group (www.ehedg.org) for a fee.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency		-
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment		-
	Information for users	+	
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify:		

9. Lessons learned from the tool/technique

An easily applicable guide for all producer faced with microbiological contamination problem sourced from poorly designed equipment and cleaning protocol, mainly for small enterprises without specialists.

14) EMULSION DONE WITH SUNFLOWER OIL AS FAT REPLACER AND SALT REDUCTION (MOSTLY SUBSTITUTED WITH POTASSIUM) IN COOKED SAUSAGES

ID number of the tool/technique	3.1.1.14.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x						

Collected by: CCIS-CAFE, PTP

1. **Specific need or problem being addressed by the tool/technique**

The formulation of cooked sausages comprises lean muscle, salt, fat and binders. The technological function of salt in mainly to improve protein and water binding. It affects macro and micro structure of the sausages and influences the processing and the sensorial characteristics of the product. The objective is to explore strategies to reduce fat and salt content in cooked sausages.

2. **Name of the technique and/or tool**

Emulsion done with sunflower oil as fat replacer and salt reduction (mostly substituted with potassium) in cooked sausages.

3. **Additional information if it is available**

Website: http://cordis.europa.eu/result/rcn/183606_en.html
http://cordis.europa.eu/docs/results/289/289397/final1-final_report_terifiq_v1-0.pdf
Publication: Corresponding deliverables: D2.2 & D2.4 Less fat and sodium in sausages by Rune Rødbotten, TeRiFiQ Final Conference, 27/10/2015, Milan, Italy

4. **Short description of the technique and/or tool**

Emulsions with sunflower oil were better emulsified than emulsions with pork leaf fat; however an off-taste was detected. Thus the use of lean meat, low in fat, is preferable to decrease fat content more than 12% but is more costly. Concerning salt, by only optimizing the cooling step in salted solution immersion, the salt content can be reduced from the current 2.1% to 1.6% without major texture changes. Reducing the salt content in meat batters leads to increased cooking loss and softer texture. Meat raw material with a low fat content gave rise to better emulsified batters compared to more fatty meats. Protein structure changes in meat batters of different salt concentrations, leading to changes in the quality of the products. The use of pre-rigor trimmings with high binding is a promising method to compensate for the reduced binding in low salt sausages.
It is possible to reduce total salt content in cooked sausages by 20% and 20 - 30% of sodium can be partially substituted by potassium. Thus, sodium and fat contents can

be reduced by 40% and by 20%, respectively, when compared with the reference product without significantly affecting the sensory properties of cooked sausages.
The main objective was to implement and transfer knowledge obtained during laboratory tests into the production process of cooked sausages to improve the nutritional quality of the products.

5. Availability, accessibility of the technique and/or tool

All the public deliverables are available on the TeRiFiQ website.
New products in the market: Traditional Spanish Chorizo 40% reduced salt and 60% reduced saturated fat (Boadas 1880).

6. Pre-requisite/s of the application

No pre-requisite is needed.

7. Cost-estimation

Both the potassium salt and the fat reduction will enhance the price/kg. Given the improved health claim of the product, and the fact that there is no compromise on pleasantness, this cost increase should be accepted by the consumers.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment		-
	Product performance and its assessment		-
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify:		

9. Lessons learned from the tool/technique

The present results constitute a valuable set of data for helping professionals wishing to reduce salt and fat contents in dry-fermented sausages. We found that healthier dry sausages can be manufactured with no adverse effect on end-product physical-chemical and biochemical properties. A pilot scale demonstrated that the use of fat emulsion and fibers was a good solution to reach the SFA reduction. For salt reduction, the cold predrying during 3 days associated with a 30% substitution of NaCl by KCl or addition of yeast extract associated with 40% salt substitution by KCl were efficient technologies.

15) ESN CONSUMER TESTING GUIDELINES

ID number of the tool/technique	3.1.1.15.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
				x	x	x		

Collected by: CBHU

1. **Specific need or problem being addressed by the tool/technique**

It is a big concern in the people dealing with marketing, new product development (NPD) in the companies to give proper answer for decision makers, using the right methods, etc. The experts within European Sensory Network (ESN) set up a guideline that support these people and give guidance to them in answering the most frequently asked questions:
How to improve a product? Is there a market niche?

2. **Name of the technique and/or tool**

ESN Consumer Testing Guidelines

3. **Additional information if it is available**

It is available on http://www.esn-network.com/.

4. **Short description of the technique and/or tool**

This guide intends to give guidance on the following main topics formed to questions:

- How to improve my product?
- Better than the competitor?
- Does the taste match the concept?
- How can I measure the sensory variation in my product?
- What is the Best Combination for Multiple Products?
- What is a good score for my product?
- Is there a market niche?

It can be a great support to people dealing with marketing and NPD, particularly in small businesses, but also give useful information for those working at big companies.

5. **Availability, accessibility of the technique and/or tool**

It is freely available for public.

6. **Pre-requisite/s of the application**

It is available online. A computer and internet access is required.

7. Cost-estimation

It is freely available to public.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency		-
	Improving quality and its assessment		-
	Improving risk assessment and risk management		-
	Regulations compliance and its assessment		-
	Product performance and its assessment	+	
	Information for users	+	
	User satisfaction and its assessment	+	
	User's feedback and reaction		-
	Other Please specify:		-

9. Lessons learned from the tool/technique

Giving support to carry our consumer tests in a proper way and get reliable results and through this increase the success of the product in the market.

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16) FOOD COMPOSITIONAL DATA (FCD)

ID number of the tool/technique	3.1.1.16.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
			x		x	x		

Collected by: CBHU

1. Specific need or problem being addressed by the tool/technique

There is an increasing demand for FCD because of nutrition labelling is mandatory according to 1169/2011 EU regulation. In additional to this increasing awareness or interest in the prevention of diseases, which is generating demands for inclusion of new components (phytochemicals, trans fatty acids, added sugar etc.) and new foods (e.g. fortified foods, recipes, cooked foods, manufactured foods) into Food Compositional table/ Food Compositional Data base (FCT/FCDB).
Based on the regulation „ The declared values shall, according to the individual case, be average values based on:
(a) the manufacturer's analysis of the food;

(b) a calculation from the known or actual average values of the ingredients used; or
(c) a calculation from generally established and accepted data."
FCD support those manufacturers whose want to choose c, option to comply with the nutritional labelling requirements.
FCD can be a great tool for the industry, but there are lots of drawbacks, eg.

- The composition of the same food can vary between countries, resulting in the need to develop national or regional FCT/FCDB.
  Each country has its own consumption pattern resulting in country-specific foods and recipes. Therefore, each country has specific data needs as they have different compositions of locally available foods.
- There is a large data gap in high-quality analytical food composition data (especially on vitamins and minerals, processed products, biodiverse foods including wild and underutilized foods)
- Many analytical data exist (e.g. in institutes or universities) but they are not published, therefore they cannot be used.

In addition many users of food composition databases and tables are not aware that food composition data can vary significantly either because of natural differences (e.g. soil, genetics, climate) or because of artificial differences (e.g. due to nutrient definitions or expressions, enrichment, fortification). People are often not conscious of the different nutrient contents between e.g. raw, cooked and processed foods or between the different expressions and definitions of nutrients and their influence on nutrient values. This is the case for many vitamins (e.g. Vitamin A, D or E, or folate versus folic acid) and even for macronutrients (total vs. available carbohydrates).
For all these reasons, it should be recognized that food composition data are not simple numbers; a great deal of knowledge is needed to generate, compile, update and use these data adequately. Adequate creation steps/protocol and training of the involved partners are needed to build FCD.

2. Name of the technique and/or tool

Food Compositional Data (FCD), FAOINFOODS Compilation Tool for CEEEC FCT

3. Additional information if it is available

http://www.fao.org/infoods/infoods/en/

4. Short description of the technique and/or tool

INFOODS is the International Network of Food Data Systems. It was established in 1984. It is a worldwide network of food composition experts aiming to improve the quality, availability, reliability and use of food composition data.

FAOINFOODS Compilation Tool for the region of Europe and Central Asia contains nutritional data from Belarus, Bulgaria, Croatia, Hungary, Kazakhstan, Moldova, Slovakia, Russia, Turkey and Ukraine. Minimum 100 items (food lines) were collected from each country, totally 1200 food lines contained. The range of foods is very wide; it contains on the one hand the most frequently consumed foods in the given country from special dairy products through raw fruits and vegetables to herbs and spices. The following food categories contained in the FAOINFOODS FCT: cereals, starchy roots,

legumes, vegetables, fruits, nuts and seed, meat and poultry, eggs, fish, milk and cheese, fats and oils, beverages.

INFOODS also stands as a forum through which international harmonization and support for food composition activities can be achieved and advocated.
Nutrient contents in foods can vary significantly because:

- of environmental, genetic and processing influences such as feed, soil, climate, genetic resources (varieties/cultivars, breeds), storage conditions, processing, fortification and market share;
- each country has its own consumption pattern resulting in country-specific foods, recipes and brand-name foods (commercial foods with the same brand-name can have varying composition due to taste or fortification regulations across borders)
- food biodiversity highly influences the composition of foods: nutrient values may vary up to 1000 times among different varieties of the same foods. This means that the nutrient content of foods can vary as much among foods as among varieties of the same food.

Therefore, each country has specific data needs as they have different compositions of their foods, even if some people think that foods have similar composition among countries due to globalization.
High-quality food composition data should be representative of national food habits and consumption patterns. They should be generated according to international guidelines so that they are comparable and reliable. Well-designed tables and databases should include a good selection of food components and the majority of highly-consumed foods. However, this is often not the case as many tables only include raw foods and a small number of nutrients while processed and fortified foods are lacking.
Whilst many countries have a national or regional food composition tables or databases, most of them contain incomplete, outdated and unreliable data. On the other hand, there are still many developing and some developed countries without such tables or databases. These countries borrow data from other sources, e.g. data are taken from publicly available database such as the United States Department of Agriculture (USDA) or from FCTs/FCDBs from neighboring countries. This may introduce a variety of errors. It is hoped that in the future more high quality analytical data are produced in order to replace those in old tables/databases.

5. Availability, accessibility of the technique and/or tool

FAOINFOODS Compilation Tool for Central and Eastern European Countries Food Composition Table is freely available for public.

6. Pre-requisite/s of the application

The Food Composition Table is available online. A computer and internet access is required.

7. Cost-estimation

FAOINFOODS Compilation Tool for CEEEC FCT is freely available to public.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency		-
	Improving quality and its assessment		-
	Improving risk assessment and risk management		-
	Regulations compliance and its assessment	+	
	Product performance and its assessment		-
	Information for users	+	
	User satisfaction and its assessment	+	
	User's feedback and reaction		-
	Other Please specify:		-

9. Lessons learned from the tool/technique

It gives information about nutritional values that can be used for manufacturers to comply mandatory legal requirements and also compare the products nutritional value to similar products in other countries.
This tool also contributes to

- national programs for the assessment of diet and nutritional status at a population level (e.g. epidemiological researchers assessing diets at a population level)
- development of dietary guidelines, therapeutic diets (e.g. to treat obesity, diabetes, nutritional deficiencies, food allergy and intolerance) and institutional diets (e.g. schools, hospitals, prisons, day-care centers).

17) FOODMANUFUTURE - INTEGRATED SUMMARY OF LONG AND SHORT-TERM FUTURE NEEDS FOR RESEARCH INFRASTRUCTURE

ID number of the tool/technique	3.1.1.17.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x	x	x	x	x	x	x

Collected by: CBHU

1. Specific need or problem being addressed by the tool/technique

The Food sector is one of the largest manufacturing sectors in Europe and food export out of Europe is essential for European economy, but is lacking behind other manufacturing sectors regarding implementation of new technology. In order to maintain and increase the number of jobs in this sector, novel and smart manufacturing technologies are needed, that can increase competiveness by lowering production costs and improving sustainability in the manufacturing and distribution in order to make it attractive to keep manufacturing plants in Europe.
The future needs of the European Food and Manufacturing Solutions sectors can't be established without identification of the current needs of the food sector which are not served yet with appropriate manufacturing solutions. This provided an opportunity for identification of those available manufacturing solutions which had already been developed for other sectors but not adapted to the food manufacturing industry.
The FoodManufuture project had provided a basis for decision making for a European Food Manufacturing Research Infrastructure that can provide the food sector and the manufacturing technology sector the newest technological knowledge and support the adaptation to fit the specific requirements for food manufacturing.

2. Name of the technique and/or tool

FoodManufuture - Integrated summary of long and short-term future needs for research infrastructure

- Inventory of long and short term needs of the food sector
- Inventory of available solutions

3. Additional information if it is available

Websites:
http://cordis.europa.eu/result/rcn/149269_en.html
http://www.federalimentare.it/informalimentare/informalimentare_1_2014-FoodManufutureCDRfinal2014_01_07.pdf

4. Short description of the technique and/or tool

The FoodManufuture project (Conceptual Design of a Food Manufacturing Research Infrastructure to boost up innovation in Food Industry) has been designed to boost innovation, competitiveness and productivity of the European Food and Manufacturing Solutions sectors. The main objective of FoodManufuture was to provide a vision and a conceptual design for a cross disciplinary research infrastructure for food manufacturing.
In the frame of the Work Package 3 of the project an Integrated summary of long and short-term future needs for research infrastructure was developed. This document summarizes the findings of four working groups covering different aspects of the food processing, such as:

- Science Technology for Food & Manufacturing,
- Industry, Knowledge Transfer and Education,
- Management Systems and Business Models,
- Economic, Social and Environmental Sustainability.

The purpose of this document is to describe to future needs of the food processing sector and the manufacturing sector for research infrastructures.

Methodology

- At first the Vision Scenarios were reviewed to get an overview considered for understanding the challenges represented by them. Key documents were also analysed, such as the draft Strategic Research and Innovation Agenda (SRIA) of the of ETP Food for Life (2012), Strategic Roadmap of ETP Manufuture (2010),
- An interactive process was started within each WG. WG members described their ideas (or problems, needs of the food sector). These were discussed within each WG to initiate transdisciplinary thinking. In each WG members described their ideas for problems, needs of the food sector and the manufacturing sector to solve problems of the food sector (step 1. and step 2.)
- These templates were collected by the WG leaders and summary tables were prepared to provide an overview of what aspects were covered from the checklist of the WG and which needs/challenges of the food sector have matching available or envisaged manufacturing solutions. These summary tables together with the collected templates were circulated between the WG members and the different WGs to generate further ideas and to enhance the development of matching responses to the listed needs and solutions. These steps (Step 1. – 3.) were repeated in 2 rounds.
- The content of the templates describing the needs of the food sector were analysed (Step 4.) and summarised by each WG as a chapter for the “Inventory of long and short term future needs of the food sector (Step 5.).
- The needs of the food sector were compared with the collection of the available/envisaged (filled in Templates 2), analysed and categorised, whether the solution is available or if it is not available yet it can be foreseen to be available.
- Partners identified which manufacturing solutions are available or can be developed or adapted soon without any additional research infrastructures (Step 7.), and collected these into a separate Inventory of available solutions (Step 8.) with descriptions of their functions, capabilities in such details that food manufacturing experts can identify their potential applications.

- The next step was to analyse and categorize the unsolved problems and the currently not available solutions whether further research is necessary or not to develop knowledge, which can be used as a basis for developing appropriate solutions (Step 9.). If research is not necessary, those solutions were listed into the "Inventory of solutions available" in short term (Step 10.a). Where further research is necessary, partners described envisaged manufacturing solutions and related food processing applications and collected them in "Inventory of envisaged manufacturing solutions" (Step 10.b).
- At the end of the Task 3.1, the necessary research infrastructures and priorities were defined (Step 11.)

Results and analysis

The findings of the working groups on research needs of the food processing and the manufacturing sectors can be grouped around the following main subjects:

- Sustainable food manufacturing
- Smart process design, process control, ICT enabled manufacturing
- Advanced food process equipment and technologies
- Food hygiene, food safety and quality
- Ensuring freshness, increasing shelf-life
- Innovation methods, knowledge and technology transfer

(1) Sustainable food manufacturing

- New machinery and plant with efficient use of resources (New Eco-Factors Model, efficient use of resources: energy, water, material)
- Waste Utilisation and Valorisation, heat recovery, cleaning of waste water
- Recovery of Valuable materials
- Solutions to support sustainability of SMEs, local food manufacturers
    - shared use of machinery – new business model
    - cost effective machinery provision for seasonal production – new business model
    - ICT, logistic solutions to support the market access (local, national international) of SMEs
- Reduction of waste (material, energy, water, time)
- Reducing the environmental impact of cleaning
- Simple, practical tools for calculation and evaluation of environmental impact
- Databases for calculation of environmental impact

(2) Smart process design, process control, ICT enabled manufacturing

- ICT enabled intelligent manufacturing and tools for transparency, process control systems, sensors, data transfer system, calculation, activators, expert systems
- Automatisation and robotisation
- Web applications and services for the end consumers – purchasing , virtual hypermarket
- Intelligent network for equipment within a processing line and along the food supply chain
- Virtual design

(3) Advanced food process equipment and technologies

- Technologies for development of new sensory properties, food microstructure, edible-films
- Flexible, easily reconfigurable, upgradable equipment
- Reduction of the investment costs of machinery – payment proportional to their exploitation – new business models
- Better exploitation of operation times – effective maintenance systems
- Novel packaging materials and forms, edible packaging, biodegradable packaging, intelligent and active packaging

(4) Food hygiene, food safety and quality

- More sensitive foreign body detection and removing systems applicable for a wider scope, multifunctional solutions
- Rapid detection
- Latest findings from nanotechnology
    - Dry and water free, water saving cleaning, self-cleaning surface, equipment, walls, ceilings, floors
    - Heavy duty and organic acid resistant floors
    - Self-cleaning drains
- Easily dismountable equipment
- Reconfigurable, flexible equipment
- Mobile high risk area unit
- Serving consumer's needs, transparency systems and solutions based on ICT, RFID
- Intelligent hypermarket – consumer information systems – web applications
- ICT solution for improved traceability for complex traceability problems (cut meat, grain, bulk food)
- Application of the new functions of the Future Internet for focused, screened information
- Effective removal of contamination from food powders, fresh produce
- Smart use of cleaning chemicals

(5) Ensuring freshness, increasing shelf-life

(6) Innovation methods, knowledge and technology transfer

- Practical training facilities, the learning factory
- ICT based and virtual training systems
- Knowledge management
- New, focused information collection, structuring systems based on the functions of the FI, content based browsing

An **inventory of long and short term needs of the food sector** was developed.

- Each need was checked for matching relevant solution and all needs were generally divided into two groups of long and short term needs

Inventory of available solutions

- In order to portray a more understandable vision of the availability of the current solutions, they were divided into two main groups of available and envisaged solutions.
- Additionally the former was divided into two other subgroups of available and available in short term solutions, which ascertains the necessity of any probable modifications in these solutions in order to be able to be applied in food sector.

Using these information/inventories a significant progress can be achieved in the enabling manufacturing facilities and systems of food processing if the improved design of the machinery is combined with the new capabilities of smart process design and process control, automatisation and robotisation, communication and computing capabilities, application of new approaches to business models and food chain are combined. These enable the cost effective application of advances processing technologies. All new designs, processes and systems should meet the criteria of tools for improving food safety, quality and supplying information to consumers to enable their informed decision. The combination of the different knowledge descriptions can result in significant reduction of emission to environment, more efficient use of natural resources, reduction of waste and flexible adaptation of food businesses to rapidly changing environment.

5. **Availability, accessibility of the technique and/or tool**

The inventories are available in public deliverables of FoodManufuture project:

- http://www.federalimentare.it/informalimentare/informalimentare_1_2014-FoodManufutureCDRfinal2014_01_07.pdf

6. **Pre-requisite/s of the application**

The needed pre-requisites of the application depend on the nature of the possible solutions. The solutions are grouped to available and envisaged solutions.

7. **Cost-estimation**

Each solution has different cost.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users	+	
	User satisfaction and its assessment	+	
	User's feedback and reaction	+	
	Other Please specify: Significant reduction of emission to environment, More efficient use of natural resources, Reduction of waste, Flexible adaptation of food businesses to rapidly changing environment.	+	

9. Lessons learned from the tool/technique

The transdisciplinary discussion between the representatives of the food processing and the manufacturing sectors on the long and short term needs of the food sector for manufacturing solutions and on the available and envisaged manufacturing solutions to tackle these problems resulted in the identification of 73 needs and challenges of the food sector and 48 potential manufacturing solutions. Some of these problems and solutions could be matched, for others the matching pairs were not identified yet. These indicate that there is a significant potential for research and innovation in the transdisciplinary collaboration for the progress towards the development and implementation of the concept of the Food Factory of the Future. To achieve that further exchange of views, research and knowledge transfer is necessary.

18) FREEZE DRYING

ID number of the tool/technique	3.1.1.18.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x	x	x				

Collected by: UHOH

1. **Specific need or problem being addressed by the tool/technique**

In food industries, water removal process is typically used to preserve perishable materials, to extend shelf life or make the material more convenient for transport. Freeze-drying works by freezing the material, then reducing the pressure and adding heat to allow the frozen water in the material to sublimate.

2. **Name of the technique and/or tool**

Freeze drying

3. **Additional information if it is available**

http://www.spscientific.com/freeze-drying-lyophilization-basics/
https://www.youtube.com/watch?v=PxwgB-uFiR8
http://www.millrocktech.com/what-is-freeze-drying/

4. **Short description of the technique and/or tool**

Freeze-drying is the process of removing water from a product by sublimation and desorption. Sublimation is the transformation of ice directly into a gas without passing through a liquid phase. Sublimation occurs when the vapor pressure and the temperature of the ice surface are below those of the triple point.

Freeze drying can also be conducted at moderated pressures and even at atmospheric pressure. The principle of this process is to produce a vapor pressure difference as large as possible by blowing dry air over the frozen material. In practice, the process is very long because of the low mass and energy transfer rates, but problems related to the application of vacuum do not exist, resulting in an important reduction of operation costs[7].

[7] Hui, Y., Cornillon, P., Legaretta, I., Lim, M., Murrell, K., Nip, W. (2004). Handbook of frozen foods. Marcel Dekker Inc. New York.

5. Availability, accessibility of the technique and/or tool

http://www.millrocktech.com/guided-freeze-dryer-selection/?gclid=CI235_XrkdMCFYg-Gwods90FTQ

6. Pre-requisite/s of the application

Information not available.

7. Cost-estimation

Information not available.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other:		

9. Lessons learned from the tool/technique

Freeze drying is used to obtain dry products of higher quality than those obtained with conventional drying methods. Freeze dry products have high structural rigidity, high rehydration capacity and low density, and they retain the initial raw material properties such as appearance, shape, taste and flavor. This process is generally used for the dehydration of products of high added value and sensitivity to heat treatments, produced by food industries.

19) fTRACE SERVICE

ID number of the tool/technique	3.1.1.19.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
	x	x	x		x	x	x	

Collected by: CBHU

1. Specific need or problem being addressed by the tool/technique

In Europe, traceability in food supply chains is not only a compulsory requirement, but also transparency is highly expected to verify the credibility of claimed benefits for consumers on food safety, food quality, sustainability, ethics and social responsibilities to strengthen consumers' trust in food. Therefore the ability to track and trace as well as to support consumers' awareness of a wide range of food attributes is substantial.
Traceability means the ability to trace and follow a food, feed, food-producing animal or substance intended to be, or expected to be incorporated into a food or feed, through all stages of production, processing and distribution (Regulation (EC) No.178/2002).
Traceability does not provide transparency in itself, but it is the base on which transparency can be built. Traceability in the absence of quality verification has limited value to individual consumers. They need credible and reliable information.
Transparency serves awareness needs in those cases when full trust is not in place and additional information is necessary to verify the credibility of claims and statements representing a value for the users and there are not objective evidences available to underpin or methods to provide objective evidences quickly, which provide the necessary guarantees. In the area of ensuring informed decisions of the users traceability represents the objective, technical elements, awareness represents the subjective element and transparency having both objective and subjective elements is the interface.
The meat sector particularly attracted ample attention in this respect as a consequence of major food safety scandals such as the BSE crisis leading to new and stringent regulatory requirements on transparency. The sector also represents a sensitive area in the exact identification of lots and origin, especially during processing phases, such as cutting and mixing.
Especially from the point of view of the consumers, new IT technologies, in particular tablets and smartphones, are making everyday life easier. These technologies provide access to information anywhere, anytime and smartphones can be used to scan product barcodes and get instantly detailed product information for instance in retail shops.

2. Name of the technique and/or tool

fTRACE service

3. Additional information if it is available

Website: https://www.ftrace.com/en/gb
Video: https://www.youtube.com/watch?v=vQ67US-rwt4
Presentation:
http://www.smartagrimatics.eu/Portals/4/Smart%20AgriFood%205_6_06%20Tim%20Bartram%20Clarity%20from%20farm%20to%20point%20of%20sale.pdf

4. Short description of the technique and/or tool

fTRACE is a service that enables consumers to trace products. All the information is provided by the manufacturers themselves about their own food. Scanning the fTRACE code sends information about where the product comes from, when and how it was processed and information about quality and recipe tips.
Products that have an fTRACE code can be traced back to the individual batch. A batch is the amount of a product that was processed in the same place at the same time. Selected producers even open their homes and farms to the consumers with pictures and videos. This allows them to see the living conditions of animals on a farm, for example. In this way, they can find out how fruit and vegetables are harvested, how animals are kept and which lakes or seas fish are caught in. In addition, many manufacturers voluntarily provide more information in fTRACE than is legally required - for example about quality control. In addition, allergy and nutrition information or recipe tips can also be shared.

About the fTRACE code:

On every product that can be traced with fTRACE, the fTRACE code is shown in two forms. One is the fTRACE barcode, which you can scan easily with the fTRACE app and any other free barcode reader.

There is also a number code, which you can type directly into the dialogue box on the website. The position of the code varies slightly from brand to brand. Here you can see where to find the code.

5. Availability, accessibility of the technique and/or tool

fTRACE is a platform where manufacturers and retailers provide information on the origins, processing and quality of their brand's products. The service is operated by GS1 Germany. The company is mainly known for the EAN barcode. GS1 Germany's

barcodes and standards ensure the transparent flow of goods. They make it possible to trace products with fTRACE.
fTRACE primarily has information on the origins and processing of fresh food. Currently meat, poultry, fish, fruit and vegetables can be traced. The only requirement is that the products have an fTRACE code.

6. Pre-requisite/s of the application

The key to the information is the fTRACE code, which can be found on the packaging. Either scan this with smartphone or enter the number code directly into the fTRACE website. To scan, simply install the fTRACE app or another free barcode reader on the smartphone.

7. Cost-estimation

The application is free for users.
Manufacturers and retailers should contact with GS1 Germany at www.gs1-germany.de.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency		-
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment		-
	Information for users	+	
	User satisfaction and its assessment	+	
	User's feedback and reaction	+	
	Other Please specify:		

9. Lessons learned from the tool/technique

fTRACE is part of the portfolio of GS1 Germany from 2012. It has a lot of users (manufacturers and retailers) in Germany, and it is already launched in other countries.
fTRACE has a growing number of partners, more information about them: https://www.ftrace.com/en/gb/partners

A success story of fTRACE:
GS1 Germany decided to launch an fTRACE traceability pilot in December 2012 with 20 participating trading partners. METRO had its first traceable fish products on

shelves one year later. METRO's suppliers and other trading partners enter their product and location data in f TRACE or in their own connected databases using GS1 identifiers like GTINs and GLNs. Together with the batch numbers, the unique identification numbers (GTINs + batch numbers) are encoded in barcodes like the GS1 DataBar®.
As fish products travel through the supply chain from fishermen to processors to distribution centres and on to METRO Cash & Carry locations, the identification data is scanned at various points along the way. The GS1 EPCIS and CBV standards together provide the foundation for all trading partners to share real-time information about the movement, history and status of the fish products as they travel through the business-to-business-to-consumer (B2B2C) supply chain.

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20) GLUTEN FREE, ALLERGEN MANAGEMENT AND PRODUCT DEVELOPMENT PERSPECTIVES

ID number of the tool/technique	3.1.1.20.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
	x	x	x	x	x			

Collected by: CBHU

1. Specific need or problem being addressed by the tool/technique

Gluten testing for compliance of gluten free regulation

Food allergy and food intolerance (e.g. coeliac disease) are estimated to afflict over 3 million people in the United Kingdom alone. Disease outcomes range from (at best) a restricted lifestyle to (at worst) death. Current EU legislation requires food businesses producing wrapped foods to declare the intentional presence (as ingredients, additives or process aids) of 13 foods or food groups and one additive (sulphite) considered to be significant allergens in a specified manner. This is to ensure that sensitive consumers are advised of their presence. In addition, if these foods are known to be potentially present (e.g. as a result of cross-contamination), many food businesses apply precautionary labelling ("may contain") to warn the sensitive consumer of this fact.
Food information legislation within the European Union has recently been subject to substantial revision, with a new regulation (1169/2011) being introduced. This will, in the most part, take effect from 13 December 2014. In terms of significant food allergens the law has also been changed. In particular, two new requirements will have significant consequences in terms of food safety management systems and/or staff training.
The first requirement concerns the supply of voluntary food information (Article 36). Article 36 requires (amongst other things) that, as a general principle, such information should, where appropriate, "be based on the relevant scientific data"

(Paragraph 2c). Furthermore, the Commission is required to subsequently implement regulations concerning the application of precautionary labelling in terms of the unintentional presence of food-allergens (Paragraph 3a).
Substantive advice on the circumstances when precautionary labelling might be applied was published by the Food Standards Agency in 2006. Since then there have been further developments in our understanding of the risk assessment process underpinning the decision whether or not to precautionary label (e.g. the 'Action Level' concept) and Campden BRI has recently published a guidance document (No. 71) which details how these developments can be applied to implementing the Agency's advice.

As a consequence of this fact we also have to note that the market for bakery goods free-from gluten and specific allergens has increased dramatically in recent years. It is now not only a requirement for a small percentage of the population, but also the choice of a much wider group.
The project led by Campden BRI, 2016 aims was as a solution for the market nieche to produce / set up technology, recipe as much more palatable alternative to gluten-free (GF) bread for gluten-sensitive people than is currently available. Gluten sensitivity is distinct from coeliac disease and is estimated to affect 6- 10% of the population; it represents a significant market opportunity both at home and overseas.

2. **Name of the technique and/or tool**

Gluten free, allergen management and product development perspectives

3. **Additional information if it is available**

Food allergens: practical risk analysis, testing and action levels 2013 (Campden BRI) Guideline G71 ISBN 978-0-907503-76-7
Reports about the reliability of the use of these allergen kits compared to analytical method, e.g. ELISA.

- Campden BRI, RRS 2014-57: Detection of food allergens in materials used for cleaning in dry manufacturing environments
- Campden BRI, RSS 2014-59

Individual product development and technology advice for gluten free bread development

4. **Short description of the technique and/or tool**

The guideline covers the requirements mentioned in point 1. related only to ingredients that are part of the formulation of the food. They do not cover situations where there is a risk/concern of cross-contamination.
Some 1-2% of adults and 5-8% of children have been reported to have a true food allergy. Very small amounts of an allergenic foodstuff can cause a severe or even fatal reaction, so food-allergic individuals adopt strict avoidance diets to prevent the consumption of food allergens. Family, friends and care-givers are also likely to adopt restrictive diets. It is therefore vitally important that correct allergen information is conveyed to consumers. A major component of this is to reduce the risk of cross-

contamination of food products with allergens, and to communicate this risk to the consumer without unnecessarily restricting their food choices and those of their family and friends.
This guideline gives an overview of allergen management with reference to food safety management systems, including a systematic approach to aid identification of risk factors. General information is also provided on allergen testing. It then discusses the risks in relation to threshold levels the smallest amount of an allergen likely to have a significant effect on the majority of allergic consumers and the need or otherwise to include “may contain” labelling on the food package.

Contents of the guideline n.71.

To sum up Good Manufacturing Practices should eliminate or greatly reduce the risk of cross-contamination in most cases. Current recommendations are that 'may contain' labelling should only be used where there is a realistic risk of cross-contamination occurring that, because of the nature of the product and its production environment, cannot be eliminated.

From the individual product development perspective the gluten-free bread (RD 321) reports on a project that is looking at ways of producing an acceptable product for those with coeliac disease or a gluten allergy. Results show that the use of lower oven temperatures and additional steam during a two-phase baking process improves crumb structure through better control of batter viscosity.

5. Availability, accessibility of the technique and/or tool

Visit: https://www.campdenbri.co.uk/research/food-allergens.php

6. Pre-requisite/s of the application

N/A.

7. Cost-estimation

Guideline 59.
Member price £60 (Campden BRI UK)
Non-Member price £90

Guideline 55.
Member price £60 (Campden BRI UK)
Non-Member price £90

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency		-
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users	+	
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify:		-

9. Lessons learned from the tool/technique

The guidance document supports the users, particularly the industry representatives in carrying out risk assessment on allergens, gives inputs for the proper labelling.
The further RSS and white papers help the users to have better understanding for the validation of the accuracy of allergen kits contra analytical methods.
Particularly because Codex plans to release a revised standard 'Foods for special dietary use for persons intolerant to gluten' later this year. CCFRA holds UKAS accreditation for two methods for assessing the gluten content and gluten-free status of raw materials and products. This includes the 'R5 Mendez ELISA Method' which is cited in the current Codex draft.

These analytical services are complemented by wider services. For example, based on the cereals technologists' expertise in product formulation and an extensive pilot production plant the development of gluten-free bakery products such as biscuits was facilitated. Also, the manufacturing and hygiene specialists often advise the implementation of Good Manufacturing Practice to avoid cross-contamination with gluten-containing materials.

21) GOOD HYGIENE PRACTICE GUIDELINES (CONSIDERING THE MAIN OBJECTIVES OF THE I-CON PROJECT)

ID number of the tool/technique	3.1.1.21.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
	x	x	x		x			

Collected by: CBHU

1. Specific need or problem being addressed by the tool/technique

The food safety regulation of the European Union has an important role in the industry self-control, based on Good Hygiene Practice (GHP) and Hazard Analysis and Critical Control Points (HACCP) system. The"Good Practice Guides" are provided in the Article III. of the Regulation 852/2004/.
Based on the provisions of the Regulation, Member States shall encourage the development of national and community guides to good practice for hygiene and for the application of HACCP principles.
In these guides the food industry summarized their view about those measures which have to be applied at the generally accepted state of art technical level of the sector to meet the requirements of the directive, considering the specific activities and products of the different sectors.
The objective of the guides was to provide help for food businesses dealing with the manufacture, storage and distribution of food in achieving three aims:

- how to implement the requirements of the Regulations 852, 853, 854/2004/EC (the applicability of these regulations is based on the type of food);
- how to meet the requirements of their current national legislation;
- in addition to that to provide specific advice on how to meet market and commercial requirements of major buyer organizations, which may be more demanding than the Law itself by providing of sector specific detailed explanations and recommendations.

2. Name of the technique and/or tool

Good Hygiene Practice guidelines.
Considering the main objectives of the I-CON project the following Good Hygiene Practice guidelines are relevant:

- Good Hygiene Practice guideline for Frozen Food Industry
- Good Hygiene Practice guideline for Canning Industry
- Good Hygiene Practice guideline for Dairy Industry
- Good Hygiene Practice guideline for Bakery Industry
- Good Hygiene Practice guideline for Grain Mill Industry
- Good Hygiene Practice guideline for Meat Industry

- Good Hygiene Practice guideline for Alcoholic Beverages Industry
- Good Hygiene Practice guideline for Beer Industry
- Good Hygiene Practice guideline for Non-Alcoholic Beverages Industry
- Good Hygiene Practice guideline for Soda Industry
- Good Hygiene Practice guideline for Pork and Beef slaughtering, splitting and cutting Industry
- Good Hygiene Practice guideline for Poultry and Rabbit slaughtering and cutting Industry

3. Additional information if it is available

Different Governmental publications are available. The guides were approved by the Hygienic Committee of the Hungarian Government.

4. Short description of the technique and/or tool

The European Union in the Hygiene regulations sets out the basic principles and objectives instead of determination detailed technical and professional requirements. So the regulation prescribes WHAT must be achieved, and the HOW is not drawn up in a detailed way.
The industry self-control means that based on the regulation the food producer defines the methods, tools and solutions in itself, what necessary and adequate to fulfil the legal requirements and monitor and validate their implementation and effectiveness in itself.
In developing the guidelines recognized experts were involved, selected by the industry trade organization. The content was discussed in different circles with the industrial experts and also with the experts of the relevant authorities. Finally agreed version (which was circulated among the most relevant companies of the sector via internet) was approved by the Hygienic Comittee of the Hungarian Ministry of Agriculture and listed to the EU registered GHP guidelines.
The application of the guide is not mandatory, otherwise the company can demonstrate compliance also in other ways. However the national authority shall take into account the checks according to the EC Regulations (882/2004/EC) based on the officially recognized Guides.
If the company uses a different approach to fulfil the requirement based on the Guide they shall be able to demonstrate the compliance. On the other hand if authority requests a different method from the solution described in the Guide, they have to justify the necessity of their expectations. So the Guide is a common base of the interpretation of Regulation.
This GHP code is not a part of the legislative requirements and does not replace any provisions of the legislation. It simply aims to provide help to the food businesses to identify their own activities and tasks to meet the legislative and market requirements.
The scopes of the relevant guides (mentioned above) are the production of:

- quick-frozen fruits and vegetables, frozen semi-finished and ready meals;
- canned (metal, glass, flexible and fixed plastic, aseptic) products;
- milk and milk products;
- bakery products (bread products, fresh pastry goods and cakes, etc.);

- bakery products, mixes for the preparation of pasta and bread, wheat germ and bran;
- meat products, minced meat and meat preparations;
- alcoholic beverages (not including the fermented and distilled products);
- beer;
- non-alcoholic beverages;
- soda-water;
- slaughtering, splitting and cutting of pork and beef;
- and slaughtering, splitting and cutting of poultry and rabbit.

When using the guide on the left hand side of the code the recommendations for good hygiene practice are shown. In the right hand side the reference to the 852, 853, 854/2004 Regulations is shown. The legislative requirements have to be considered together with the more detailed explanations. When the recommendations were framed the terms “must”, “shall” “need to”, “necessary” were used for measures which are unavoidable to meet the requirements and these are printed in bold letters, while “should”, “recommended”, “advisable”, “it is a good practice”, etc. were used for measures representing voluntary elements.
These guides reflect the state of art knowledge and practice by the time of the edition. With the progress of technical knowledge and development of legislation this guide has to be reviewed regularly. The authors and the national federations are open for discussing any comments, improvements.

5. Availability, accessibility of the technique and/or tool

Websites:
http://elelmiszerlanc.kormany.hu/jo-higieniai-gyakorlat-utmutatok
http://www.campden.hu/jo_higieniai_gyakorlat.php,

6. Pre-requisite/s of the application

N/A

7. Cost-estimation

This guide is publicly available on the website of
- Hungarian Government (Ministry of Agriculture) or
- Campden BRI Hungary.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency		-
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment		-
	Information for users	+	
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify:		

9. Lessons learned from the tool/technique

The experiences of using these guides were fairly positive based on the reaction both of the industry and the authority experts.
An adequate evidence of the positive experience is that two guidelines were issued after the first edition in 2006. The second edition of the Good Hygiene Practice guideline for Frozen Food Industry and the Good Hygiene Practice guideline for Canning Industry were issued in 2016.
Although during the preparation of this code all efforts were made for a complex explanation of the necessary measures meeting the recommendations within this code does not gives an exemption from meeting those parts of the legislation which were not discussed here. To improve the acceptance status of this code the national federations discussed its content with their national food control authorities.

22) GUIDE TO THE MANAGEMENT OF LISTERIA IN FOOD PROCESSING

ID number of the tool/technique	3.1.1.22.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
	x	x	x		x			

Collected by: CBHU

1. Specific need or problem being addressed by the tool/technique

Listeriosis is a serious foodborne disease in all over the world, and causes severe health complications to people every year.
Presence of Listeria monocytogenes can be found in several different food products, which is difficult to detect by the random checking carried out by the food companies, but sometimes detectable by the repeated, more systematic tests.
Listeriosis is largely associated with chilled or frozen products where a further heat treatment is not applied or it is not validated.
The guide gives a practical approach which helps food businesses to manage and control risks, resulting in food that is safe for consumers.

2. Name of the technique and/or tool

Guide to the Management of Listeria in Food Processing

3. Additional information if it is available

British Frozen Food Federation
Websites:

- www.bfff.co.uk
- www.coolcookery.co.uk
- https://www.fda.gov/downloads/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/UCM535981.pdf
- FSA Guidance on the management of outbreaks of foodbourne illness in England and Wales: http://tinyurl.com/povlkrt
- FSA Scotland guidance on smoked fish production on contamination by
- Listeria Monocytogenes: http://tinyurl.com/povlkrt
- Food Standards Agency Annual Report of Incidents: http://tinyurl.com/nqmg6e6
- Food Standards Agency Annual Science Report and Chief Scientists Report: http://tinyurl.com/qep6llw
- Examples of Sources of Product Contamination with Listeria monocytogenes (not exhaustive), can be found under the 'Food Safety and Zoonoses' section: http://tinyurl.com/q7jk2uc
- The EFSA Zoonoses Report 2013 http://tinyurl.com/no8ep65 provides EU
- data on deaths attributable to Listeriosis
- Control of Listeria monocytogenes and Staphylococcus aureus in raw milk cheese: http://www.truefood.eu/page.asp?ID=23

4. Short description of the technique and/or tool

The purpose of the guidance is to help small businesses understand the actions that they should be taking to proactively manage and reduce, as far as possible, the incidence of Listeria spp. and in particular the pathogen Listeria monocytogenes in the materials, processes and products in their control.
A wide range of foods have been implicated in outbreaks e.g. sandwiches, sandwich fillers, mould ripened soft cheeses, paté, cooked sliced meats, pizza toppings, cold smoked salmon, RTE fish/shellfish, RTE salads and vegetables, RTE snack/buffet items, cream based cakes/desserts and also eg. blanched quick frozen sweetcorn if it is used in a freash salad without boiling. Whilst this is not an exhaustive list, it gives a small business a sense of what types of foods are at greatest risk.
The guide includes description of Listeria, the regulatory background, and further chapter for Management and monitoring for the prevention of L. monocytogenes, the environmental control and monitoring, Raw material and supplier management, Sampling, Investigation and Corrective actions.

5. Availability, accessibility of the technique and/or tool

Website: www.bfff.co.uk

6. Pre-requisite/s of the application

N/A

7. Cost-estimation

This guide is publicly available on the website of British Frozen Food Federation (www.bfff.co.uk).

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency		-
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment		-
	Information for users	+	
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify:		

9. Lessons learned from the tool/technique

An easily applicable guide for all producers faced with Listeria contamination problem mainly for small enterprises without specialists.

23) GUIDELINE FOR CLEANING SUITED EQUIPMENT

ID number of the tool/technique	3.1.1.23.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x		x	x					

Collected by: CBHU

1. **Specific need or problem being addressed by the tool/technique**

During the last decade the market of the fresh cut industry have undergone relatively rapid growth. However, with a growing fresh produce market the consumer-driven rising demands for more sustainable technologies pose new challenges for the fresh-cut industry.
There are numerous techniques used currently for disinfecting and sanitizing surfaces in food industry, but their sustainability aspects are less understood. It is an important question to address that in this guideline.

2. **Name of the technique and/or tool**

"Guideline for Cleaning Suited Equipment"

3. **Additional information if it is available**

The guideline can be found on the website of www.susclean.eu (project name: Sustainable Cleaning and Disinfection in Fresh Cut Food Industries (SUSCLEAN).

4. **Short description of the technique and/or tool**

Nature and intended use: The guideline provides information with regard to the technologies related to reducing the consumption of water in sanitation. The guideline describes a rapid method for testing production lines of MPVs for microbial contaminations, which was developed within the SUSCLEAN project.
The guideline also aims to provide information on alternative equipment sanitizing and a general overview of the basics on the hygienic design in MPV process, besides the effects of advanced surfaces and practical in-process considerations as well.
Scope: The scope / area of the application of the guideline is the MPV industry.
Brief explanation
The guideline first shortly describes a rapid method developed within the SUSCLEAN project for testing production lines of MPVs for microbial contaminations.
Than the importance and basics on the hygienic design in MPV process (the principles, the effects of advanced surfaces, conclusions) is overviewed.
On the next section of the guideline in order to assess the different sanitation techniques from environmental but also technical and economic perspective a multi-criteria assessment and its results are described. There are assessed the following

alternative equipment sanitising strategies – chemical and physical treatments: phytochemicals, chlorine dioxide, ozone, hydrogen peroxide, organic acids, enzymes, copper and silver, pulsed UV light, Neutral Electrolyzed Oxidising Water (NEOW), ultrasound. The most promising techniques after this assessment were: Organic acids, Ultrasound, Hydrogen Peroxide, Enzymes, Ozone/Chlorine dioxide.
Target users: This document is intended for the fresh-cut produce industry and also for different stakeholders (researcher, machinery supplier and cleaning chemical producers).

5. **Availability, accessibility of the technique and/or tool**

See on the website of SUSCLEAN: www.susclean.eu .

6. **Pre-requisite/s of the application**

Because it is a guideline, no prerequisites needed.

7. **Cost-estimation**

The guideline can be free downloaded from the website of SUSCLEAN (www.susclean.eu).

8. **Novelties, benefits and added value**

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment		-
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment		-
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify:		

9. **Lessons learned from the tool/technique**

Its strengths are the general overview of the usage of chlorine alternative techniques and the multi-criteria assessment from environmental but also technical and economic perspective, which can be used in the future to assess the different sanitation techniques.

24) GUIDELINE ON EFFECTIVE KNOWLEDGE AND TECHNOLOGY TRANSFER ACTIVITIES TO SMES IN THE FOOD SECTOR WITH PARTICULAR FOCUS ON TRADITIONAL FOOD MANUFACTURERS

ID number of the tool/technique	3.1.1.24.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x	x	x	x	x	x	x

Collected by: CBHU

1. Specific need or problem being addressed by the tool/technique

With traditional food products a sound balance has to be achieved between the requirements of maintaining the genuine, traditional character of the product and the implementation of the new developments in the knowledge and technology. The application of such new knowledge and technology should be considered, which can provide additional benefits for the society and the company, without compromising the original nutritional, health and cultural values of the products. Therefore the effective knowledge and technology transfer has a specific importance in the innovation at traditional food products.
This guideline was prepared within the TRUEFOOD project (Traditional United Europe Food) "Improving quality and fostering innovation of European traditional food production systems", an integrated project financed by the EC under the FP6 - contract no: FOOD-CT-2006-016264. The aim of this document is to provide guidance on practical skills and successful working practices in contacts and daily work relationships with the food businesses to all personnel involved in the process of knowledge and technology transfer to food businesses including mediators between industry and the research community, knowledge transfer staff of research organisations and universities and also those researchers, who want to foster the implementation of their research results in food businesses.
Since small and medium size enterprises (SMEs) have several additional barriers of knowledge transfer compared to large companies, in the document specific attention is paid to the aspects of the SMEs.
Several research results and practical experiences show that one of the main barriers in effective knowledge transfer is the difference in the way of thinking and priorities of industry and researchers. There are significant differences also between the approach and the opportunities of large companies and SMEs. While researchers usually focus on scientific excellence expressed in validated statements and methods, based on substantial proofs and think over a longer time period, SMEs need a solution for a problem, which can be implemented easily – in many cases with limited resources – and quickly.
Since food products are eaten, and are thus incorporated into the human body, the consumer's perception of changes differs significantly from those products, which are used without having a direct influence on the functioning of the body. When radical

changes are made in the nature, structure or properties of food, food safety concerns are raised or the products are rejected simply because their sensory properties are different from those sensory attributes to which the consumers had been used and for which their preference has evolved through long experience.
Therefore in the food sector incremental innovation is more typical than radical change. Consumers prefer the diversity and variety of foods. It is relatively easy to copy a successful innovative product by a competitor without investing major efforts into the innovation. A slight modification of the composition can result in a product which has somewhat different sensory properties, and therefore it can be claimed as being different from the original product which was copied. Thus in many cases it is relatively difficult to identify such distinguishable properties or functions of a food product, which can form such an intellectual property that can be protected and enforced.
Therefore senior managers of many SMEs, particularly in the new member states, do not trust in the feasibility of investing efforts and financial resources into application of research results for innovation.
Other typical barriers to knowledge transfer in food SMEs include lack of skills of the SMEs in working with researchers, lack of information on consumers' needs and market, and on accessible financial support schemes, limited business, management and marketing skills, and lack of management time and resources.

2. Name of the technique and/or tool

Guideline on effective knowledge and technology transfer activities to SMEs in the food sector with particular focus on traditional food manufacturers

3. Additional information if it is available

Truefood website: http://www.truefood.eu/index.asp

4. Short description of the technique and/or tool

The guide is intended to provide an overview of the main issues that knowledge transfer personnel have to consider and handle, but not to repeat the detailed information described in other guidelines and documents. Therefore, where detailed information is available elsewhere - like protection of intellectual properties, contractual arrangements, knowledge transfer policies of research organisations, innovation management - only short summaries are provided with references to the original sources.

Content of the guideline:

- Introduction
- Knowledge transfer in the process of innovation
- Identifying needs and exploring hidden needs of the industry
  - Preparations
  - Identifying R+D needs of the company
  - Exploring hidden needs of the company
- Dialogue between the industry and research
  - General needs of collecting and structuring available information, research results and converting it to industry friendly format
  - Databases on research results, overviews and research summaries

    - Structuring information for technical reviews, manuals, good practice guidelines, expert systems
    - Role of the mediators
    - Dialogue with the research centres, universities and other research providers
    - Presenting a solution to the industry
- How to implement research-based knowledge at SMEs
    - Underlying assumptions
    - Developing solutions, identifying additional research needs
    - Matching industry needs and available solutions
    - Implementation of collaborative R+D projects
- Knowledge and technology transfer tools – how to handle different levels of competence within the companies
    - General considerations
    - Awareness raising through seminars
    - Capacity building through training
    - Guided experimentation during the research process
    - Annual thematic seminar/conference during the research process
    - Presentations on industry meetings
    - Personal visits
    - Participation in expert panels
    - Using the internet/project home page
    - Training course at the end of research project
    - Outreach activities towards the SMEs
    - Collective techniques - using networks
    - Product development network - Nofima model
    - National Technology Platforms
    - Brokerage events
    - Best practice guides
    - One page summaries of the practical results of the research projects
    - Newsletters
    - WEB-based self assessment tools
    - Transfer of people between research and industry
    - Posters
    - Booklets
    - CD-ROMs
    - Annual reports
    - Trade press articles
    - Scientific publications
- Managing the knowledge and technology transfer process
    - General considerations on partnership in research collaborations and knowledge transfer
    - Management practices for SMEs
    - Complementary support services for SMEs
    - Management practices for research and knowledge transfer organisations
    - Recommended practices for contractual arrangements for research and knowledge transfer between research providers and SMEs
    - Protection of intellectual properties

- Success stories
- References
- Glossary
- Annexes

5. Availability, accessibility of the technique and/or tool

The guideline can be downloaded on the TRUEFOOD project website:
http://www.truefood.eu/publications.asp
It can be freely ordered:
https://www.campden.hu/kiadvanyok_reszletek.php?product_id=41

6. Pre-requisite/s of the application

N/A

7. Cost-estimation

The guideline can be freely downloaded or ordered.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users	+	
	User satisfaction and its assessment	+	
	User's feedback and reaction	+	
	Other:Protection of intellectual properties	+	

9. Lessons learned from the tool/technique

Establishing trust between the partners has a primary importance, which can be improved if long term collaborations are built up through understanding and considering each-other's needs, expectations, way of thinking and priorities.
The successful examples in the end of the guideline ("Succes stories") demonstrate that there are several ways how SMEs can improve the performance of the supply chain in which they operate and demonstrate also the benefits of implementing the supply chain management approach, e.g. the management of multiple relationships through focusing on harmonising the use of competencies, resources and capabilities along the entire food chain (instead of focusing on the individual steps) to deliver enhanced customer service and economic value through improving trust and collaboration between supply chain partners.

25) GUIDELINES FOR THE HYGIENIC DESIGN, CONSTRUCTION AND LAYOUT OF FOOD PROCESSING FACTORIES G39 (CAMPDEN BRI)

ID number of the tool/technique	3.1.1.25.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x		x	x					

Collected by: CBHU

1. Specific need or problem being addressed by the tool/technique

Factories need to be designed, built and maintained to the highest possible hygiene standards, in order to facilitate the production of safe and wholesome food.

2. Name of the technique and/or tool

"Guidelines for the hygienic design, construction and layout of food processing factories G39" (Campden BRI)

3. Additional information if it is available

More details related to the "Guidelines for the hygienic design, construction and layout of food processing factories G39" can be found.
https://www.campdenbri.co.uk/publications/pubDetails.php?pubsID=106

4. Short description of the technique and/or tool

This guideline provides technical information for the hygienic design and construction of food manufacturing premises.
It is important to use the correct materials for floors, walls and ceilings, and to put all of the pieces of a complex jigsaw together in the right way. This requires expertise on the hygienic properties of building materials, floors, drains, walls, ceiling and factory finishes and the engineering aspects of air management.
Good hygiene is essential in preventing end-product contamination. It covers everything from good hygienic design of food production areas and processing equipment to understanding the benefits and limitations of specific hygienic practices before, during and after food production. This guide is one of a set, which has been produced to help food and construction industry personnel to identify and consider the many hygiene-related factors that need to be taken into account when designing, building or refurbishing food production premises. Among others this guide overviews the determination of the required level of segregation, the determination of equipment and factory layout.
This particular guide looks at the issues associated with building, adapting or refurbishing a food factory as a whole. In a step-wise manner, it addresses issues ranging from site location, estimating the size of the factory required and planning

the flow of materials and people within the finished, working factory, through to developing the construction brief and considerations for undertaking the building work.

5. Availability, accessibility of the technique and/or tool

See further details:
https://www.campdenbri.co.uk/publications/pubDetails.php?pubsID=106

6. Pre-requisite/s of the application

N/A

7. Cost-estimation

The "Guidelines for the hygienic design, construction and layout of food processing factories G39" can be purchased from the book store of Campden BRI. The price for members is 60 GBP, while the price for non-members is 90 GBP.
(https://www.campdenbri.co.uk/publications/pubDetails.php?pubsID=106)

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment		-
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment		-
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify:		

9. Lessons learned from the tool/technique

Good hygienic design of premises and equipment makes maintaining hygiene easier, cheaper and more effective. This will not only reduce the running costs but will also give for the food manufacturer better safety assurance.

26) HIGH HYDROSTATIC PRESSURE (HHP)

ID number of the tool/technique	3.1.1.26.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x	x	x				

Collected by: UHOH

1. **Specific need or problem being addressed by the tool/technique**

Consumers demand high quality foods, which are fresh, tasty and nutritious; this has created considerable interest in the development of new food processing techniques. Presently, non-thermal techniques, including high hydrostatic pressure (HHP), are regarded with special interest by the food industry.
Extended shelf-life and a "fresh-like" product presentation emphasize the need to take full account of food safety risks, alongside possible health benefits to consumers. These characteristics offer the dairy industry numerous practical applications to produce microbially safe and minimally processed dairy products with improved characteristics[8].

2. **Name of the technique and/or tool**

High hydrostatic pressure (HHP)

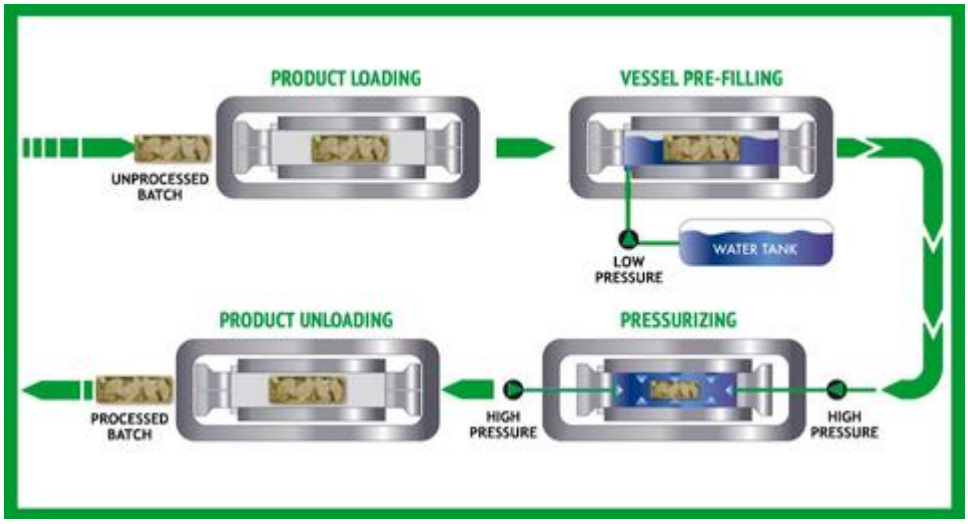
3. **Additional information if it is available**

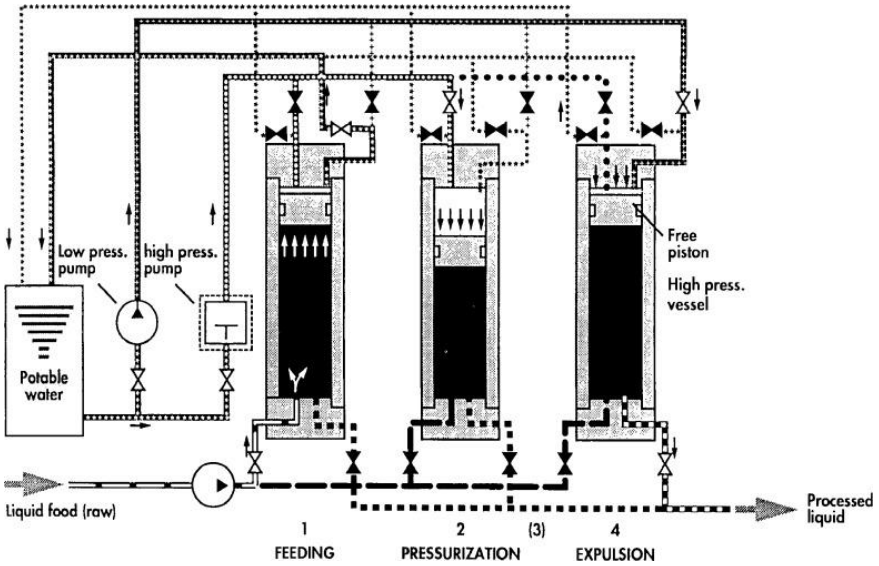
https://www.youtube.com/watch?v=GZL6jQjWu-M

4. **Short description of the technique and/or tool**

Process can be broadly classified into 3 main categories viz., batch, semi continuous and continuous.
Batch operation calls for loading of packed food into the pressure vessel, following which the vessel is sealed and water is pumped into the vessel to displace any air. Upon filling the vessel, pressure relief valve is closed and pressure is allowed to build up within the vessel. Pressure is allowed to remain in contact with the product for a particular time-pressure combination and upon completion, the pressure relief valve is opened to allow the water used for compression to expand and return to atmospheric pressure (decompression). The vessel is opened, the packaged food is removed and is ready for shipment.

[8] Chawla, R., Patil, G. R., & Singh, A. K. (2011). High hydrostatic pressure technology in dairy processing: a review. Journal of Food Science and Technology, 48(3), 260-268.





5. Availability, accessibility of the technique and/or tool

The HPP is commercially available by different companies, some of most important are:
http://www.hiperbaric.com/en/
http://www.freshertechusa.com/independentdata.html

6. Pre-requisite/s of the application

The time required to develop pressure in the vessel is influenced by the compressibility of the pressure medium and the nature of the food material. In most cases, water is used as the pressure transmitting medium.

7. Cost-estimation

Information not available

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify:		

9. Lessons learned from the tool/technique

Advantages include prevention from cross contamination risk- as packaged food is loaded inside the vessel; no need for clean up between runs and usage of relatively simple equipment as compared to semi continuous systems where free piston is used to increase the compression over the liquid food. Food is introduced via low pressure pump and when the vessel is filled the free piston is displaced. When filled, the inlet port is closed and high pressure process water is introduced behind the free piston to compress the liquid food. The pressure treatment can be carried out between 3000 and 6000 bars and at temperatures ranging from −20°C to 80°C, according to the equipment used.

27) HIGH-PRESSURE WATER-JET CUTTING

ID number of the tool/technique	3.1.1.27.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x	x	x				

Collected by: UHOH

1. **Specific need or problem being addressed by the tool/technique**

Increase in shelf-life by avoiding compression of the product, which reduces unwanted structural changes. In case of fresh products the amount of damaged cells or tissue is minimized. Less damaged tissue cells will ultimately lead to a significantly reduced microbial spoilage and enzymatic browning reactions, since less substrate leaks out of the tissue cells coming into contact with oxygen and foodborne microorganisms. Eventually this will increase food safety and quality. Using a water-jet cutting system also eliminates cross-contamination. Wastage can also be reduced due to precise cutting action.

2. **Name of the technique and/or tool**

High-pressure water-jet cutting

3. **Additional information if it is available**

- http://www.kmt-waterjet.com/PDF/KMT_technology%20description_ENG_101019.pdf
- https://www.youtube.com/watch?v=sSHMh6NzI9k
- https://www.youtube.com/watch?v=pIDtMk25J8E
- https://www.youtube.com/watch?v=lab494J1vtw
- http://www.flowwaterjet.com/Applications/Foods
- http://www.engineering.com/AdvancedManufacturing/ArticleID/12716/An-Engineers-Guide-to-Waterjet-Cutting.aspx
- https://www.performancewaterjet.com.au/jetmax-food-cutting-machine
- http://waterjets.org/archive/about-waterjets/overview-of-waterjets/#what_it_costs_to_make_waterjet_parts

4. **Short description of the technique and/or tool**

- The technique can be used for fresh-cut, minimally processed food products (salads, vegetables, etc) or bakery goods with high potential for further application areas like frozen meat.

- It involves a single or multiple nozzles attached to a high-pressure water pump. The nozzles are operating at 55.000-90.000 PSI (3-6 Mbar), cutting speeds vary with respect to product category (range 100-5000 mm/min)
- The technology is intended for efficient processing in the food industry at a large scale. It increases productivity of specific cutting applications, while reducing labour costs and wastage.

5. Availability, accessibility of the technique and/or tool

www.kmt-waterjet.de
www.mttec.com
www.flowwaterjet.com

6. Pre-requisite/s of the application

Very compact equipment consisting of a high-pressure pump, a nozzle system and cutting tables/conveyor belts. The system is fairly easy to integrate.
Cutting speed and pressure need to be adjusted to the respective product and desired production output. A picture of a potential setup can be seen below:

7. Cost-estimation

Cost-estimation depends on a variety of factors (local electricity/water prices, wages, production speed, application, material, etc). There are different estimations for costs according to different references:

- 5-8 €/h for simple cutting applications (estimation by KMT waterjet).
- 100-135 $/h (estimation by engineering.com)
- As low as 80 $/h (estimation by waterjets.org)
- https://wardjet.com/waterjet/cost-to-run-a-waterjet

The technology is publicly available and free to use.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify:		

9. Lessons learned from the tool/technique

Success stories:

- The slicing of many vegetables, such as tomatoes with a 0.1 mm orifice water-jet is highly established.
- Fresh-cut watermelons remained firmer and exhibited less weight loss during storage when cut by water jet (McGlynn et al. 2003)
- Red Oak Leaf Lettuce was successfully water-jet cut with a 0.1 mm orifice (Wulfkuehler et al., 2014)

Limitations

- Potato slicing was not successful: Examined potato slices exhibited more damaged cells, which was attributed to the water-jet being not sufficiently coherent (Becker and Gray, 1992)
- Meat products: Pure water cutting is limited by the cross-section and the homogeneity of the product. Hard material, such as bone in meat requires different water-jet cutting techniques (e.g. abrasive water-jet cutting with ice-particles (McGeough, J. A., 2016)

28) HOW TO DETERMINE SHELF LIFE TESTING OF FOOD PRODUCTS

ID number of the tool/technique	3.1.1.28.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x	x	x	x			

Collected by: CBHU

1. **Specific need or problem being addressed by the tool/technique**

It is up to the manufacturer of the food to determine and assign the shelf life of the food they produce. The Regulation (EC) No 178/2002 (the 'General Food Law Regulation') require that a food must be both of the nature, substance and quality expected by the consumer, and also not injurious to health for any reason.
If the shelf life is set too short, then the product may be discarded, if the shelf life is set too long, the food could become of unacceptable quality and potentially unsafe to eat.
There is a need for a shelf life testing tool, which can be used by the food processors to determine the shelf life of their products.

2. **Name of the technique and/or tool**

How to determine shelf life testing of food products

3. **Additional information if it is available**

- Related to the shelf life testing a fact sheet can be found on the website of Campden BRI UK: https://www.campdenbri.co.uk/white-papers/determine-product-shelf-life.php .
- Further information: "Evaluation of product shelf life of chilled foods"(Guideline 46, new edition): https://www.campdenbri.co.uk/publications/furtherDetails.php?pubsID=100)

4. **Short description of the technique and/or tool**

The assignment of shelf-life is very important. If it is too short then manufacturing costs may be high and profit margins low. If it is too long then there is the potential for food quality to become poor or unacceptable, or for the growth of food pathogens to occur - and the product will not meet the requirements of food safety legislation. It is therefore important to assign the shelf-life in a systematic and scientific manner, taking all relevant factors into consideration. The tool is aimed particularly at manufacturers and retailers.

The process of the new product development can be divided into typical phases, in each of them specific shelf life assessment activity should be involved: Phase I (Pilot

scale), Phase II (Pre-production run), Phase III (Full scale production), see as following:

Phase I (Pilot scale)

The first phase is the pilot scale, in which the steps and the preliminary consideration of the product shelf life are the following:

- The concept of the product
  - Adequately to the marketing brief the shelf life constraints has to be defined (minimum shelf life to make the product commercially viable)
- The characteristics of the product and process
  - Identification of essential product parameters: (intrinsic factors, e.g. water activity, pH and / or total acidity, preservatives including salt, nutrients, natural microflora, available oxygen, natural biochemistry like enzymes and chemical reactants)
  - Identification and characterization of the other important factors, which likely influence the shelf life (e.g. recipe (raw materials – ingredients), product packaging (e.g. materials, structure, dimensions, modified atmosphere packaging (MAP) / vacuum packaging, headspace gas mixture in case of MAP), storage and distribution conditions (e.g. temperature, relative humidity, light)
  - Define key processing factors, on which the product is safe (e.g. heat treatment process)
- Production samples in pilot plan
- Preliminary shelf life assessment
  - First trials to assess quality and safety of the product (Note: only those product should be tasted, which was found earlier microbiologically safe!)
  - If the target shelf life
    - Achieved: proceed to Phase II
    - No achieved: reconsider product characteristics

Phase II (Pre-production run)

The objectives of this phase are to scale up the production, to provide and confirm product and process specifications, and to check viability of the product. The steps and the shelf life considerations are the following:

- Product from pilot scale
  - Development of pre-production run. Consider scale up issues, assess of marketing idea of the product
- Development of HACCP analysis
  - Considering the shelf life, it help to identify the essential microbiological hazards, which limit the safe shelf life
- Shelf life tests
  - Use appropriate storage condition
  - Select the key factors to measure during the tests
  - Select sampling frequency and tests,
  - Select samples produced in this phase, conduct tests to evaluate self life
- Interpret shelf life evaluation data
  - Identify, what is the maximum of the safe shelf life
  - Identify, what is the maximum of the quality shelf life

- Do the maximum safe and quality shelf lives meet the target shelf life?
  - If no, reconsider the product, specify the range, assess whether the safe range is achievable or redesign the product and go back to the first step of this Phase II
  - If yes, does the maximum quality shelf life meet target shelf life?
    - If yes, set the working shelf life
    - If no, reconsider the product, specify the range, assess whether the safe range is achievable or redesign the product and go back to the first step of this Phase II

Phase III (Full scale production)

From safety point of view the following activities are essential at this stage:

- Verification of HACCP plan
- Shelf life confirmation
  - Use appropriate storage and analyses taking account information obtained during pre-production stage
  - Confirm product variability in terms of preservative factors
- Interpret shelf life tests
  - Is the product safe for the entire range of variations observed?
    - If no, reconsider the product, specify the range, assess whether the safe range is achievable or redesign the product and go back to the first step of this Phase
    - If yes, is the product quality acceptable for the entire range of observations?
      - If no, reconsider the product, specify the range, assess whether the safe range is achievable or redesign the product and go back to the first step of this Phase
      - If yes, START ON GOING PRODUCTION

5. Availability, accessibility of the technique and/or tool

See further details:
https://www.campdenbri.co.uk/white-papers/determine-product-shelf-life.php
and
https://www.campdenbri.co.uk/publications/furtherDetails.php?pubsID=100)

6. Pre-requisite/s of the application

To carry out shelf-life assessment the appropriate facilities and equipment (e.g. probes and/or logger for temperature measurement, storage facilities of the samples, specific facilities for challenge testing, equipment for pH and/or water activity measurements, etc.) should be provided by the user.
Information related to these pre-requisites can be found partially in the Guideline 46 (Evaluation of product shelf life of chilled foods).

7. Cost-estimation

The fact sheet "How to determine microbiological shelf-life of products "can be free downloaded from the following link: https://www.campdenbri.co.uk/white-papers/determine-product-shelf-life.php
The" Evaluation of product shelf life of chilled foods" (Guideline 46) can be purchased from the book store of Campden BRI. The price for members is 50 GBP, while the price for non-members is 75 GBP (https://www.campdenbri.co.uk/publications/pubDetails.php?pubsID=100)

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users	+	
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify:		

9. Lessons learned from the tool/technique

The shelf-life of food products is influenced by microbiological, chemical and sensory considerations - along, in some cases, with legislative requirements. It needs to be determined following sound scientific principles that can take into account all the relevant formulation, manufacturing, distribution and storage factors.
For foods adequate shelf life should be achieved. Knowledge of the factors affecting shelf life and use of appropriate shelf life evaluation methodology is essential for the food processors to deliver acceptable products to the consumers.
The shelf-life determined is unique to the product and storage conditions tested and cannot be extrapolated to other products or storage conditions. Assigning the correct shelf-life can be the key to the commercial success of a new product and should be done in the early stages of new product development.

29) ISO 22000 STANDARD

ID number of the tool/technique	3.1.1.29.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
	x	x	x	x	x	x	x	

Collected by: STRIA

1. Specific need or problem being addressed by the tool/technique

The Bat-Grill Ltd.'s main activity is processing poultry meat, which is unserviceable without food safety and quality assurance systems. The Bat-Grill's aim, which is also a special consumer demand can be described as follows: "Preparing a food with consistent quality, a food which is reliable in food safety, and satisfying customer needs."
Nowadays, the adequacy of the mandatory EU standards and consumer needs have become a major goal for SMEs. Consumer's demand for information in the enterprise's production process and the product's place of origin continued to increase. To meet the growing demand, the food companies have to apply techniques and tools, whereby they can ensure the long-term confidence what consumers put in their products. In order to grow a company's goodwill and develop customer's confidence in the product, it is essential to comply with product quality and traceability requirements.
In Hungary, the introduction of the HACCP food safety system is compulsory for all food companies, however, the system itself is not certifiable. It would be important for the companies to objectively ensure a guaranteed quality and traceability of products within one system.

2. Name of the technique and/or tool

ISO 22000 standard

3. Additional information if it is available

https://en.wikipedia.org/wiki/ISO_22000
http://www.iso22001.hu/
http://www.batgrill.hu/en_minosegpolitika.html

4. Short description of the technique and/or tool

The ISO 22000 system is intended to ensure traceability and quality to customers. The standard determines integrated requirements for the HACCP system too, thereby ensuring the compliance with all regulations. The ISO 22000 standard is used throughout the factory area, in order to organize the activities, define the rules and locate the control/check points (eg. critical points, deterioration in quality).
The standard helps customers to feel safe when they take the products and if a problem arises they can follow its origin back, thereby the system is strengthening customer satisfaction and trust too. Food processing SMEs (as Bat-Grill) use a lot of tools and techniques and ISO 22000 helps them to integrate these things in a frame, and if they

want to introduce a new technology or machine, they absolutely take into consideration the ISO quality standards.
The ISO 220000 is applicable to all members of the food chain, so thus for food SMEs, but also could be important for restaurants, or food related service providers. The system is completely personalized, that means the standard will be tailored to the user company.

5. **Availability, accessibility of the technique and/or tool**

The ISO 22000 standard is needed to purchase, but subsidy also can be applied by the government to build the system. After its acquisition, anybody can access the system, and it will be tailored to the user's activity.

6. **Pre-requisite/s of the application**

The pre-requisites of the application are the operation of the factory and its compliance with domestic and EU regulations, laws. But it is quite expensive, and do not always worth it to smaller companies. In addition, the companies (who sold the system) make surveillance audits annually and the certificate can be withdrew as a consequence. Trainings to employees, sampling plan, maintenance plan, financial plan, balance sheet and other documentations are also required.

7. **Cost-estimation**

The ISO 22000 system has relatively high costs. This includes the purchase of sampling tools (for example in the case of Bat-Grill: Salmonella and e-coliform bacteria detection tools, sampling devices) cleaning supplies, employee's working clothes and safety equipments. Due to the high costs, it is not easily available to anyone. Its cost can reach or go beyond 10.000 € annually.

8. **Novelties, benefits and added value**

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency		-
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users	+	
	User satisfaction and its assessment	+	
	User's feedback and reaction	+	
	Other Please specify:		-

9. Lessons learned from the tool/technique

The only weakness of the system is the lot of work with it and its high costs, but it has much more advantages. The system supports the product development and innovation, increases customer satisfaction and sales, ensures customer's trust, the consistent product quality and product traceability with the obligatory unified barcode. The ISO 22000 standard positively affect the performance and the outcome.

Two success stories of ISO 22000 standard:
1. In the case of Bat-Grill Ltd. with the support of the integrated monitoring and recall system – which is based on the ISO 22000 – producers can find out the chicken's origin (the date of slaughtering, the farm they are originate from, the feed they had been given, identify the incubator they spring from when it was cut, and which processing points it went through till it arrived to the selling store) with the use of the product's barcode. At the same time, the other direction of monitoring serves ensures that, in case an animal health problem occurred concerning the stock at a farm or a feed-mixer, by means of the system, it can be traced and established which product was delivered from a certain farm to which commercial partners.

2. Bat-Grill with the support of the ISO 22000 system continuously strives to introduce new products and to develop existing ones. As a result of this operation, within the framework of the system they introduced a new vacuum packaging technology which helps to further preserve the quality of poultry, thereby satisfying the specific needs of consumers.

30) INLINE NIR SPECTROSCOPY

ID number of the tool/technique	3.1.1.30.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x	x	x				

Collected by: UHOH

1. **Specific need or problem being addressed by the tool/technique**

The quality of powdered milk is important or other powdered foods are important. Therefore it would be helpful to analyze quality parameters and composition of the powder during the production. This would allow to adjust parameters during the production as well as controlling important properties like moisture content of the powder. With this method the quality and safety of such foods could be improved

2. **Name of the technique and/or tool**

Inline NIR spectroscopy

3. **Additional information if it is available**

http://www.foodengineeringmag.com/articles/90659-inline-monitoring-aids-in-food-safety-and-quality
https://www.impublications.com/subs/jnirs/open/J17_0059.pdf
https://www.youtube.com/watch?v=fRt88-b2gJM
https://www.youtube.com/watch?v=GmQdQIWB5cc

4. **Short description of the technique and/or tool**

Inline monitoring are sensors which are mounted directly in the process flow. Therefore it is possible to analyze product parameters during the production. This allows faster adjustments of the process and also detection of spoilage.
It could be used in the milk powder production or other powdered foods.
Near-infrared spectroscopy (NIRS) is a spectroscopic method that uses the near-infrared region of the electromagnetic spectrum (from about 700 nm to 2500 nm).
Near-infrared spectroscopy is based on molecular overtone and combination vibrations
Targets users would be researchers as well as industry.

5. **Availability, accessibility of the technique and/or tool**

https://www.sartorius.us/sartoriusUS/en/USD/UnassignedProducts/NIR-Spectrometers/p/nirspectrometers?setCountry=US-en
http://www.optek.com/pdf/top5/optek-Brochure-TOP5-Food-US.pdf

6. Pre-requisite/s of the application

The sensors come in a variety of forms and seizes and could be easily implemented in the production.

7. Cost-estimation

Information not available

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify:		

9. Lessons learned from the tool/technique

Success stories:
Rapid detection of melamine in milk powder by near infrared spectroscopy
https://www.impublications.com/subs/jnirs/open/J17_0059.pdf
http://www.sciencedirect.com/science/article/pii/S0260877408000071

31) INNOVATION IN MAKING SELF-ADHESIVE LABELS MORE ATTRACTIVE

ID number of the tool/technique	3.1.1.31.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x		x	x	x		

Collected by: SCCI

1. Specific need or problem being addressed by the tool/technique

Company Alfopa, spol. s r. o. Košice was established in 1991 and nowadays it belongs to top providers in the field of labeling and packaging of products, as well as a wide range of printing services.
Alfopa, spol. s r.o. Košice belongs to pioneers of modern technologies and many of innovations incorporated into its offer as the first in Slovakia. Alfopa was the first company in Slovakia to start production of self-sealing labels on flexoprint machines Nilpeter in 1993. Few years later, company acquired another primacy in production of decorative shrink sleeve. Among the main products of Alfopa, spol. s r.o. Košice are different kinds of self-adhesive labels, as well as shrinking foil products – sleeve suitable for a vast range of products.
Company developed the new solution of packing use –decorative labels made of heat-shrinking foil (sleeves). The sleeves can be made so that they are separated from the packaged product by the user without perforation that eliminates esthetically undesirable increase of perforation holes in area of maximum foil shrinkage.
This information is useful to producers that consider the sleeves application to their products and need to resolve method of the sleeve „opening“. They are the cases when the packaged product is to be divided in two parts during use, eventually to break the lock seal in the form of shrunk foil.
Sleeve division is simplified usually through perforation around the product or along the seam sides in the place of desirable division, eventually through insertion of thin foil strip. However, in case of perforation, perforation holes non-esthetically increase in area of maximum shrinkage after application and shrinking of the sleeve on the product. Our solution eliminates this undesirable effect. Small cut-up can increase esthetic level of product packing in many industrial branches.

2. Name of the technique and/or tool

Innovation in making self-adhesive labels more attractive.

3. Additional information if it is available

Available video about the mentioned Slovak company ALFOPA, spol. s r.o.Košice:
https://www.youtube.com/watch?v=cVs0pM71DWk#action=share

4. Short description of the technique and/or tool

Alfopa, spol. s r.o. Košice was the first company in Slovakia to start production of self-sealing labels on flexoprint machines and even nowadays gains from the thorough experience and knowledge of materials and technologies. A significant increase in quality was ensured by using of UV colors and paints. Modern flexoprint machines allow us to reach a high degree of print control and to diminish human factor complication.

5. Availability, accessibility of the technique and/or tool

Company processes high quality materials with the use of top quality machines, both made by top manufacturers and having the highest standard of quality. Apart from the main products, in offer are additional products and services in the field of labeling and packaging industry.

6. Pre-requisite/s of the application

Company belongs to pioneers of modern technologies and many of innovations incorporated into its offer as the first in Slovakia. Goal of the company is to provide optimal solutions to different needs of clients in the field of packaging, labeling, logistics and advertising. The overall high quality of the final product depends not only on modern technologies, excellent materials and adhesives, but reliable consulting of our experts. All mentioned factors are reasons why company introduces into its production new technologies.

7. Cost-estimation

All technologies that company owns are not free for users and they are not available for general public. Most of them were purchased using public procurement.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment		-
	Product performance and its assessment	+	
	Information for users	+	
	User satisfaction and its assessment	+	
	User's feedback and reaction		-
	Other Please specify:		

9. Lessons learned from the tool/technique

The main goal of the company is to provide flawless products and high quality services to the clients. In 2007 company received a Certificate of Quality Management according to ISO 9001. Since then company periodically realizes internal audit and re-certification.
ALFOPA, spol.s.r.o. Company Košice offers another functional solution for decorative self-adhesive labels. Company offers an option to apply a special thermo-coloured symbol on the label that reacts to the change of temperature.
The objective of the thermo-symbol is to bring visual information about the product temperature. First successfully managed labels with thermo-symbols were for the client operating in the alcohol business. Blue flake on the bottle signalizes correct temperature of the content of the bottle before consuming, but also during the storage period. As this technology was, until now, applied only by screen printing, ability of using this element in flexo-printing is our competitive advantage. Even in this case our team enthusiastic for solutions of special technological methods has brought us forward.
Except for the fact that the labels printed with thermo-colour are a good marketing tool, they also have a practical function – they guard the optimal temperature of the product's environment: thermo-symbol signalizes incorrectly stored product if filled up with the colour. If the temperature is adjusted to the required level, the thermo-colour disappears. It similarly works when indicating correct temperature when served. Generally, if the product is to be used at certain temperature, the thermo-colour will only get active when the product reaches this temperature. So the label gives higher added value to the product by visual thermal control of the product's quality. Moreover, consumers have the opportunity to affect the product utilization period during the whole warranty period by keeping the right temperature when storing the product.
This "smart" colour is supplied in different shades according to the temperature at which it should react. Each case of adequate usage for a specific product is resolved individually, according to requirements for the temperature range, colouring, and active zone of temperatures.
ALFOPA Ltd. Košice brings a new solution of making decorative labels even more attractive. The labels are produced by use of partial self-luminious varnish where certain parts of the label are visible by UV light.
Illuminative effect of the label, visible only under the UV lamp, had been achieved by use of special materials, working procedures and professional approach. The commodities marked with illuminative label will be more attractive for target customer not only in bars, restaurants and entertainment networks, but also in all the places with the use of UV light such as shelves in shops and shop windows in stores
This information is useful for all the producers, who search how to make their products more special, attractive and interesting for the customers. The effect of illuminating label is more eye-catching than any other „non- illuminating" commodity with classic label. What is more, the illuminating labels can be applied not only on groceries.
What preceded the illuminating label product was its testing and development. At present there are 3 colours of illumination varnish used by flexo technology. The varnish, without an affect of UV light only slightly changes the label appearance. After UV radiance, the varnished part of the label turns illuminated – usually of green colour.

32) IQ-FRESHLABEL/ SMART LABELLING

ID number of the tool/technique	3.1.1.32.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x	x	x	x	x	x	

Collected by: UHOH

1. Specific need or problem being addressed by the tool/technique

Controlling the post production life cycle of a food product in regards to safety and quality is an important factor, because wrong handling (e.g. interrupted cold chain) increases e.g. the risk of spoilage. Food waste is another tremendous problem nowadays. Smart labels indicating the freshness of the product could reduce food waste and help identify consumers the quality and safety of a product.

2. Name of the technique and/or tool

IQ-Freshlabel/ Smart labelling

3. Additional information if it is available

http://www.iq-freshlabel.eu/8.0.html
http://www.ttz-bremerhaven.de/de/forschung/lebensmittel/forschungsprojekte/173-iq-freshlabel.html
http://www.iq-freshlabel.eu/fileadmin/uploads/information_material/Training_Greece_Sept_2012/IQ-Freshlabel-Brochure.pdf

Tsironi, T., Giannoglou, M., Platakou, E., & Taoukis, P. (2015). Training of SMEs for frozen food shelf life testing and novel smart packaging application for cold chain monitoring. *International Journal of Food Studies*, *4*(2).
Tsironi, T., Giannoglou, M., Platakou, E., & Taoukis, P. (2016). Evaluation of Time Temperature Integrators for shelf-life monitoring of frozen seafood under real cold chain conditions. *Food Packaging and Shelf Life*, *10*, 46-53.
Herbert, U., Halim, M., Wahl, J., Ostrowski, H., & Kreyenschmidt, J. Assessment of different packaging strategies on the quality and shelf life of poultry meat.

4. Short description of the technique and/or tool

- Smart labels indicate the freshness of a product via irreversible color change or color movement along a scale
- Change of color based on physical, enzymatic, chemical or microbiological reaction

- Indirect information on food quality via Time-Temperature-Integrators (TTI): 1) monitor time and temperature for frozen foods or 2) monitor oxygen content in modified atmosphere of fresh chilled food
- 1) Use of photochromic ink: noticeable color change indicating that the product has been at detrimental temperatures for a pre-defined minimum period of time. Color change happens due to the activation of colourless crystalline pigments by a controllable exposure to UV light. RESULT: deep blue color
- 2) Use of aluminium-time-indicators: time-temperature dependent resolution process of color from SILVER to YELLOW

5. Availability, accessibility of the technique and/or tool

IQ-Freshlabel project had the specific aim to increase the availability of smart labels to SMEs through the involvement of SME-AGs from different countries (more information on homepage and in the brochure).
Project ended in 2014, but as this was one of their main aims collaborations might likely be possible or they could refer to industry partners.
Also possible future research is mentioned.

6. Pre-requisite/s of the application

None. Smart labels can be applied to a variety of different food products, though there might be limitations for several foods.
Especially in meat and poultry sector the smart labels are applied, any frozen food can have the TTI.

7. Cost-estimation

Inexpensive way of controlling food safety and quality:
Estimated costs are 4 to 10 cents per label

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users	+	
	User satisfaction and its assessment	+	
	User's feedback and reaction	+	
	Other		

9. Lessons learned from the tool/technique

Successful implementations of smart labels
Consumer surveys revealed positive attitude of people towards smart labels, also in regards to decreasing food waste. Consumers said they would pay up to 20 cents more for a product with a smart label.

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33) LIGHT - EMITTING DIODES (LED'S) NON-FOOD CONTACT SURFACE

ID number of the tool/technique	3.1.1.33.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x	x	x				

Collected by: UHOH

1. Specific need or problem being addressed by the tool/technique

The sterilizing capabilities of ultraviolet (UV) radiation are well known, yet visible light has been shown to have bactericidal effects under certain conditions, hence playing a role in food safety. This presents several problems, especially in terms of undesirable growth but can be solved with Light - emitting diodes: LEDs have become increasingly feasible and advantageous as a form of lighting that can be used in conjunction with the above lighting systems, or as a substitute, while inactivating foodborne pathogens.

2. Name of the technique and/or tool

Light - emitting diodes (LED's) non-food contact surface

3. **Additional information if it is available**

http://onlinelibrary.wiley.com/doi/10.1111/1541-4337.12155/full

4. **Short description of the technique and/or tool**

Light-emitting diodes (LEDs) are solid-state lighting devices that emit light with emission wavelengths of narrow bandwidths, high photoelectric efficiency and photon flux or irradiance, low thermal output, compactness, portability, and which are easily integrated into electronic systems. Because of the minimal radiant heat emitted, LEDs cause little increase in temperature on the surface or interior of foods, which is beneficial in preserving the acceptability of such foods to consumers.

5. **Availability, accessibility of the technique and/or tool**

http://www.steinberg-licht.de/hs.php

6. **Pre-requisite/s of the application**

Not different as a normal light installation requires.

7. **Cost-estimation**

Because of the long life expectancies of LEDs, their robustness, and compactness, LED lighting systems have the potential to be a very cost-effective technology to adopt. In addition, LEDs are rapidly becoming more efficient and cheaper, hence it is expected that LED technology will become more attractive to the food industry in the near future.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify:		

9. Lessons learned from the tool/technique

Because of the rate at which LED technology has been improving and is expected to improve, there is great potential for its application in the food industry. LEDs have longer life expectancies. They are of comparable, or of higher photon efficiency to conventional lighting, and are more durable. Hence, LEDs can be economically and environmentally beneficial.

The role of LEDs in food safety is also noteworthy. High dosages of monochromatic light are necessary for inactivating foodborne pathogens, as photosensitizing or photocatalytic agents or materials produce ROS at specific wavelengths. Similarly, the lack of radiant heat allows LEDs to be used as a nonthermal means of inactivating foodborne pathogens. UV LEDs can also be used in decontaminating food. In vitro studies have shown the effectiveness of LEDs inactivating a variety of significant foodborne pathogens, with minimal heating effect.

34) MULTIPLE WATER IN OIL IN WATER EMULSIONS (WOW)

ID number of the tool/technique	3.1.1.34.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x						

Collected by: CCIS-CAFE, PTP

1. **Specific need or problem being addressed by the tool/technique**

The main aim of this was to develop strategies for reducing fat and salt/sugar in sauces for ready-prepared foods. The primary focus of this task was to develop formulations and protocols to create multiple water-in-oil-in-water (wow) emulsions that would work in conjunction with other salt and sugar reducing approaches.

2. **Name of the technique and/or tool**

Multiple water in oil in water emulsions (WOW).

3. **Additional information if it is available**

Website:
http://cordis.europa.eu/result/rcn/183606_en.htm
http://cordis.europa.eu/docs/results/289/289397/final1-final_report_terifiq_v1-0.pdf

Publication:
Formation and stability of Multiple emulsions by Peter J. Wilde, 27/03/2014, TeRiFiQ Annual Meeting

4. **Short description of the technique and/or tool**

The most important factor for stabilising WOW emulsions is the choice of emulsifiers. Two emulsifiers are required, a hydrophobic emulsifier to stabilise the W1 water droplets in oil during the first stage of the process where the aqueous phase (W1) is emulsified into the oil phase (O) to create a water in oil (WO) emulsion. The stability of these water droplets was found to be critical.
Many different hydrophobic emulsifiers and combinations were tested, but the only one which conferred sufficient stability to survive heating and shear during processing was polyglycerol polyricinoleate (PGPR). This emulsifier has a unique structure which is ideal for stabilising WO emulsions, and is permitted in a range of foods.

5. **Availability, accessibility of the technique and/or tool**

All the public deliverables are available on the TeRiFiQ website.

6. Pre-requisite/s of the application

No pre-requisite is neeaded.

7. Cost-estimation

Cost estimate is not specified.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment		-
	Product performance and its assessment		-
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify:		

9. Lessons learned from the tool/technique

The outputs of this task provided a number of protocols that could be adapted for the preparation of multiple emulsions that were suitable for a range of foods and processing environments.
Prospect and challenges are to maintain the stability of the water in oil in water (WOW) structure during processing of real foods.
Consumers enjoyed the reformulated products, and would even be prepared to pay a little more, when considering the quality and health benefits.

35) NATIONAL NUTRITIONAL DATABASE

ID number of the tool/technique	3.1.1.35.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
	x		x		x	x		

Collected by: CBHU

1. **Specific need or problem being addressed by the tool/technique**

The nutritional facts data on the pack/label is required according to the 1169/2011 EU regulation. The indication of nutrition labelling will be mandatory in all processed food (exceptions listed in Annex V. of 1169/2011 EU Regulation) from 13. December 2016). There are three options are to label such data, 1st is from literature, 2nd is based on calculation and 3rd from analytical tests. It is a great challenge for each food manufacturer to determine the exact nutritional values of food products, as they can vary according to regions, species, weather etc. in case of fruits and vegetables. The same problem occurs for meat and meat products etc., or any case in which he raw material having a great impact.

2. **Name of the technique and/or tool**

National nutritional database

3. **Additional information if it is available**

The Hungarian national database are available on the following websites:

- http://elelmiszerlanc.kormany.hu/
- http://portal.nebih.gov.hu/
- http://www.campden.hu/

Some other countries also have their own databases, links to some of them is on http://elelmiszerlanc.kormany.hu/.

4. **Short description of the technique and/or tool**

The national composition database contributes to compliance to EU regulation requirements.
It just not simple handles the data input for the option, data from literature, but also gives informations about the potential deviation among the data.
The most commonly consumed quick-frozen raw materials (fruits and vegetables) were collected in the database. The database contains accredited laboratory measurement results for the following nutrients: fat, saturated fat, carbohydrate, sugar, protein, salt and fiber. Each value is given with a range (where more results

were available) and a mean value (where applicable). The table also contains the number of available measurement results.
At the moment the database exists for fruit and vegetable, frozen fruit and vegetable.

5. Availability, accessibility of the technique and/or tool

The national database for frozen and raw material of canned products is freely available for public.

6. Pre-requisite/s of the application

The national database for frozen and raw material of canned products are available online. A computer and internet access is required.

7. Cost-estimation

These are freely available to public.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency		-
	Improving quality and its assessment	+	
	Improving risk assessment and risk management		-
	Regulations compliance and its assessment	+	
	Product performance and its assessment		-
	Information for users	+	
	User satisfaction and its assessment	+	
	User's feedback and reaction		-
	Other Please specify:		-

9. Lessons learned from the tool/technique

The benefits of the collective approach and data collection.
It gives inputs for the nutritional values mandatory label on the pack.

36) NEW NUTRITIONAL RECOMMENDATIONS FOR OPTIMAL HEALTH AND QUALITY OF LIFE IN EUROPEAN ELDERLY (NU-AGE DIET)

ID number of the tool/technique	3.1.1.36.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x						

Collected by: CCIS-CAFE, PTP

1. Specific need or problem being addressed by the tool/technique

Life expectancy in Europe has risen significantly and it is estimated that by 2030, 40% of the population will be over 65-years old. Human ageing is a complex dynamic process that involves the continuous adaptation of the body to life-long exposure to internal and external damaging factors. This often leads to the development of a chronic inflammatory status, termed inflamm-ageing. It is evident, that European public health policies should focus on healthy ageing, which includes the prevention of diseases and the delay of health deterioration.

2. Name of the technique and/or tool

New nutritional recommendations for optimal health and quality of life in European elderly (NU-AGE diet).

3. Additional information if it is available

Website:
http://www.nu-age.eu

Publications:
Mediterranean Diet and Inflammaging in the elderly - The European project NU-AGE. Published in Mechanisms of Ageing and Development journal (April 2014). Editors: Santoro A, Brigidi P, Gonos ES, Bohr, VA, Franceschi C.
Sociodemographic determinants of diet quality of the EU elderly: a comparative analysis in four countries. Published in Public Health Nutrition journal (May 2014). Authors: 0Irz X, Fratiglioni L, Kuosmanen N, Mazzocchi M, Modugno L, Nocella G, Shakersain B, Traill WB, Xu W, Zanello G.
The effects of whole-diet interactions on vascular health and inflammatory and fatty acid status. Doctoral thesis, University of East Anglia (2015). Author: O'Neill C.
Huges V.2012. Cultural differences. Nature, 492: 14-15

4. Short description of the technique and/or tool

Given the environmental, stochastic and genetic-epigenetic variables that affect health, lifestyle and diet are the most easily modifiable. New dietary strategies are

therefore addressing the specific needs of elderly population for a healthy ageing in Europe.
A nutritional trial with over 1 140 volunteers across Europe was performed within the project NU-AGE. They underwent an in depth physical, cognitive and biochemical characterisation. Additional immunology, genetics, epigenetics, transcriptomics, metagenomics and metabolomics analyses were performed in 120 individuals to test the efficacy of the NU-AGE diet.
Special attention was paid to selected nutrients that could be of concern in the aging population, such as vitamin D, B12, and calcium, along with water and dietary fibre. Then, the scientists translated these dietary reference values into the 'NU-AGE food-based dietary guidelines' in order to inform consumers what and how much they should eat from a certain food group.
Advantage of the project was that it was the first and the biggest study using a 'whole diet' approach to answer crucial questions about the improvement of health and quality of life in the EU ageing population
The overall objective of research is the delivery of elderly-tailored food prototypes based on research outputs of the preceding phases of the project. Aspects related to acceptability and affordability by over-65 years elderly (who may, e.g. have problems in chewing, tasting, swallowing, etc.) will also be considered. The specific objectives of this WP are:

- To develop meat prototypes enriched in functional ingredients for the elderly
- To develop oil-based prototypes enriched in functional ingredients for the elderly
- To develop a prototype of probiotic product
- To develop other enriched functional food prototypes for the elderly

5. Availability, accessibility of the technique and/or tool

Details are not specified.

6. Pre-requisite/s of the application

No pre-requisite is necessary.

7. Cost-estimation

Cost estimate is not specified.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment		-
	Product performance and its assessment		-
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify:		

9. Lessons learned from the tool/technique

The researchers from the NU-AGE project combined existing dietary reference values, a set of references for nutritional intake that is based on currently available scientific knowledge, as well as food-based dietary guidelines, to create new recommendations relevant to the elderly.
Researchers presented that a NU-AGE Mediterranean style diet, tested in the project, significantly decreased the levels of the protein known as C-reactive protein, one of the main inflammatory marker linked with the ageing process. Another positive effect of this diet was that the rate of bone loss in people with osteoporosis was reduced. Other parameters such as insulin sensitivity, cardiovascular health, digestive health and quality of life are yet to be analysed.

37) OPEN - VESSEL MICROWAVE - ASSISTED ONLINE SAMPLE TREATMENT

ID number of the tool/technique	3.1.1.37.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x	x	x				

Collected by: UHOH

1. **Specific need or problem being addressed by the tool/technique**

Extracts from plants or fruits are an important concern for food industry. They contain innumerable constituents, which serve as source of molecules with antimicrobial properties and raw materials for different processes. Then, it is important to improve techniques which allow these extractions in small and medium scale without big machinery.

2. **Name of the technique and/or tool**

Open - vessel microwave - assisted online sample treatment

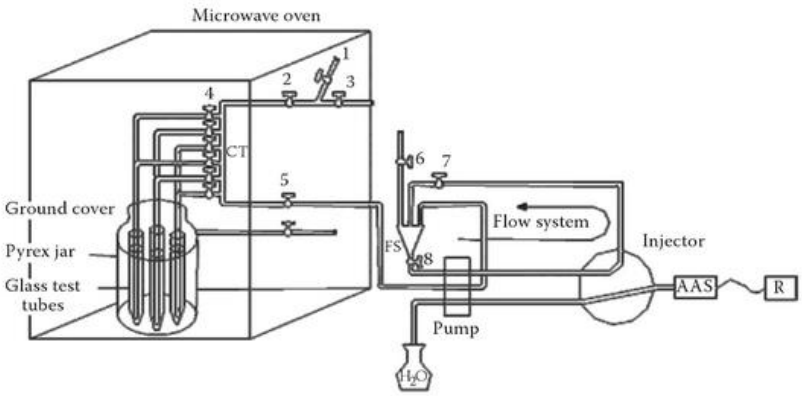
3. **Additional information if it is available**

- http://www.sciencedirect.com/science/article/pii/S0268005X13003858
- Knoerzer, K., Juliano, P., Smithers, G. (2016). Innovative Food Processing Technologies: Extraction, Separation, Component Modification and Process Intensification. Elservier. Cambridge.

4. **Short description of the technique and/or tool**

The open - vessel microwave - assisted online sample treatments have frequently been coupled to other steps of the analytical process such as clean - up, derivation or, directly, to detection of important compounds to be extracted from plants or another vegetal tissue. A household oven or, better, a commercial focused system has typically been used for this purpose.
The main advantages of online are their low cost of equipment, safe and with easy automation. The figure shows a system using a household oven for the simultaneous treatment of several samples[9].

[9] Knoerzer, K., Juliano, P., Smither, G. (2016). Innovative Food Processing Technologies: Extraction, Separation, Component Modification and Process Intensification. Woodhead Publishing. Cambridge.



5. Availability, accessibility of the technique and/or tool

Nowadays is mentioned in scientific literature, prototypes are being developed and under investigation to create guidelines for the safety evaluation of food additives from plant extracts, because typical toxicological values have not been assigned to them.

6. Pre-requisite/s of the application

Not exigent, basically the application can be set up with vessels made of various materials, household ovens, pump and injector.

7. Cost-estimation

Information not available

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other		

9. Lessons learned from the tool/technique

Information not available

38) PATHWAY-27 INDUSTRY GUIDELINES FOR DEVELOPING PRODUCTS WITH HEALTH CLAIMS (GRANT AGREEMENT N°311876: PATHWAY-27.)

ID number of the tool/technique	3.1.1.38.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x		x	x	x	x		

Collected by: CBHU

1. Specific need or problem being addressed by the tool/technique

Products with this 'added value' can be attractive to consumers who see them as healthier, and their novelty allows manufacturers to gain a greater profit margin than from a 'commodity' product. Health claims can be important drivers of product development and they can have an impact on which food products consumers will choose. However, developing products with health claims is a very complex process with very sensitive aspects (e.g. characterization of the compound), and also the substantiation process is also very difficult for most SMEs.
At this moment, there are no available guidelines for SMEs who struggle to meet with the requirements established by the EC Regulation 1924/2006. There is a need for a simple guidance material.

2. Name of the technique and/or tool

PATHWAY-27 Industry Guidelines for developing products with health claims (Grant agreement n°311876: PATHWAY-27.)

3. Additional information if it is available

The draft is available now for public consultation and commenting. Please contact: dr András Sebők (a. sebők@campdenkht.com).
The final version of the Guidelines will be publicly available on the PATHWAY-27 website (http://pathway27.eu/).

Related publications:

- HEGYI, A.- VIOLA, K.- GYURÓ, A.- SEBŐK, A. -VIDRY, S. -PUTZ, P. -BÁNÁTI, D. (2015): Needs and difficulties of food businesses in the substantiation of health and nutrition claims, No 206235, 2015 International European Forum, February 17-21, 2014, Innsbruck-Igls, Austria, International European Forum on Innovation and System Dynamics in Food Networks.
- SEBŐK, A.; HEGYI, A.; KERTÉSZ, ZS. (2016): Importance of coordinated interactions of multiple stakeholders for developing products with health claims. Proceeding in System Dynamics and Innovation in Food Networks 2016

4. Short description of the technique and/or tool

The Industry Guidelines provide a practical and comprehensive guidance on the development of products with health claims to food businesses and their suppliers (material, knowledge and related services).
Claimed health benefit(s) of products which are not approved by the EC have to be demonstrated in large human randomized controlled trials (RCTs), so safe food samples with the required characteristics (e.g. appropriate bioactive concentration, sensorial properties, etc.) have be available at the right time and place and in the right quantity for the human intervention studies. To achieve that a well-organized production and delivery is required.
This practical guide presents the steps of the development of products with health claims. Specific challenges, good practices and the typical pitfalls for developing and placing such products onto the market are highlighted within a framework of recommended practices for the development and market launch of conventional products.
During the presentation of the stages of the product development process the nature and sensitivity of the bioactive constituent and its effect on the manufacturing are highlighted.
Specific considerations are described in a very easy-to understand language on the selection and validation of health claims, which are one of the main obstacles for the SMEs.
Thereafter the recommended practices for developing and implementing the marketing strategy and market launch are covered.
The table of content of the Industry Guidelines:

Preface
1 Introduction
1.1 Background and objective of the guidelines
2 Procedures and general methods for developing products with health claims

2.1 What is a health claim?
2.2 Stages of product development procedure
2.2.1 Idea generation, concept development
2.2.2 Setting the target- product development brief
2.2.3 Nutrient profile
2.2.4 Prerequisites for the human intervention studies
2.2.5 Screening feasibility
2.2.6 Planning and project management
2.2.7 Steps from prototype development to scaling-up to factory level
2.2.8 Product, process, packaging and labelling approval
2.2.9 Market introduction
2.3 Ensuring food safety
2.3.1 General food safety requirements and aspects of products for human consumption (food safety management system based on HACCP)
2.3.2 Safety of the test products (for sensory and consumer testing)
2.4 Determination of shelf life

The Guidelines should not be considered as a book. Usually, during a product development when a SME faces some kind of a problem, use the specific chapters of the Guidelines to solve that specific problem.

5. Availability, accessibility of the technique and/or tool

The Guidelines will be publicly available on the PATHWAY-27 website (http://pathway27.eu/).

6. Pre-requisite/s of the application

N/A

7. Cost-estimation

The Guidelines will be publicly available on the PATHWAY-27 website (http://pathway27.eu/).

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management		-
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users	+	
	User satisfaction and its assessment	+	
	User's feedback and reaction		-
	Other Please specify:		

9. Lessons learned from the tool/technique

The development of food products with health claims is a more complex process than the development of conventional products. It requires even higher levels of collaboration and harmonised interactions between several disciplines and independent partners. Therefore, a careful and systematic design of the product development process is crucial. A flowchart is provided for the proper design of the product development process. There are interrelations between the product development steps. Each mistakes influence the whole process. On the flowchart, these interrelations are presented with the colored arrows.
However, there are several tools available which helps to avoid or reduce the chances of mistakes:

- Detailed and clear product development brief should be prepared at the beginning of the development,
- Ingredient, final product, process and packaging specifications,
- Gantt chart is a common tool to harmonize activities in time.

The Industry Guidelines describes the content of these tools and documents highlighting the nature of the bioactive components.

39) PRACTICAL RISK ANALYSIS, TESTING AND ACTION LEVELS 2013 (CAMPDEN BRI UK), ALLERGEN MANAGEMENT GUIDELINE

ID number of the tool/technique	3.1.1.39.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
	x	x	x	x	x			

Collected by: CBHU

1. Specific need or problem being addressed by the tool/technique

EC Regulation 1169/2011 includes the list of the 14 allergens which is mandatory to label on the pack.
Manufacturers often use phrases such as 'may contain' to show that there could be small amount of an allergen in a food product for example milk, egg, nuts etc. because it has entered the product accidentally during the production process. It's not a legal requirement to say on the label that a food might accidently contain small amount of an allergen, but many manufacturers label their products in this way to warn their customers of this risk.
There is a concern that 'may contain' labelling is used too much, sometimes when it isn't really necessary. This could undermine valid warnings on products and restrict people's choice unnecessarily. Advisory labelling is essential for people with food allergies, and manufacturers are striving to provide helpful information.

Allergen management is a major task for the food and drinks industry. The ultimate requirements are to ensure that those who suffer from specific allergies know which foods contain problem ingredients, and that other foods do not unknowingly contain allergens. Helen Brown from Campden BRI, of our Biochemistry section, explained:

"Several countries and regions (including Europe, USA, Canada, Japan, Australia and New Zealand) have introduced legislation which requires the presence of the major food allergens, or their derivatives, to be labelled when included as ingredients in pre-packed foods. The offered guidelines can be explained the way in which presence must be indicated, and can also give advice on which derivatives are exempt from declaration because they do not pose a problem."

Cross contamination

Situations when allergenic foods are unintentionally present due to cross-contamination are not covered by labelling legislation. However, preventing such contamination is vitally important. Allergen management requires assessment of the potential risks of cross-contamination at every step of the food production process, and the implementation of steps to minimise or prevent it. This may include supplier

questionnaires to check the allergenic status of ingredients, physical segregation within the production area, and scheduling of production runs, as well as ensuring that packaging and labelling of the final product are correct.

In many factories, allergen-containing products are processed on the same lines as allergen-free products, so an effective and well-managed cleaning regime is imperative. We can provide help and advice on this, and can analyse surfaces to see if any allergens remain. These can be used to provide evidence that the cleaning regime is effective, as well as in confirming the allergenic status of raw materials."
It should be also noticed that there are reliable good analytical techniques, methods for the identification/measurement of these allergens, e.g. ELISA and gluten, but the companies need such solutions that quicker, cheaper, easy to use in factory level and do not require too much skill from the staff are needed.

2. Name of the technique and/or tool

Practical risk analysis, testing and action levels 2013 (Campden BRI), Guideline G71 ISBN 978-0-907503-76-7 was published.

3. Additional information if it is available

Several numbers of relevant publications are issued, such as 'Validation of cleaning to remove food allergens' (Guideline No. 59), which gives detailed guidance on how to demonstrate that cleaning mechanisms are effective. It also details what tests are available, sampling options and the limitations of testing. It does not discuss cleaning per se, as this is covered in our related guide 'Cleaning and disinfection of food factories: a practical guide' (Guideline No. 55).

Campden white paper
Reports about the reliability of the use of these allergen kits compared to analytical method, e.g. ELISA.

- Campden BRI, RRS 2014-57: Detection of food allergens in materials used for cleaning in dry manufacturing environments
- Campden BRI, RSS 2014-59

4. Short description of the technique and/or tool

Food allergy and food intolerance (e.g. coeliac disease) are estimated to afflict over 3 million people in the United Kingdom alone. Disease outcomes range from (at best) a restricted lifestyle to (at worst) death. Current EU legislation requires food businesses producing wrapped foods to declare the intentional presence (as ingredients, additives or process aids) of 13 foods or food groups and one additive (sulphite) considered to be significant allergens in a specified manner. This is to ensure that sensitive consumers are advised of their presence. In addition, if these foods are known to be potentially present (e.g. as a result of cross-contamination), many food businesses apply precautionary labelling ("may contain") to warn the sensitive consumer of this fact.

Food information legislation within the European Union has recently been subject to substantial revision, with a new regulation (1169/2011) being introduced. This will, in the most part, take effect from 13 December 2014. In terms of significant food allergens the law has also been changed. In particular, two new requirements will have significant consequences in terms of food safety management systems and/or staff training.
The first requirement concerns the supply of voluntary food information (Article 36). Article 36 requires (amongst other things) that, as a general principle, such information should, where appropriate, "be based on the relevant scientific data" (Paragraph 2c). Furthermore, the Commission is required to subsequently implement regulations concerning the application of precautionary labelling in terms of the unintentional presence of food-allergens (Paragraph 3a).
Substantive advice on the circumstances when precautionary labelling might be applied was published by the Food Standards Agency in 2006. Since then there have been further developments in our understanding of the risk assessment process underpinning the decision whether or not to precautionary label (e.g. the 'Action Level' concept) and Campden BRI has recently published a guidance document (No. 71) which details how these developments can be applied to implementing the Agency's advice.
The above requirements relate only to ingredients that are part of the formulation of the food. They do not cover situations where there is a risk/concern of cross-contamination. Good Manufacturing Practices should eliminate or greatly reduce the risk of cross-contamination in most cases. Current recommendations are that 'may contain' labelling should only be used where there is a realistic risk of cross-contamination occurring that, because of the nature of the product and its production environment, cannot be eliminated.
The two recommended guides give inputs for elimination of the allergens.
The first one focuses on the cleaning and disinfection, than the second one of efficiency of the cleaning from the allergens removal points of view.
The guideline 55 gave more information about cleaning and disinfection of food factories: a practical guide covering the following details:

SECTION l: BACKGROUND INFORMATION 1
CHAPTER 1: THE IMPORTANCE OF CLEANING AND DISINFECTION 1
1.1 Legislation
1.2 HACCP and cleaning
1.3 Cost benefit
CHAPTER 2: MANAGEMENT RESPONSIBILITIES FOR
CLEANING AND DISINFECTION
2.1 Management structure
2.1.1 Management responsibilities
2.1.2 How to choose your Hygiene Team
2.2 Hygiene Manager responsibilities
2.2.1 Selection and auditing of a suitable chemical supplier
2.2.2 Selection and management of sanitation chemicals, cleaning equipment and methodology
2.2.3 Defining the cleaning window
2.2.4 Development of cleaning schedules
2.2.5 Training of Hygiene Operatives
2.2.6 Employment of specific contractors

The guideline 59 gave more information about validation of cleaning to remove food allergens covering the following details:

5. Availability, accessibility of the technique and/or tool

Visit https://www.campdenbri.co.uk/research/food-allergens.php

6. Pre-requisite/s of the application

N/A.

7. Cost-estimation

Member price £90 (Campden BRI UK)
Non-Member price £135

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency		-
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users	+	
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify:		-

9. Lessons learned from the tool/technique

The guidance document supports the users, particularly the industry representatives in carrying out risk assessment on allergens, gives inputs for the proper labelling.
The further RSS and white papers help the users to have better understanding for the validation of the allergen management and cleaning protocol used at factory level for the removal of the allergens. The additional materials support the accuracy of allergen kits contra analytical methods.

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40) PREDICTIVE MICROBIOLOGICAL MODELS

ID number of the tool/technique	3.1.1.40.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x		x		x				

Collected by: CBHU

1. Specific need or problem being addressed by the tool/technique

Predictive microbiological models are tools that can be used to assess product shelf life and safety. Models can also be used in product development, in identification of areas where challenge testing should be undertaken or can be applied in HACCP plan development.
Physical, chemical and microbiological properties of food products may have a deep influence on food quality and safety. Predictive modelling and microbial risk assessment have emerged as a comprehensive and systematic approach for addressing the risk of microbial pathogens and spoilers in specific foods and processes. The SMEs from the food production have limited knowledge about these predictive tools.
Therefore to overview what are they and how can be used in the food industry a short summary was prepared in the subject of predictive microbiological models by Campden BRI.

2. Name of the technique and/or tool

Predictive microbiological models

3. Additional information if it is available

The overview of the predictive microbiological models can be found on the website of Campden BRI UK , or in direct link: https://www.campdenbri.co.uk/white-papers/predictive-microbiological-models.php .
Further additional information is available

- in the website of Combase (http://www.combase.cc/index.php/en/)

- in the website of USDA from the Pathogen Modeling Program (PMP) (https://pmp.errc.ars.usda.gov/PMPOnline.aspx)

4. Short description of the technique and/or tool

Predictive food microbiology models are developed to support the design of safe products and processes, the assessment of the effect of different combinations of critical controlling factors such as processing parameters and the intrinsic and extrinsic properties of the product on the growth, survival and death of the different types of microbes.
The intrinsic and extrinsic properties (e.g. time, temperature, pH, salt content, water activity, nitrite content, modified atmosphere in the package, etc.) can be used as input parameters, and the predictive microbiological models as computer based software packages allow the user to estimate the rate of microbial growth or get an indication of whether growth of a particular microorganism will occur under a specified set of conditions.
The predictive microbiological model is intended to be used both by researchers and by the industry experts (in particular by product developers, risk assessors).
The overview prepared by Campden BRI gives a short introduction to the science of computer based microbiological models, shows and explains in general the application of the following models: FORECAST, CIMSCEE code, COMBASE predictor system, and PATHOGEN MODELLING PROGRAM (PMP). The potential user of the models can find inside the "white paper" links to the models.
At the end of the Predictive microbiological models "white paper" are Tables 1 – 8, which are related to the FORECAST, COMBASE, and PMP models , in which the range of the input parameters as range of the use are listed. These Tables can be very helpful, in particular in the model selection.
It should be noted, that there are other user friendly microbiological models, which are not mentioned by this "white paper, for e.g. Sym'Previus, which is an extensive decision support system that includes also database and predictive models for growth and inactivation of pathogenic bacteria and some spoilage microorganisms (see more details https://symprevius.eu/software/)

5. Availability, accessibility of the technique and/or tool

See further details:
- in the website of Campden BRI UK, or in direct link: https://www.campdenbri.co.uk/white-papers/predictive-microbiological-models.php
- in the website of Combase (http://www.combase.cc/index.php/en/)
- in the website of USDA from the Pathogen Modeling Program (PMP) (https://pmp.errc.ars.usda.gov/PMPOnline.aspx)

6. Pre-requisite/s of the application

The predictive microbiological modelling systems are computer based software packages, which needed to run different operation systems, but their majority requires Microsoft Windows. Some of the models can be used via online (e.g. Combase, PMP online), while others have stand – alone (or home) version, which must be downloaded (e.g. PMP version 7. or PMP version 8.).

7. Cost-estimation

The overview of the predictive microbiological models can be free downloaded from the following link: https://www.campdenbri.co.uk/white-papers/predictive-microbiological-models.php
Some of the modeling software is freely accessible (e.g. Combase, PMP). But there are existing software tools, which only partially can be used freely, while for other parts of those a registration fee must be paid (e.g. Sym'Previus).

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment		-
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment		-
	Product performance and its assessment	+	
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify:		

9. Lessons learned from the tool/technique

The predictive microbiological modelling tools are based on laboratory generated data. Predictive models have been developed for both spoilage and pathogenic organisms and there are both growth and survival models available for use.
However," there can be not guarantee, that predicted values will match those that would occur in a specific food system. Before the models could be used in such a manner, the user would have to validate the models for each specific food of interest" (see PMP Online).

41) SIMPLIFIED INDUSTRIAL RISK ASSESSMENT

ID number of the tool/technique	3.1.1.41.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x		x	x					

Collected by: CBHU

1. **Specific need or problem being addressed by the tool/technique**

In food safety management the risk assessment is a core tool. The food manufacturers are required to conduct assessment of risk to support and justify their food safety system. There is a need for a risk assessment tool, which can be used easily and shortly, and can help the companies to relatively assess their food safety risks and to identify the priorities of their food safety management system.

2. **Name of the technique and/or tool**

Simplified Industrial Risk Assessment

3. **Additional information if it is available**

In the subject of "Simplified Industrial Risk Assessment" no specific source was fund. For industrial microbiological risk assessment the followings can be useful:

"Industrial microbiological risk assessment: a practical guide 2nd Ed 2007" published by Campden BRI, is the second edition of this guide, which describes how MRA as a tool is now perceived and used (https://www.campdenbri.co.uk/publications/pubDetails.php?pubsID=114).

"Risk Assessment and Management of Raw Materials Guideline 65" published by Campden BRI, which provides guidance on the application of risk assessment techniques to identify, evaluate and control hazards associated with raw materials in food or feed manufacturing environment (https://www.campdenbri.co.uk/publications/pubDetails.php?pubsID=4550).

The white paper "Microbiological Risk Assessment (MRA) in Food Processing" published by Safefood 360, Inc., (http://safefood360.com/resources/Microbial-Risk-Assessment.pdf)

4. **Short description of the technique and/or tool**

Food safety risk analyses focus on major safety concerns in manufacturing premises. In case of microbiological hazards a Microbiological Risk Assessment (MRA) should be carried out by the assessors. The simplified MRA can be considered as a tool that can

be used in the management of the risks posed by foodborne pathogens. The target users of this tool are the industry experts and the risk assessors.
The method of the simplified MRA is based on the technique for simple risk profile. The risk profile is a simple paper-based approach to risk assessment. The risk profile will allow the user to recognize the features of the process and product exerting the biggest influence on the level of risk. During the risk profiling series of questions should be answered in the following steps of MRA:

- Hazard identification
- Hazard characterization
- Exposure assessment
- Risk characterization

The last three sub-step (Hazard characterization, Exposure assessment, Risk characterization) contributing to the risk profile can be rated on a scale (e.g. from 1 (low) to 5 (high)).

Hazard identification:

At this step the assessors have to identify the list of the potential food borne pathogens that may be present in the specific food related to the RA. To start the work first the description of the food must be completed from safety point of view. The assessors have to decide, which potential pathogenic microorganisms are significant.

Hazard characterization:

The hazard characterization should be conducted for each pathogens, which were found by the hazard identification significant. At this step the pathogens and the nature of the problems can caused by them (the adverse health effect) should be assessed. The available hazard and risk databases can be helpful (for e.g. FoodRisk.org http://www.foodrisk.org/). Without good source of information is difficult to answer, sometimes there are no certain data. Therefore the degree of the uncertainty should also be answered.

Exposure assessment:

With exposure assessment the likely occurrence of the pathogen and the level of pathogenic microorganisms (and/or toxins) in the food should be determined by the assessors at the time of consumption.
At this step must take into account lot of questions as followings: the contamination level of the ingredients and the likely occurrence of the pathogenic microorganisms in the ingredients, the impact of processing steps, the likelihood of toxins presence if the microorganisms can produce toxins, the potential of re-contamination after processing or decontamination, the effect of packaging in preventing recontamination before consumption, the impact of the storage – distribution and retail, the impact of the product usage at home of the consumer, and the likely portion of the food consumed.
Step by step all of these questions should be answered. For each answer a scoring system should be used. Of course for each question the degree of the uncertainty of the answers (which based on the background of the knowledge) also should be scored.

Risk characterization:

Finally the sum of the scores as total scores produced by the simplified MRA reflect the assessment of the risk. The uncertainty of the assessment can be also

characterized. As result from the risk profiling two scores can be calculated for the comparable pathogens:

- Risk profile total score
- Information quality profile sore (which is related to the uncertainty of the data and information used in risk assessment).

5. Availability, accessibility of the technique and/or tool

See the links listed in part "3. Additional information if it is available."

6. Pre-requisite/s of the application

N/A

7. Cost-estimation

The "Industrial microbiological risk assessment: a practical guide 2nd Ed 2007" " can be purchased from the book store of Campden BRI. The price for members is 60 GBP, while the price for non-members is 90 GBP. (https://www.campdenbri.co.uk/publications/pubDetails.php?pubsID=114).

The "Risk Assessment and Management of Raw Materials Guideline 65" can be purchased from the book store of Campden BRI. The price for members is 60 GBP, while the price for non-members is 90 GBP. (https://www.campdenbri.co.uk/publications/pubDetails.php?pubsID=4550)

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment		-
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment		-
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify:		

9. Lessons learned from the tool/technique

The simplified risk assessment is an industrial, practice oriented method, which focuses into the identification of the priority of the food safety systems: the risks of different type of pathogens can be shortly analyzed. The scored results are comparable and relative instead of absolute. Scoring the uncertainty, the method can be used in cases when the data and information (which based on the background of the knowledge) is relatively incomplete.
It should be emphasized, that sometimes a whole validation of products and /or processes can be a more complex task, like simplified risk assessment: in some cases individuals or small group of individuals working in the industry do not have full access to a large collection of scientific publication. Therefore the food industry rely on help from other professionals are expertized on a complex risk assessment. These professional risk assessors are coming mostly from private sector and sometime from science.

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42) SLEEVING - NEW METHOD IN THE LABELLING OF PRODUCTS

ID number of the tool/technique	3.1.1.42.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x			x	x			

Collected by: SCCI

1. Specific need or problem being addressed by the tool/technique

Company Horsona s.r.o. is located in the city of Trnava, Slovakia. Horsona was established in 1996 as a company with the aim to offer highest possible quality in the production of packaging materials for the food-processing industry.

The company is concentrated in the production of packaging materials from the flexible foils, papers and combined materials. Company uses the rotogravure printing technology. It is also a producer of paper cushion pads, with or without printing for the chocolate desserts and a package material on the B-wave basis with or without the printing.

2. Name of the technique and/or tool

Sleeving - new method in the labelling of products

3. Additional information if it is available

You can find more additional information about this method and other methods for packaging that company Horsona s.r.o. offers on the web page of the company :

http://www.horsona.sk/services-and-products.php

4. **Short description of the technique and/or tool**

Sleeving is a method in which by connecting of the strips of foil is the label used on the products (bottles, jars).

5. **Availability, accessibility of the technique and/or tool**

All needed information can be find on the web page of the company.

6. **Pre-requisite/s of the application**

Main pre- requisite for using of these new technologies is the need to be innovative and be able to meet all requirements of not only food processing SMEs for labeling their products.

7. **Cost-estimation**

Mentioned technologies that company owns are not free for users and they are not available for general public. Most of them were purchased using public procurement.

8. **Novelties, benefits and added value**

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management		-
	Regulations compliance and its assessment		-
	Product performance and its assessment	+	
	Information for users	+	
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify:		

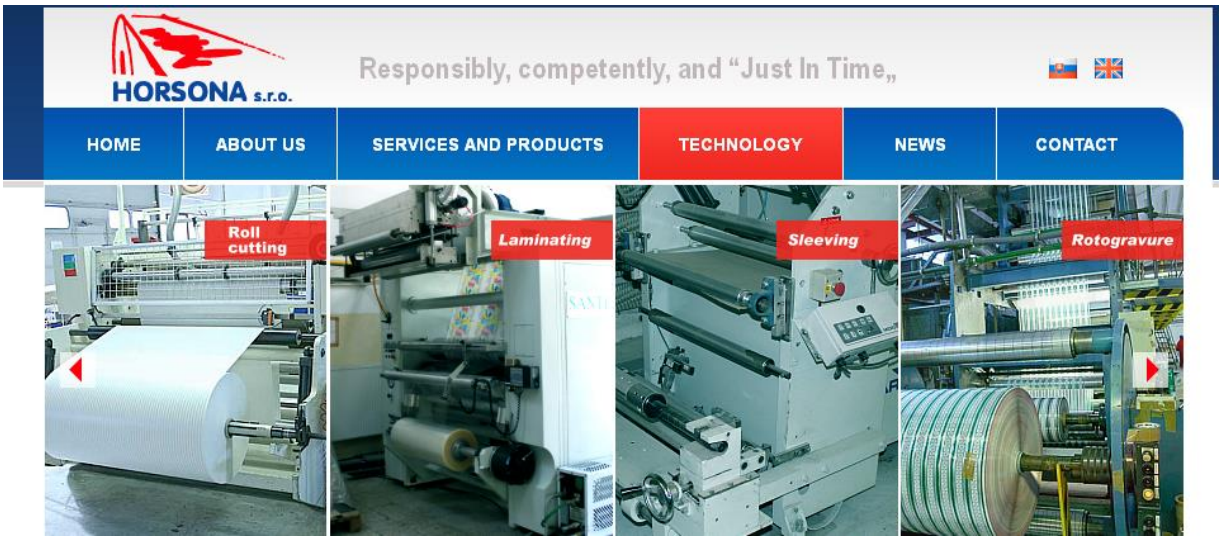
9. **Lessons learned from the tool/technique**

Company Horsona s.r.o. is next company on the Slovak market with technologies for sleeving. Experiences of the company with this technology is very positive.

Company offers to their clients also other technologies, for example:

Rotogravure printing technology

Paper cushion pad unit for production of 3,5 and 7 layer cushion pads
Roll cutting
Sheet cutting
Shape cutting
Laminating machine



All of company´s products are produced according to the STN EN ISO standard 9001:2009 and meet the requirements of the highest quality.
At this time has company next running project: Construction of a new printing operation for the production and printing of packaging materials.

43) SONIC DRYER

ID number of the tool/technique	3.1.1.43.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x	x	x				

Collected by: UHOH

1. **Specific need or problem being addressed by the tool/technique**

Since drying is one of the most important and oldest unit operations used for thousand years in a variety of food, the application of this technique aims to reduce the mass and usually the volume of the product, which makes their transportation, storage and packaging easier and more economic, but most important is their preservation and to increase their shelf – life.

2. **Name of the technique and/or tool**

Sonic dryer

3. **Additional information if it is available**

https://www.youtube.com/watch?v=cuxbaugVfKU

4. **Short description of the technique and/or tool**

Sonic drying depends on the energy generated in the form of sound waves. Many researchers studied the increase of drying rate in an ultrasonic field and presented a number of theories. It seems that the effect of sound in moisture removal is quite complex and caused by a decrease in viscosity, reduction of the laminar sublayer thickness due to an increase in turbulence of the air stream in contact with the material, increase of moisture evaporation due to breakage of the boundary layer and an increase in the moisture migration due to the expansion of vapor bubbles inside capillaries.
The mechanism of ultrasound drying is based on the principle that ultrasound travels through a medium like nay sound wave, resulting in a series of compression and rarefaction. At sufficiently high power, the rarefaction exceeds the attractive forces between molecules in the liquid phase, which leads to the formation of cavitation bubbles to release energy for many chemical and mechanical effects

5. Availability, accessibility of the technique and/or tool

- http://www.sonicairsystems.com/tank_dryer.php
- http://www.marchantschmidt.com/product-catalog/15/sonic-air-engineered-drying-systems

6. Pre-requisite/s of the application

Depending on the exactly sonic dryer, can be that requires less energy than air pressure fans with electric heaters.

7. Cost-estimation

Information not available.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other		

9. Lessons learned from the tool/technique

Ultrasound techniques are simple, relatively cheap and energy saving, and thus became an emerging technology for probing and modifying food products. In addition, probes that generate high power ultrasound are cheap, portable and modifiable to suit different purposes in the food industry. The assistance of air drying with an ultrasonic field can reduce drying time to about half, depending on sound energy and frequency[10].

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44) SPRAY DRYER FOR MICROENCAPSULATION

ID number of the tool/technique	3.1.1.44.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x	x	x				

Collected by: UHOH

1. Specific need or problem being addressed by the tool/technique

There is a big concern about techniques and technologies which allow industries to increase the effectiveness and protection of functional compounds, additives, dyes and flavors in industry against oxidizing agents, enzymes, temperature and light.

2. Name of the technique and/or tool

Spray dryer for microencapsulation

3. Additional information if it is available

https://www.youtube.com/watch?v=0o4ZCjHnaRw

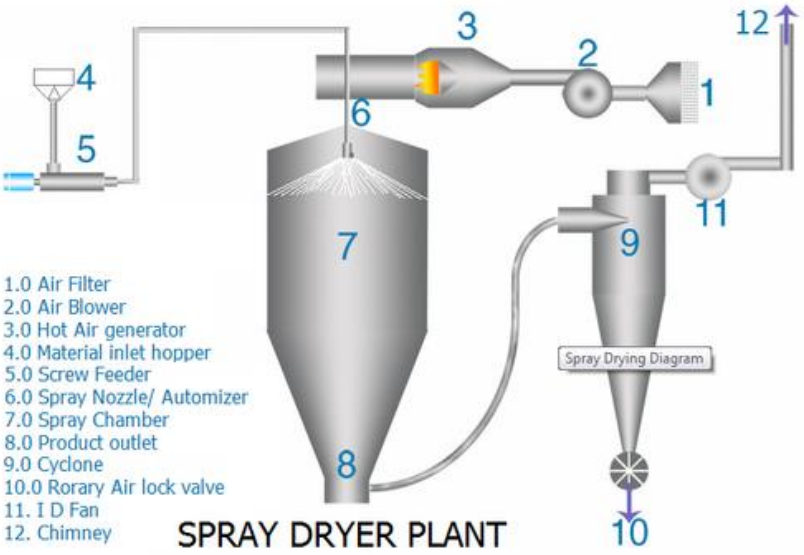
4. Short description of the technique and/or tool

Microencapsulation is the envelopment of small solid particles, liquid droplets, or gases in a coating. Microencapsulation is based on the embedding effect of a polymeric matrix, which creates a microenvironment in the capsule able to control the interactions between the internal part and the external one.
This technology allows the protection of a wide range of materials of biological interest, from small molecules and proteins to cells of bacterial, yeast, and animal origin. Thanks to microencapsulated ingredients, many products that were considered

[10] Bhattacharya, S. (2014). Conventional and Advanced Food Processing Technologies. John Wiley & Sons. Oxford.

technically unfeasible are now possible. In the food industry, there are three reasons for applying microencapsulation[11]:

- To reduce the core reactivity with environmental factors, to decrease the transfer rate of the core material to the outside environment.
- To promote easier handling and control the release of the core material.
- To mask the core taste and dilute the core material when it should be used in only very small amounts.



Spray drying is a cheap method to convert a solution, suspension or emulsion into a solid powder format in one step. It is a widely established process in many industries such as food and material science. In the dairy industry, plants operate on protein, whey concentrate, milks (skim, whole and filled), milk substitutes, lactose, permeate, formulated baby foods and cheese encapsulation.

5. Availability, accessibility of the technique and/or tool

https://www.indiamart.com/dev-industries-pune/spray-dryers.html
http://www.gea.com/de/products/production-minor.jsp
http://spray-dryer.com/designs-spray-dryer-chamber-design/inert-circuit-spray-dryer/

6. Pre-requisite/s of the application

Although either Carbon dioxide or Nitrogen would be suitable substitutes for the drying air, Nitrogen is the usual chosen gas. Therefore this gas must be supplied, having the advantage that the Nitrogen charge would be re-circulated and used constantly between CIP cleaning shut-downs of the plant, reducing in this way exorbitant cost of the gas. Additional instrumentation is required, related to the

[11] Galanakis, C. (2016). Innovation Strategies in the Food Industry: Tools for Implementation. Academic Press. Cambridge.

usual operating instruments that would include circuit pressure for Oxygen and Nitrogen[12]

7. Cost-estimation

Spray Drying is the most common and cheapest technique to produce microencapsulated food materials. Equipment is readily available and production costs are lower than most other methods[13].

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify:		

9. Lessons learned from the tool/technique

Encapsulation as an effective preservation method to cover a bioactive compound with a protective shell provides many advantages: These bioactive materials include lipids, vitamins, peptides, fatty acids, antioxidants, minerals and probiotics. But it is important to choose appropriate drying technique and proper encapsulating material. Encapsulation by drying process is the best option to solve major problems of food ingredients faced in food industries as well as in solving micronutrient deficiencies all over the world. Future study should be focused on overcoming the gap between preservation process and demands for large-scale production[14].

[12] European Spraydry Technologies. (2015). Inner circuit Spray dryer. Retrieved from: http://spray-dryer.com/designs-spray-dryer-chamber-design/inert-circuit-spray-dryer/

[13] Estevinho, B., Rocha, F., Santos, L., Alves, A. (2013). Microencapsulation with chitosan by spray drying for industry applications – A review. Trends in food science & technology. 31(2), 138 – 155.

[14] Ray, S., Raychaudhuri, U., Chakraborty R. (2015). An overview of encapsulation of active compounds used in food products by drying technology. Food Bioscience. 13, 76-83.

45) SUPERCRITICAL FLUID EXTRACTION OF PRESERVANTS WITH CARBON DIOXIDE

ID number of the tool/technique	3.1.1.45.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x	x	x				

Collected by: UHOH

1. Specific need or problem being addressed by the tool/technique

There is an increasing public awareness of the health, environment and safety hazards associated with the use of organic solvents in food processing and the possible solvent contamination of the final products. The high cost of organic solvents and the increasingly stringent environmental regulations together with the new requirements of the medical and food industries for ultra-pure and high added value products have pointed out the need for the development of new and clean technologies for the processing of food products[15].

2. Name of the technique and/or tool

Supercritical fluid extraction of preservants with carbon dioxide

3. Additional information if it is available

https://www.youtube.com/watch?v=8nMzQLHpSxU
https://www.youtube.com/watch?v=OQPD4YBgeT8

4. Short description of the technique and/or tool

Supercritical carbon dioxide is considered to be a valuable technology for processing and preserving. It is considered a "green solvent", is cheap, abundant, and nonflammable, and its application in the functional food and natural health products industry is growing rapidly.
Fruits and vegetables contain different kinds of bioactive compounds such as vitamins, phenolics, carotenoids, sterols, glucosinolates and other sulfur containing compounds that significantly affect their taste, color and nutritive values.
Furthermore, as noted, the waste products of fruits and vegetable processing are also abundant sources of bioactives and therefore, using waste as a source of bioactives can be of considerable economic benefit to food processors.
Also, in addition to their potential health benefit, bioactive compounds high in antioxidant activity can be added t food products to preserve their color and flavor, and hence improve their shelf life[16].

[15] Otles, S. (2004). Supercritical fluid extraction. Retrieved from: http://eng.ege.edu.tr/~otles/SupercriticalFluidsScienceAndTechnology/bolumb/Wc34c920327cd9.htm

[16] Jaiswal, A. (2016). Food processing technologies: Impact on product attributes. CRC Press. Boca Raton.

5. Availability, accessibility of the technique and/or tool

https://www.amarequip.com/products/supercritical-fluid-extraction/
http://www.traderscity.com/board/products-1/offers-to-sell-and-export-1/supercritical-co2-extraction-equipment-5l-351942/
http://www.tharprocess.com/technology/
http://www.synthite.com/synthite/our-processes/cold-craft/co2-extraction

6. Pre-requisite/s of the application

Information not available.

7. Cost-estimation

Information not available.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify:		

9. Lessons learned from the tool/technique

In general, literature has shown that using $SSCO_2$ is a viable technique for extraction of fluids of interest to the food industry. The potential is attracting interesting because of its potential for inactivation of microorganisms and enzymes, showing lethal effects in liquid foods, along with deactivation of enzymes and deodorization of liquid materials[17]. At such, studies highlighting the presence of bioactive compounds in fruit and vegetables have stimulated the demand for process technologies capable of extracting such compounds, and $SSCO_2$ processing of fruits and vegetables has been well studied (Jaiswal, 2016).

[17] Ahmed, J., Ramaswamy, H., Kasapis, S., Boye, J. (2016). Novel Food Processing: Effects on Rheological and Functional Properties. CRC Press. Boca Raton

46) THREAT ASSESSMENT CRITICAL CONTROL POINTS

ID number of the tool/technique	3.1.1.46.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x	x	x				x

Collected by: CBHU

1. Specific need or problem being addressed by the tool/technique

The food industry sees the safety of its products as its main concern. Over the years, industry and regulators have developed food safety management systems which mean that major outbreaks of food poisoning are now quite unusual in many countries.
HACCP has proven to be effective against *accidental* contamination. HACCP principles however have not been routinely used to detect or mitigate *deliberate* attacks on a system or process. Such attacks may include deliberate contamination or fraud. Deliberate acts may have food safety implications but can harm organizations in other ways, such as damaging business reputation or extorting money.
The common factor behind all such deliberate acts is people. The people may be within a food business, may be employees of a supplier to the food business, or may be complete outsiders with no connection to the food business. The key issue being their motivation; they may aim to cause harm to human health or business reputation, or to make financial gains at the expense of the business. In any of these situations it is in the interests of the food business to protect itself from such attacks.
Threat Assessment Critical Control Points (TACCP) is a systematic approach and tool that allows to anticipate fraud or other forms of attack on their products, facilities and intellectual property. It aims to assure the authenticity of food by minimizing the chance of an attack and mitigating the consequences of a successful attack.

2. Name of the technique and/or tool

Threat Assessment Critical Control Points (TACCP)

3. Additional information if it is available

Issued in 2014, Publicly Available Specification PAS 96 (available as a free download from The British Standards Institution) explains the TACCP process, outlines steps that can deter an attacker or give early detection of an attack and provides other sources of information and intelligence that may help identify emerging threats.
www.food.gov.uk/sites/default/files/pas96-2014-food-drink-protection-guide.pdf

4. Short description of the technique and/or tool

Threat Assessment Critical Control Points (TACCP) is a structural risk management methodology, which aligns with HACCP, but has a different focus. Like many precautions taken to assure the safety of food, are likely to also deter or detect deliberate acts. It also complements existing business risk management and incident management processes.
Main steps include:
- Identifying and assessing threats to the organization, the operation and the product;
- Identifying key staff, vulnerable points and supply points;
- Determining whether existing control procedures would detect the threat; prioritising possible impact;
- Deciding on and implementing necessary controls and monitoring emerging risks.
TACCP can be adapted by food businesses of all sizes and at all points in food supply chains. It is intended to be of use to all organizations, but may be of particular use to managers of small and medium sized food enterprises who may not have easy access to specialist advice.
Threats like Economically motivated adulteration (EMA), Malicious contamination, Extortion, Espionage, Counterfeiting and Cyber crime may be considered step by step through the supply chain and manufacturing. Their impact is evaluated on and prioritised through a Likelihood-Impact matrix where the most important ones can be highlighted and acted upon.

5. Availability, accessibility of the technique and/or tool

The TACCP process is explained in detail in PAS 96 (see (3) Additional information) where case studies and checklists are provided.

6. Pre-requisite/s of the application

The TACCP process assumes and builds on a business' existing effective operation of HACCP, as many precautions taken to assure the safety of food, are likely to also deter or detect deliberate acts. It also complements existing business risk management and incident management processes.

7. Cost-estimation

Example checklists are provided for free in PAS 96

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other: Customer (trade) and US Export requirement	+	

9. Lessons learned from the tool/technique

Based on and following the approach of the well-established HACCP, a structural risk management approach like Threat Assessment Critical Control Points (TACCP) can be successfully used to raise awareness for the management of a food protection crisis situation or contingency planning for recovery from an attack.
TACCP can find its way in the scope of the internal audits even for companies not certified to food standards which explicitly require a food defense plan. The free tool PAS 96 helps in its implementation though the details of the process as well as examples and case studies.

47) TSENSO - TEMPERATURE MONITORING AND LAST-MILE DISPOSITION SYSTEM FOR PASSIVE COOLED DELIVERY

ID number of the tool/technique	3.1.1.47.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x	x		x			x

Collected by: CBHU

1. Specific need or problem being addressed by the tool/technique

One third of the world's food is wasted. In particular, mostly perishable goods such as fruit and vegetables, fish, meat and dairy products, because fresh and safe storage and transport conditions are a major challenge. The temperature is a key factor.
It is necessary to control and monitor the temperature of food from farm to fork since the temperature has a significant influence on the shelf life and food safety.
To track the temperature during transportation, usually data loggers are used. Today's data loggers track and document the temperature conditions in equal time intervals, such as once per minute. At the destination the data loggers need to be collected to read out the data. This adds to the handling costs of the transportation and has the significant disadvantage that invalid temperature conditions can be discovered only at the destination, when it is too late for remedial action.

2. Name of the technique and/or tool

tsenso - temperature monitoring and last-mile disposition system for passive cooled delivery

3. Additional information if it is available

Website: http://tsenso.com/en/
Leaflet: http://www.finish-project.eu/wp-content/uploads/2015/03/03_bringx-TSENSO.pdf
Presentations:
http://www.finish-project.eu/wp-content/uploads/2015/11/bringy_tsenso_Presentation.pdf
https://www.youtube.com/watch?v=ofNJeg8UBWA

4. Short description of the technique and/or tool

TSENSO is a complete monitoring solution with smart predictions and early warnings, suited for all kinds of transportation in the range of -25°C to 70°C. The sensor is small, lightweight (< 50 g), water resistant and has a battery lifetime of one year. It accompanies the cargo during the complete transportation. The sensor is continuously transmitting temperature values to the cloud via a mobile app. The

intelligent algorithm is then calculating the probable evolution of the cargo temperature and predicting the remaining time for the cargo to reach its limit temperature. In the case that the remaining time is less than the duration of the transportation, remedial actions are proposed to the driver in real time. In this way, critical conditions such as wrong packaging, leaking sealing or insufficient cooling are cleared before the temperature rises and damages the goods. Therefore with TSENSO perishable products reach their target perfectly cooled on time.
Additional elements of the solution:

- Gapless Temperature Monitoring: The solution links the temperature data of the individual sections, such as production, logistics, storage, retail and delivery service. This results in an individual temperature history for each product.
- Microbacterial Simulation: Based on the complete temperature history and the characteristics of the individual product, they can calculate the food safety respectively the expected shelf life.This is used to check whether the safety has actually been influenced by temperature fluctuations and whether the food is still suitable for sale and consumption.
- Shelf Life Calculation: The complex data from simulation is combined and translated in a simple number: the Fresh Index. This index shows at a glance how fresh and safe a product is. It is calculated in real-time and updated as the temperature conditions change.

The Fresh Index is not printed but can be read out via an app and displayed digitally, e.g. on digital price tags and in online grocery stores. This keeps it dynamic: As long as the product is temperature-monitored, the index is updated automatically. The fresh index indicates how fresh the product is. The higher the number, the fresher the food is, and the longer is its shelf life. The freshness data of the product is stored in the tsenso cloud and can be retrieved at any time. Along the food supply chain, this means that on arrival it can be checked immediately in what condition the goods are.
Application in Online Shops: Especially in online food stores the proof of quality of perishable products is important. The Fresh Index increases transparency and strengthens customer confidence.
Application in Stationary Stores: For retailers and their customers, the Fresh Index offers the advantage of being able to read the actual shelf life of products. The “first in, first out” principle is optimized: what is going to expire first is sold first. Particularly fresh products can be promoted via the Fresh Index: “Get it now!” And food which should be consumed soon can be easily identified and saved, e.g. with special offers.
Application in Refrigerators: By app or the smart fridge the index can show the true freshness and safety of food.

5. Availability, accessibility of the technique and/or tool

The application and service can be ordered via tsenso website:
http://tsenso.com/en/

6. Pre-requisite/s of the application

The relevant hardware/sensors should be purchased. The needed amount and type is up to the complexity of the service.

The applications compatible with tsenso cloud service should be downloaded.

7. Cost-estimation

The applications are free. The sensors and the complex service solutions can be purchased. For exact prize tsenso should be contacted:
http://tsenso.com/en/contact/

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment		-
	Information for users	+	
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify: Process performance	+	

9. Lessons learned from the tool/technique

The Company was founded in 2014 in Stuttgart worked on various software projects, always with the aim of optimizing the logistics especially on the last mile. The goal is to provide solutions that are easy, efficient and environmentally friendly.
With tsenso, they were able to convince the selection committees of two well-known funding programs: In 2015, they were part of the FInish Accelerator, funded by the European Commission. In 2016, METRO and techstarts supported them during their participation at the METRO Accelerator.
Amongst others, CEO Matthias could introduce the Fresh Index project to 300 investors and experts (see video): https://www.youtube.com/watch?v=ofNJeg8UBWA

48) UNDERSTANDING HIGH RISK, HIGH CARE, AND AMBIENT HIGH CARE" (BRC GLOBAL STANDARD FOR FOOD SAFETY ISSUE 7)

ID number of the tool/technique	3.1.1.48.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x			x			

Collected by: CBHU

1. Specific need or problem being addressed by the tool/technique

The determination of the required level of segregation is one of the key element in food hygiene. To understand the low-risk / high-risk / high-care segregation is essential for the food processors.

2. Name of the technique and/or tool

"Understanding High Risk, High Care, and Ambient High Care" (BRC Global Standard for Food Safety Issue 7)

3. Additional information if it is available

http://www.brcbookshop.com/p/1786/brc-global-standard-for-food-safety-issue-7-understanding-high-risk-high-care-and-ambient-high-care-unlocked-pdf-version

4. Short description of the technique and/or tool

The terms 'high risk' and 'high care' have been used in the BRC Global Standards for many years to define areas where chilled or frozen foods, which are particularly vulnerable to microbiological contamination, are handled.
In addition, in recent years several well-publicized food poisoning incidents have been associated with a range of ambient products that had not previously been considered a concern, such as chocolate and peanut butter. To reflect the lessons learned about food safety following these outbreaks, the new issue of the BRC Food Standard also introduces 'ambient high care' areas.

The guideline gives definitions of the products which are produced in high risk / high care zones, and product produced in ambient high care areas.
This guideline underlines and shortly explains the specific requirements of the zones from different hygienic point of view (how the specific clauses for these areas should be interpreted) as follows:

- Physical Segregation, barriers
- Transfer points of staff, raw materials
- Drainage systems

- Ventilation
- Changing Facilities
- Hausekeeping and cleaning
- Waste disposal
- Laundry services for protective clothing
- Documented inspections

Also the appendixes (production zone decision tree, examples of products and typical product zones, table of equivalent processes to achieve 70 °C / 2 minutes heat treatment) are useful for food manufacturers.
This guideline is intended to help not only sites of food manufacturers, but it can be useful for the design organization of food premises too.

5. Availability, accessibility of the technique and/or tool

See further details:
http://www.brcbookshop.com/p/1786/brc-global-standard-for-food-safety-issue-7-understanding-high-risk-high-care-and-ambient-high-care-unlocked-pdf-version

6. Pre-requisite/s of the application

No prerequisite needed for the application of this tool.
But the guideline itself summarizes and explains the hygienic prerequisites of the different zones, which prerequisites are essential to produce safe food.

7. Cost-estimation

The guideline "Understanding High Risk, High Care, and Ambient High Care" can be purchased from the BRC book shop, the price is 45 GBP.
http://www.brcbookshop.com/p/1786/brc-global-standard-for-food-safety-issue-7-understanding-high-risk-high-care-and-ambient-high-care-unlocked-pdf-version

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment		-
	Product performance and its assessment		-
	Information for users	+	
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other		

9. Lessons learned from the tool/technique

This guideline is helpful for the food manufacturers to understand whether the products they produce will require handling in a high-risk, high-care or ambient high-care environment.
Focusing into the different key hygienic issues the guideline gives short explanations how the specific clauses for these areas should be interpreted.

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49) WATER ACTIVITY MEASUREMENT

ID number of the tool/technique	3.1.1.49.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x	x	x				

Collected by: UHOH

1. Specific need or problem being addressed by the tool/technique

Problems associated with microbiological safety and product quality during production, processing, packaging and storage. Water activity has a direct impact on the growth of microorganisms such as mold, yeasts and bacteria. It also affects product's texture, taste, color, nutritional value and shelf life.
Effectively reduce the internal water migration of foods by being aware of the product's precise differences in water activity values e.g. use of humectants, climate control, appropriate packaging

2. Name of the technique and/or tool

Water activity measurement

3. Additional information if it is available

Rotronic offers a wide range of highly precise devices of measuring water activity:
Website: https://www.rotronic.com/en-gb/humidity-measurement-feuchtemessung-temperaturmessung/water-activity-wasseraktivitaet.html
Methods for measuring water activity (aw) of foods and its applications to moisture sorption isotherm studies
Publication: http://www.tandfonline.com/doi/abs/10.1080/10408398.2015.1108282

4. Short description of the technique and/or tool

- A sensor-based and rapid analysis of water activity. Control of moisture migration in food systems/products. Elimination of microorganism growth and improvement

of organoleptic and other quality aspects. The tool can assist in safety and quality of products.

- The technique can be used in various food processing applications for fresh, mid-dry and dry products, distribution packaging and storage. Apart from food, this applies to other industrial sectors such as pharmaceutical and cosmetic industries. Limitations are the number of samples for the control of big batches required, measuring time at higher moisture content and calibration for the conditions during the measurements.

- The principle relies on the measurement of the equilibrium relative humidity of samples in a wide range of moisture contents at constant temperature. The capacitive instrument actually measures the amount of water vapor in the headspace of the sample by changing its capacitance due to the effect of moisture. Readings are obtained in the form of % equilibrium relative humidity (ERH) and expressed as water activity.

- The sensor can be used by researchers, industrial professionals (e.g. product developers, engineers and technologists)

5. Availability, accessibility of the technique and/or tool

The sensor is commercially available according to the needs of the end-user by different companies:
https://www.rotronic.com
http://www.novasina.ch/
http://www.aqualab.com/

6. Pre-requisite/s of the application

Calibration of the sensor is required at the same temperature at which the samples are evaluated in order to convert the capacitance value to water activity units. The apparatus usually consists of a Rotronic HygrometerTM C94 capacitive humidity sensor, a Pt 100 RTD temperature sensor and one volume-variable, nickel-plated brass sample holders with a water jacket for temperature control. Each AwVc humidity-temperature probe uses a small fan to circulate air past the sample and accelerate equilibration of the product. The sensors are protected with a wire mesh dust filter. The samples are placed in the disposable sample containers and positioned in the sample holders. A sealed thermostatic chamber is formed by placing the sensor on top of the sample holder. Temperature and relative humidity data are measured using a display Rotronic Hygrometer A2 instrument. During the measurement, the partial pressure of water vapor at the surface of the product is slowly equilibrated with that of the air trapped in the sample holder.

7. Cost-estimation

The price of the tool is related to the needs of the end-user starting from ca. 1000 Euro

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify:		

9. Lessons learned from the tool/technique

Successful case
Problem: Insect infestation and mold formation during storage of dried mushrooms
Tool: Water activity detection / monitoring of dried mushrooms led to optimization of drying conditions and consequently final moisture content
Solution: Optimal final moisture content after drying resulted in elimination of microorganism growth during storage and reduction of postharvest losses in terms of quality and quantity

50) NEW LABELING PRINTING DEVICE

ID number of the tool/technique	3.1.1.50.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
		x	x	x	x	x		x

Collected by: KIGPSiO

1. **Specific need or problem being addressed by the tool/technique**

Due to globalization and increasing global trade volume in the complex food value creation chains the exchange of information between several market players is curtail for the food safety. The appropriate exchange of information about the quality and the quantity of goods is flowing through the complex food systems is possible through appropriate technologies and information systems. In this context labeling and treatability solutions play important role for the exchange of information and quality management.

2. **Name of the technique and/or tool**

New labeling printing device

3. **Additional information if it is available**

N/A

4. **Short description ofthe technique and/or tool**

This is an innovative combination of printing and labeling systems with transponder technology. What's more, this gives an optimal solution for encoding and identifying large quantities of goods. High quality "Logomatic" devices are widely used in the identification process of pallets and other units based on unique bar code labels and human readable information. Additional advantages:

- High speed printing and labeling of commercial units
- Usability for serial production

5. **Availability, accessibility of the technique and/or tool**

Logopak East Sp. z o.o.
ul. Serwituty 23 02-233 Warszawa

6. **Pre-requisite/s of the application**

Features of the label, like contents of the stored digital information, machine or human readability requirements, has to be agreed with the manufacturer.

7. Cost-estimation

The price of the solution depends on the label size and the information required. Usually service is included in contact.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency		-
	Improving quality and its assessment		-
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users	+	
	User satisfaction and its assessment	+	
	User's feedback and reaction		-
	Other Please specify: Tracking & tracing, recall management	+	

9. Lessons learned from the tool/technique

- Automatic handling of information
- Exchange of information between partners in value creation chain
- Appropriate for large flow of volume

3.2. Mechatronics

3.2.1. List of collected tools and techniques

The following tools and techniques were collected by the project partners in the area of mechatronics:

3.2.2. Descriptions of collected tools and techniques

1) EXPERIENCE EXCHANGE CIRCLE

ID number of the tool/technique	3.2.1.1.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x		x				x

Collected by: BIZ-UP

1. Specific need or problem being addressed by the tool/technique

Almost every company faces problems and challenges in their daily operations. To share their approach to solving these problems, an experience exchange circle on specific subject areas can be founded.

2. Name of the technique and/or tool

Experience exchange circle

3. Additional information if it is available

http://www.mechatronik-cluster.at/

4. Short description of the technique and/or tool

Experience exchange circles are an important way of getting connected with other companies, R&D institutions, multipliers or stakeholders. Exchange of experience should help to solve individual problems of companies with showing possible approaches to find solutions in similar cases. The focus is the solution approach, but without getting too much into details, so that company secrets keep protected. On the other hand, company representatives can tell about mistakes they have made so that the members of the circle have the opportunity to learn from each other's mistakes and not make them twice.

Upcoming specific topics are being discussed in a circle of about 6 to 12 company representatives. There are short presentations from 2 to 3 companies with best practice cases how they solved problems and they share their own experiences. Alternatively, an external expert can be invited to present solution techniques. A further discussion is stimulated by these presentations. An exchange of knowledge takes place and networks are formed.

Experience Exchange rounds can be set-up on different topics, e.g. Development of mechatronic systems, Production optimization, Quality control, and many more. Depending on the topic researchers, product developers, production engineers or sales representatives shall participate.

5. Availability, accessibility of the technique and/or tool

The specific experience exchange circle on "Development of mechatronic systems" takes place 4 times a year and the invitation and registration procedure is done via the homepage of the Mechatronics Cluster (MC).

6. Pre-requisite/s of the application

There is no special requirement, except a conference room where the company representatives meet.

7. Cost-estimation

The cost is €150 per meeting and participant if the company is an MC-member, and 300€ for non-members.
As the tender is published on the MC homepage, every SME has the possibility to participate. The topics that are discussed are published, but the details are confidential within the circle.

8. Novelties, benefits and added value

Mandatory to select by one of the two options + affirmative or - negative/no effect!		+	-
	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment		-
	Product performance and its assessment	+	
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other: Exchange know-how and experiences, Networking with companies, intermediaries, R&D institutions	+	

9. Lessons learned from the tool/technique

- Cultivating of contacts with customers, clients and other business partners
- Enable collaborations to increase business/technology innovation of cluster-partner-companies
- Foster Technology transfer between cluster-partner-companies and/or R&D institutions
- Strengthen the economical competiveness of the region (Upper Austria)
- Identify potential partners for future cooperation projects
- Establish contacts for long-term business relationships
- Exchange know-how

2) FRISBEE TOOL

ID number of the tool/technique	3.2.1.2.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x						

Collected by: CCIS-CAFE, PTP

1. Specific need or problem being addressed by the tool/technique

Fresh foods demand good methods to keep food products at an acceptable low temperature all through the production line, transport and storage. Storage temperature is important in all stages of the products shelf life, and storage by producer, the retailer and the consumer. The market opinion is still that fresh foods are better than frozen foods. Thus, the demand for keeping the food fresh is increasing, and the requirement for keeping the right temperatures are essential. It is therefore important to measure and show that superchilled products with a low content of ice do have the same quality characteristics as fresh products. Therefore it is important to develop new tools, concepts and solutions for improving refrigeration technologies along the European food cold chain.

2. Name of the technique and/or tool

The FRISBEE tool.

3. Additional information if it is available

Website:
http://frisbeetool.eu/FrisbeeTool/about.html

Publication:
Gwanpua, S., Verboven, P., Leducq, D., Brown, T., Verlinden, B., Bekele, E., Aregawi, W., Evans, J., Foster, A., Duret, S., Hoang, H., van der Sluis, S., Wissink, E., Hendriksen, L., Taoukis, P., Gogou, E., Stahl, V., El Jabri, M., Lepage, J., Claussen, I., Indergård, E., Nicolai, B., Alvarez, G., Geeraerd, A. (2015). The FRISBEE tool, a software for optimising the trade-off between food quality, energy use, and global warming impact of cold chains. Journal of Food Engineering, 148, 2-12. doi:10.1016/j.jfoodeng.2014.06.021.

4. Short description of the technique and/or tool

The FRISBEE tool is software for assessing cold chains with respect to quality of products, energy use and the CO2 emission (environmental) impact of the refrigeration technologies involved in the cold chain. It contains validated kinetic

models that can predict how the quality and safety evolve along the cold chain as a function of temperature and duration. Six main product categories have been considered: fruits, ready to eat meal, meat, fish, vegetable and milk products.
The energy required for food refrigeration accounts for 8 % of electric power and 2.5 % of carbon dioxide emissions worldwide. The efficiency of food refrigeration has a safety, economic and environmental impact that affects not only consumers, but also the refrigeration industry as a whole. The EU-funded FRISBEE (Food refrigeration innovations for safety, consumer benefit, environmental impact and energy optimization along cold chain in Europe) project strove to improve refrigeration and the cold chain overall, working with a total of 26 partners across 12 EU Member States.
Specifically it is aimed to enhance food quality, consumer confidence and the competitiveness of European industries, in addition to reducing energy consumption for environmental sustainability. The project team developed new refrigeration models that took account of energy consumption, food quality degradation, high-tech innovations and disruptive technologies.
New technologies developed include the design for a domestic magnetic refrigerator and the characterization of phase change materials (PCMs) used in food packaging. Nanoencapsulation of PCMs was explored, confirming its positive impact on energy reduction.
A study was also conducted on the use of nanoparticles in refrigeration at low temperatures, looking at its potential benefits and technical and safety implications. Other advances include a simulation tool to predict ice formation during superchilling, a model for ice crystals, tests on real cold chains and new software to study refrigeration.
The results of this research were disseminated through the project website, journal publications and newsletters. With a better overview of European refrigeration needs and the emergence of new technologies, the results will support the entire European food industry, economy and environment as well as consumers worldwide.

5. Availability, accessibility of the technique and/or tool

The FRISBEE toll can be downloaded on this link:
http://frisbeetool.eu/FrisbeeTool/download.html

Six main product categories have been considered: fruits, ready to eat meal, meat, fish, vegetable and milk products.

6. Pre-requisite/s of the application

The FRISBEE tool is developed within the MatLab environment (The MathWorks, Inc., Natick, MA, USA). From the MatLab program a Windows standalone executable has been compiled which is what is being distributed to the end users. As a result you can use the FRISBEE tool without having MatLab installed on your machine. The FRISBEE tool has been compiled to suit 32 and 64 bit Windows based systems.
To be able to run the FRISBEE tool, you must first install the MCRInstaller.

7. Cost-estimation

The FRISBEE Tool is freely available for download by any interested party upon acceptance of this license agreement. The FRISBEE Tool can only be used for simulating and optimizing the sustainability indicators (namely, quality and safety, energy use and global warming potential) associated with refrigeration technologies in the agri-food cold chain for the food products included in this version.

8. Novelties, benefits and added value

Mandatory to select by one of the two options + affirmative or - negative/no effect!		+	-
	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment		-
	Product performance and its assessment		-
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other:		

9. Lessons learned from the tool/technique

The FRISBEE tool allows the end user to select a specific food product and to define a custom cold chain. The user can choose default settings or can define the settings of a specific cold chain to the lowest level of detail.

To achieve its aims, FRISBEE compiled new databases of technologies and food product temperatures. It developed quality, energy and environmental assessment tools to develop and evaluate novel and emerging refrigeration technologies for the European food industry. Work also involved assessing the current cold chain and consumer expectations within Europe, as well as conducting a survey on the needs of refrigeration operators.

3) INNOVATION VOUCHER

ID number of the tool/technique	3.2.1.3.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x			x				x

Collected by: BIZ-UP

1. **Specific need or problem being addressed by the tool/technique**

The knowledge and technology transfer is essential for the economic development of any region. That is the reason why it is important to shift available knowledge into concrete business relevant ideas. Furthermore, the constant interaction between universities and companies ensures a high level of knowledge within the companies. Besides technical product and process innovation it is also necessary to focus on economic knowledge, the exploitation of new sales opportunities, design development as well as innovative organizational models. To foster this approach innovation vouchers are granted.

2. **Name of the technique and/or tool**

Innovation Voucher

3. **Additional information if it is available**

https://www.ffg.at/en/innovation-voucher

4. **Short description of the technique and/or tool**

The main aim of the innovation vouchers is to foster close cooperation between R&D institutions and SMEs.
An innovation voucher is a tool by which funding institution, like FFG in Austria, supports cooperation between companies and research organizations. With the help of one-off grants up to certain the amount of money (e.g. in Austria appx. 5.000 Euro) it dissolves the boundaries between the corporate and academic environments and increases the competitiveness of the whole region.
A voucher can be used to buy new and not widely used knowledge which can help a company move forward. Usually an innovation voucher can be used by a company for: (1) development of a product, process or service; (2) testing and measuring, feasibility studies; (3) access to research facilities; (4) designing prototypes, product design; (5)

analysis of suitability of used materials; (6) technology audit; (7) optimization of the operational processes in a company.
Innovation vouchers can only be applied by small or medium enterprises (SME).

5. Availability, accessibility of the technique and/or tool

To access the system you have to register. After registering, you can write applications via the account. Any SME can apply for an innovation voucher, independent of their business purpose.
Innovation vouchers are not only available in Austria, but also in other Central European countries, e.g. Poland.

6. Pre-requisite/s of the application

Prior to the application the SME must choose an R&D institution (university, university for applied sciences or privately held R&D institution). The R&D institution must offer a quote, which has to be included in the application form.

7. Cost-estimation

The innovation voucher is available for any Austrian SME. There are two different vouchers:

- Innovation Voucher: 5.000€ with 100% funding (max. once per year)
- Innovation Voucher Plus: 12.500€ with 80% funding (only applicable as follow up of the 5.000€ Innovation voucher)

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management		-
	Regulations compliance and its assessment		-
	Product performance and its assessment	+	
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other: foster cooperation between SMEs and R&D, enhance innovativeness of SMEs	+	

9. Lessons learned from the tool/technique

The innovation vouchers make it easier for small and medium-sized companies to overcome inhibition thresholds regarding cooperations with research institutions.
Additionally, for larger projects, Upper Austria offers funding programs like easy2research and easy2market.

4) IN-PACK ATMOSPHERIC COLD PLASMA (ACP)

ID number of the tool/technique	3.2.1.4.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x		x	x	x		

Collected by: CCIS-CAFE, PTP

1. Specific need or problem being addressed by the tool/technique

Chlorine is one of the most effective sanitisers and its use is widespread in the fresh-cut industry. Despite strict safety & hygiene standards during processing, outbreaks of foodborne illness associated with ready-to-eat fruit and vegetables exist globally. New risks are often encountered because of changing characteristics of relevant microorganisms and the environment. Increasing the safety of these products is of paramount importance for protecting consumers, especially in view of the growth in the consumption of packaged fresh-cut produce.

2. Name of the technique and/or tool

In-pack atmospheric cold plasma (ACP)

3. Additional information if it is available

Website:
http://cordis.europa.eu/result/rcn/168303_en.html

Publications:
CHARACTERIZATION OF A NOVEL ATMOSPHERIC AIR COLD PLASMA SYSTEM FOR TREATMENT OF PACKAGED BIOMATERIALS
Misra, N. N.; Ziuzina, D.; Cullen, P. J.; Keener, K. M. (2013)
Projects: EC | SAFE-BAG (285820)

Cold Plasma Inactivation of Bacterial Biofilms and Reduction of Quorum Sensing Regulated Virulence Factors.
Dana Ziuzina; Daniela Boehm; Sonal Patil; Cullen, P. J.; Paula Bourke
Projects: EC | SAFE-BAG (285820)

Atmospheric Cold Plasma Inactivation of Escherichia Coli in Liquid Media Inside a Sealed Package
Ziuzina, Dana; Patil, Sonal; Bourke, Paula; keener, Kevin; Cullen, Patrick (2013)
Projects: EC | SAFE-BAG (285820)
Bacterial Inactivation by High Voltage Atmospheric Cold Plasma: Influence of Process Parameters and Effects on Cell Leakage and DNA
Han, Lu; Patil, Sonal; Keener, Kevin M; Cullen, Patrick; Bourke, Paula (2014)

Projects: EC | SAFE-BAG (285820)

Applications of cold plasma technology in food packaging
Pankaj, Shashi; Bueno-ferrer, C.; Misra, N; Milosavljević, V.; O'Donnell, C. P.; Bourke, Paula; keener, Kevin; Cullen, Patrick (2014)
Projects: EC | SAFE-BAG (285820)

In-package atmospheric pressure cold plasma treatment of strawberries
Misra, N. N.; Patil, Sonal; Moiseev, Tamara; Bourke, Paula; Mosnier, J. P.; Keener, K. M.; Cullen, P. J. (2014)
Projects: EC | SAFE-BAG (285820)

4. **Short description of the technique and/or tool**

Atmospheric cold plasma technology involves sending a high-voltage current through a food package to ionize the gas contained within. This ionized gas (or plasma) has an antimicrobial effect, without affecting the nutritional characteristics of the food.
Scientists found that the post-treatment storage time, the voltage level and the type of exposure (direct or indirect) changes the efficacy of the treatment. They saw that higher oxygen concentrations resulted in greater ozone production, the reactive gas responsible for neutralizing the bacteria.
Researchers found that nitrogen oxide levels (a second reactive gas) were also linked to effective treatment. They showed that in all cases increased treatment time led to fewer pathogens.
The SAFEBAG project has developed a pre-competitive prototype of a novel continuous in-pack decontamination system for fresh-cut produce, based on atmospheric cold plasma technology. SAFEBAG is a dry, non-thermal and chemical-free washing technology, compatible with online production and MAP packaging, which leaves no hazardous residues in the treated produce. The developers of technology have been committed to making this system affordable, robust and easy to maintain.
By having access to a technology such as SAFEBAG, fresh-cut fruit and vegetable suppliers will be equipped to provide products that deliver on safety, taste and freshness. This will result in an increased confidence in ready-to fresh-produce by the consumers, which will in turn impact on the competitiveness of hundreds of European fresh-cut processing SMEs.

5. **Availability, accessibility of the technique and/or tool**

Scientists tested the treatment on bags containing strawberries, cherry tomatoes and spinach, using Escherichia coli and Salmonella as the test bacteria. They found that strawberries and cherry tomatoes were not adversely affected, but spinach wilted regardless of treatment mode.
Non-thermal plasma has been applied in the food industry including decontamination of raw agricultural products (Golden Delicious apple, lettuce, almond, mangoes, and melon), egg surface and real food system (cooked meat, cheese)

6. Pre-requisite/s of the application

The primary modes of action are due to UV light and reactive chemical products of the cold plasma ionization process. There are various ways to supply the necessary energy for plasma generation to a neutral gas as shown in the figure below. One possibility is to supply thermal energy, for example in flames, adiabatic compression of the gas is also capable of gas heating up to the point of plasma generation or via energetic beams that moderate in a gas volume.

7. Cost-estimation

Low running cost (cost of natural gases and electricity).

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment		-
	Product performance and its assessment	+	
	Information for users	+	
	User satisfaction and its assessment	+	
	User's feedback and reaction		-
	Other:		

9. Lessons learned from the tool/technique

This technique became a subject of high interest for a wide variety of technologies including the food industry. The atmospheric cold plasma is proposed for decontamination of fruits and vegetables, especially, without changes in sensory attributes.
Advantages:

- Novel, ultra-fast sterilization/preservation process (sterilization takes only few minutes)
- Surface treatment process doesn't affect nutrients and vitamins within the food
- Process operates at ambient temperatures (ideal for thermo labile products)
- Depending on the plasma type, it is possible to inactivate all types of pathogens

Environmentally friendly (uses natural gases including nitrogen, argon, air, hydrogen and oxygen)

5) KNOWLEDGE TRANSFER WITHIN INDUSTRIAL RESEARCH LABORATORIES, INNOVATION CENTRES, TECHNOPOLES AND SMES, IN PARTICULAR RELATED TO THE DEVELOPMENT OF SYNERGIES 'WITH AND FOR' MECHATRONICS COMPANIES, TOWARDS INDUSTRY 4.0.

ID number of the tool/technique	3.2.1.5.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x		x				x

Collected by: CAN-ER

1. Specific need or problem being addressed by the tool/technique

Facilitate the access of micro and small businesses to the research community (laboratories, research centers, universities), in particular referring to innovation in the field of **mechatronics**. Knowledge transfer between companies and research representatives will skip "language" barriers and increase networking opportunities, in order to enable new technological or commercial partnerships. Within CNA ER system, *CNA Innovazione* is the accredited Center for the technological transfer process.

2. Name of the technique and/or tool

KNOWLEDGE TRANSFER within Industrial Research Laboratories, Innovation Centres, Technopoles and SMEs, in particular related to the development of synergies '*with and for*' mechatronics companies, towards INDUSTRY 4.0.

3. Additional information if it is available

www.cnainnovazione.net
http://www.retealtatecnologia.it/en

4. Short description of the technique and/or tool

Nature and intended use of the tool: Facilitate and promote the matching between smes and research representatives
What activities the tool is intended to assist: Identification of the company's need, identification of the most coherent research center/institute, matching events support.
Scope/area of the application: For sure where innovative companies exist. research centers could have cross-regional matchings.
Target users/segments: innovative companies, start-ups
The Emilia Romagna high ttechnology network with its industrial research laboratories and innovation centres located in the technopoles of the territory provides expertise, tools and resources for the development of enterprises. CNA is

the facilitator in the knowledge transfer process within industrial research laboratories, innovation centres, technopoles and SMEs.
CNA signed an agreement with the national research council (CNR), the largest public research institution in Italy, the only one under the research ministry performing multidisciplinary activities. under this agreement, CNA ER is implementing knowledge transfer local initiatives to favour potential links towards new technological/commercial partnerships able to give an answer to the specific need of the company, through a bottom-up approach.

5. Availability, accessibility of the technique and/or tool

The methodology implemented by cna could be transferred to the interested pps.

6. Pre-requisite/s of the application

Companies should be “innovative”; budget to be allocated for initiaves; on-going research and innovation projects.

7. Cost-estimation

N.A. (budget to be allocated for initiaves; on-going research and innovation projects, dedicated staff costs).

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality assessment	+	
	Improving risk assessment	+	
	Regulations compliance assessment		-
	Product performance assessment	+	
	User information assessment		-
	User satisfaction assessment		-
	User reaction assessment		-
	Other: Finding effective partnering opportunities	+	

9. Lessons learned from the tool/technique

The lesson learned corresponds to the adopted approach: this technology transfer format aimes at implementing a bottom-up approach (company towards research), to be the more effective as possible in the short term, avoiding the risk to present an overview of the research offer without focusing on the specific need.

6) NEW INNOVATIVE TECHNOLOGICAL EQUIPMENT TO ENSURE FOOD PRODUCTION AND PACKAGING OF FINISHED PRODUCTS.

ID number of the tool/technique	3.2.1.6.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x		x				

Collected by: SCCI

1. Specific need or problem being addressed by the tool/technique

The main need of most food related SMEs is to improve competitiveness by purchasing of innovative technologies. They want to be successful and beat their competitors in the field of food safety, quality and labeling of their products on the Slovak market as well as in international competition. New technologies can help them to fulfill their stated objectives, for example improving quality of their products or increasing production.

2. Name of the technique and/or tool

New innovative technological equipment to ensure food production and packaging of finished products.

3. Additional information if it is available

More detailed description of new innovative technologies are available:
http://www.dru.sk/nakup-inovativnych-technologickych-zariadeni-v-dru-as-zvolen

4. Short description of the technique and/or tool

The innovative machine technology replaced the original existing equipment, that have been extensively technically and morally impaired. New technologies provide increasing economic efficiency savings of employees, energy also ensure increased quality parameters of actual production including packaging. Output range of products / finished products preserved pastry / of the given technology is retained unchanged. The products are delivered to business entities with the aim to sale to the final consumer.

5. Availability, accessibility of the technique and/or tool

You can find all needed information about the technologies on web page of the company. There is also detailed description of technologies used in the production before and after new technologies were implemented.

6. Pre-requisite/s of the application

The use of these innovative technologies is involved in the process of food production and packaging of finished products.

7. Cost-estimation

These technologies are manufactured by highly specialized firms specifically for the needs of DRU. Technologies that company DRU owns are not free for users and they are not available for general public.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment		-
	Product performance and its assessment	+	
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify:		

9. Lessons learned from the tool/technique

Experiences of the company with the preparation and implementation of the technologies are mostly positive. Company evaluates process of introduction of innovative technologies as the fulfillment of objectives and expectations, that were planned and designed in the application documentation for non-repayable grants.

DRU Company based in Zvolen was founded in 1999 as a result of the corporate transformation of the Co-operative COOP VYROBA into a joint stock company. However, the tradition of its products goes forty years back. DRU with its 130 employees and annual production of cca 6.65 million EUR ranks among medium-sized

companies of the Slovak market. At the same time it is a member of the Slovak Association of Producers of Confectionery, Coffee-Related Products and Pastry.
Products of DRU company are highly recommendable for their high quality, attractive packaging and exquisite taste.

Location of the project: Strážska cesta 8700/6, 960 01 Zvolen, Slovakia

Name of the project: Purchase of innovative technological equipment in the company DRU a.s. Zvolen, Slovakia

Project description: Company DRU a.s. Zvolen is a producer of salted and sweet pastries. This project is based on the strategic plan DRU a.s. Zvolen and is focused on the acquisition of seven new innovative technology facilities, which are crucial for the company in terms of production efficiency, volume and quality of existing products. As part of the project will also be developed technological conditions for the development and production of new innovative product types.

Duration of the project: 13.2.2014 – 30.09.2014

Amount of granted subsidy for the project: 266 833.80 €

7) POWERKURE ™ - COMPENSATION DEVICE TO STABILIZE ELECTRIC CURRENT SUPPLY AND OPTIMIZE THE DISTRIBUTION ACCORDING TO PROCESSES NEEDS

ID number of the tool/technique	3.2.1.7.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x		x				x

Collected by: PTP

1. Specific need or problem being addressed by the tool/technique

Companies in some countries have difficulties in energy supply (or issues with quality) and that is something that endangers their efforts to control the quality in processes as well as efficiency. Usually this refers to electricity and depending on national/regional distribution systems, savings after optimization are possible. The Pomurske mlekarne in Murska Sobota/Slovenia (diary producer) had some oscillations in electric power supply (peaks and downs, which caused issues of malfunction and higher energy costs, so they decided to test and later introduce concrete PowerKure ™ installation, to optimize the supply. People were trained how to use this real hardware and software tool.

2. Name of the technique and/or tool

Powerkure ™ - compensation device to stabilize electric current supply and optimize the distribution according to processes needs (learning algorithms) and upon analytics of harmonics, the quality can be improved and process faults causing bottlenecks and quality drops minimized, due to optimal working power and machinery not stopping.

3. Additional information if it is available

http://www.powerkure.com

4. Short description of the technique and/or tool

The tool helps to understand the nature of the production process demands and characteristics, specifics in energy supply and effectiveness of the paid electricity to distributing companies. Concretely that means Voltage and Current balancing, Mitigates the In-Rush currents, stabilizes Over-voltage & Under voltage, minimizes Voltage flickering, provides swell & dag mitigations, transient suppression, gives Impulse and spike protection, filtrates broadband harmonics, protects against Brownout, provides momentary supply in case of interruption.
All in all it is about the combination of the software and hardware providing production units to optimize processes (mechanics) and assuring cost efficiency through savings.

Applications are possible in all industrial sectors, biggest savings are possible very big consumers are involved (bakery, drying facilities, diary plants, meat industry,…) and were the distribution network is of poor quality – savings in Europe are lower in comparison to USA or other parts of the world.
Production engineers are primarily targeted, since it is a combination of compensating device /hardware and software for analytics. Solution is interesting for clients as there are in some countries available financing models, where costs (either leasing rate or loan) are paid from savings.

5. Availability, accessibility of the technique and/or tool

Provider: Powerkure Solutions Ltd, Canada
As this tool became a ™ product, though developed from some Canadian private project, it is now a market good and a network of agents are actually providing these technical solutions worldwide on commercial base. Through some financing schemes it was possible to do some pilot testing in the past where companies got free testing and analysis of the business processes, and later some decided to go in commercial deal with the provider of this service

6. Pre-requisite/s of the application

Simply, the tool is meant for production units with higher consumption of electricity, where in case of Slovenia it showed reasonable to test/introduce this if monthly costs for electricity are/were above 15.000€. It does not matter the type of production, however it gives significantly better results if the production unit has its own power grid transformer.

7. Cost-estimation

The tool is basically tailor made so it is difficult to say the range but if minimum of 3-6% of the monthly cost can be saved and device should be paid out in 7-8 years, one can make an estimation of own cost. Savings are even bigger where the poorer distributions (grids) are of poorer quality.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment		-
	Product performance and its assessment		-
	Information for users	+	
	User satisfaction and its assessment		-
	User's feedback and reaction	+	
	Other:		

9. **Lessons learned from the tool/technique**

Once a project made in excel and wish to develop concrete solution led to development of real tool (once just an analysis of process control for energy loses) now became concrete assisting tool for analysis and in the back ground also technical/hardware solution. Among strengths we see its application in various sectors, business model of repaying through savings on monthly base (were agreements with banks are made), weaknesses, it is tailor made and difficult to say exactly the savings before measurements are made and by that real ROI, but it definitely helps companies/businesses to calculate their efficiency or improvement, getting "greener", optimization of the machinery leads to less stops and time of new calibration of precise machinery or less of heating up after stops…less bottlenecks, better performance in general.

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8) SURVEY FORMS

ID number of the tool/technique	3.2.1.8.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
				x		x	x	

Collected by: BIZ-UP

1. **Specific need or problem being addressed by the tool/technique**

A survey can be used to assess the needs of the food related SMEs.
Of course any other topic can also be subject of a survey.

2. **Name of the technique and/or tool**

Survey forms

3. **Additional information if it is available**

https://zapier.com/learn/forms-surveys/design-analyze-survey/

4. **Short description of the technique and/or tool**

A survey is a list of questions aimed at extracting specific data from a target group to asses thoughts and opinions on a particular subject.
Surveys can be conducted as an online survey, mobile survey, paper survey, phone survey, or face-to-face survey.

Based on a survey as assessment tool of the needs of food related SMEs an intermediary like the Mechatronics Cluster can e.g. organize information and/or qualification and/or training events in order to increase the knowledge of SME's employees. This will help SMEs to deal with their business challenges and problems.

5. Availability, accessibility of the technique and/or tool

A survey can be carried out by all enterprises as well as private persons.
For carrying out a survey, a questionnaire on a specific topic has to be developed and can the be used in paper or electronic version. Paper surveys are usually carried out at events or sent to the participants by postal service. Online surveys can be accessed by anyone.

6. Pre-requisite/s of the application

For a paper survey one needs only paper. For the creation of a web-based survey freeware as well as licensed software tools can be used.

7. Cost-estimation

The participation in a survey is free.
The creation of an own survey can be either free of charge or cost some amount of money, depending on the software.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency		-
	Improving quality and its assessment		-
	Improving risk assessment and risk management		-
	Regulations compliance and its assessment		-
	Product performance and its assessment	+	
	Information for users		-
	User satisfaction and its assessment	+	
	User's feedback and reaction	+	
	Other:		

9. Lessons learned from the tool/technique

When creating a survey one has to keep in mind to focus on a specific goal, to survey the right target group, and to ask objective questions. To increase the number of participants reminders are necessary.

9) SYMPOSIUM WITH ACCOMPANYING SMALL TRADE FAIR

ID number of the tool/technique	3.2.1.9.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
					x	x	x	x

Collected by: BIZ-UP

1. Specific need or problem being addressed by the tool/technique

Symposia, workshops and conferences aim at transferring potential researched solutions to new applications and contribute to skills empowerment.
Trade fairs provide the ideal opportunity to present your company to a large general and specialized public and to interest them in your technology and doings.
Both can be used to show state-of-the-art technology and to get in touch with R&D institutions or other companies in an informal way. In addition to giving a talk or presenting at a booth, companies/clusters can get involved in open discussions/forums/special events, where they can present their point of view to a large audience in a more direct approach.

2. Name of the technique and/or tool

Symposium with accompanying small trade fair

3. Additional information if it is available

e.g. http://www.mechatronikforum.net/

4. Short description of the technique and/or tool

Symposia as well as trade fairs are an efficient way to target specific audiences and specialized persons. This can be other companies, R&D institutions, education facilities, the public sector, multipliers or stakeholders.
At these events, the lecturers as well as exhibitors present state-of-the-art technology and products. This can be done in a general way, or by aiming at a specific aspect that shall be in the focus of the event.
Attending participants can have a specific intention for attending, or are generally interested in the topic of the event. They can get to know the lecturers and exhibitors and directly get in touch with them. This allows sharing experience and know-how, as well as outlining possible cooperations.

5. Availability, accessibility of the technique and/or tool

Most symposia and trade fairs take place annually or biennially.
The tendering and registration procedure is usually done via the organizer's homepage.

6. Pre-requisite/s of the application

There are no special requirements for attendees.

7. Cost-estimation

The fee for attending such an event depend on the duration of the symposium / trade fair and are in the range of several hundred Euros.
The costs for exhibitors or sponsors start from around € 1.000 and can reach several ten thousand Euros.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency		-
	Improving quality and its assessment		-
	Improving risk assessment and risk management		-
	Regulations compliance and its assessment		-
	Product performance and its assessment		-
	Information for users	+	
	User satisfaction and its assessment	+	
	User's feedback and reaction	+	
	Other: Networking with companies, intermediaries, R&D institutions, Exchange know-how and experience	+	

9. Lessons learned from the tool/technique

- Be careful when planning parallel sessions (avoid that 90% of people participate one lecture while only 3 persons attending parallel lecture)
- Plan enough time for networking
- Involve participants in an active way, e.g. with workshop sessions, brokerage events

10) SUPPLY CHAIN MANAGEMENT ONLINE TOOL / ADINIS CLOUD SERVICE

ID number of the tool/technique	3.2.1.10.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x	x	x	x			

Collected by: KIGPSiO

1. Specific need or problem being addressed by the tool/technique

For every improvement, the material and information flow models of an organisation are essential to provide a common understanding for the inter-organisational Supply Chain. The transparency gained from the models provides the prerequisite to overcome the local optimum and optimise the complete Value Chain.ADINIS Cloud service, which is based on Best Practices developed by the Supply Chain Council, supports the development of Process Architectures for all Supply Chain partners using standard processes and KPI's

2. Name of the technique and/or tool

Supply Chain Management online tool / ADINIS Cloud service

3. Additional information if it is available

N/A

4. Short description ofthe technique and/or tool

ADINIS Cloud service, which is based on Best Practices developed by the Supply Chain Council, supports the development of Process Architectures for all Supply Chain partners using standard processes and KPI's. Individual adjustments to processes or indicators are mapped in the tool and can be published for all involved stakeholders.
Supply Chain partners have to synchronise their material and information flows by aligning their process interfaces in order to continuously enhance the efficiency of their business transactions. In ADINIS Cloud service, the related interface information is mapped and can be documented to define business critical Service Levels.
An important aspect of the new Supply Chain Configurations' design is the definition of dynamic KPI's. Their characteristics, such as metrics and frequency, can bedefined in ADINIS Cloud service. The tool provides functionality to evaluate the different levels of modelled processes and the respective level of KPI's. The indicators can be integrated with business solutions or databases and the information is updated and visualised within the tool.
In terms of time constraints and cost targets, ADINIS Cloud service offers a simulation component for the evaluation of different Supply Chain alternatives. Results can be compared with the use of graphical and tabular representations. Reports can be configured and easily generated using the Analysis component.

The Supply Chain Management Tool offers the following functionalities:

- Ability to create supply chain links (defining of processes and their individual components);
- Mapping of the goods flow within the chain (workflow);
- Different variants of goods flow;
- Supply Chain optimization;
- Traceability monitoring;
- Ability to define units, move units and connect units to each other.

5. Availability, accessibility of the technique and/or tool

Standard version available. Usually customizing services up to the specific situation is needed.
Online access possible. Also “stand alone” or “client server” version available.

6. Pre-requisite/s of the application

Standard version available. Usually customizing services up to the specific situation is needed.

7. Cost-estimation

Large differentiation between versions. Up to the customer needs.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users	+	
	User satisfaction and its assessment		-
	User’s feedback and reaction		-
	Other		

9. Lessons learned from the tool/technique

Wide possibilities of application in many different projects and approaches as presented tool supports optimization in many areas of companies and supply chain processes.

11) THE SORTING LINE WITH WATER UNLOADING USED FOR SORTING AND PACKING OF FRUITS

ID number of the tool/technique	3.2.1.11.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x		x	x				

Collected by: KIGPSiO

1. Specific need or problem being addressed by the tool/technique

The sorting and packing line significantly improves fruit preparation for trade. First and foremost, the line allows to widely sort fruits in terms of many market-relevant parameters.

2. Name of the technique and/or tool

The sorting line with water unloading used for sorting and packing of fruits.

3. Additional information if it is available

http://szugajew-agri.pl/
http://www.sorter.pl/
http://en.unitec-group.com/
http://www.informia.fr/

4. Short description ofthe technique and/or tool

The high efficiency sorting line with water unloading used for sorting and packing of fruits
The sorting line features:

- Automatic water unloading for apples;
- Electronic sorter for apples and pears;
- Sorting section;
- Packing section (cardboard boxes);
- Section for discharging the second class fruits;
- Section for discharging the full packages;
- Section for filling the box-pallets;
- Section for transportation of empty packages from mezzanine;
- The control box for sorting line with electromechanical equipment.

5. Availability, accessibility of the technique and/or tool

N/A

6. Pre-requisite/s of the application

N/A

7. Cost-estimation

N/A

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management		-
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other		

9. Lessons learned from the tool/technique

Purchasing of the sorting and packing line and its implementation fundamentally fixes fruit preparation for trade. First and foremost, the line allows to widely sort fruits in terms of many market-relevant parameters. Sorted fruits are perceived by consumers as homogeneous and are purchased more willingly. At the same time fruit packaging is practically taking place without any damages to the fruits. Fruits without "bruises" caused by manual packaging are willingly bought by consumers. Implementation of full sorting and packaging automation allows to reduce workload for fruit preparation for trade and thus to improve the economic efficiency of the process. This should

3.3. Food design

3.3.1. List of collected tools and techniques

The following tools and techniques were collected by the project partners in the area of food design:

3.3.2. Descriptions of collected tools and techniques

1) BUSINESS MODEL CANVAS FOR FOOD DESIGN (SYNERGIES BETWEEN FOOD AND ICT, DESIGN AND CULTURAL AND CREATIVE INDUSTRIES)

ID number of the tool/technique	3.3.1.1.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x		x				

Collected by: CNA-ER

1. **Specific need or problem being addressed by the tool/technique**

The specific problem concerns how to concretly help micro and small companies, not enough structured, to turn an idea into a viable project.

Specific needs:

- the challenge of integration between the different components of the supply chain and the lack of communication among the stakeholders involved
- the limited contacts between the manufacturing industries and the advanced technology providers
- low level of managerial skills:
- involvement of product and process designers, interaction designers, start-uppers
- low international projection
- the lack of digitalization of regional SMEs

2. **Name of the technique and/or tool**

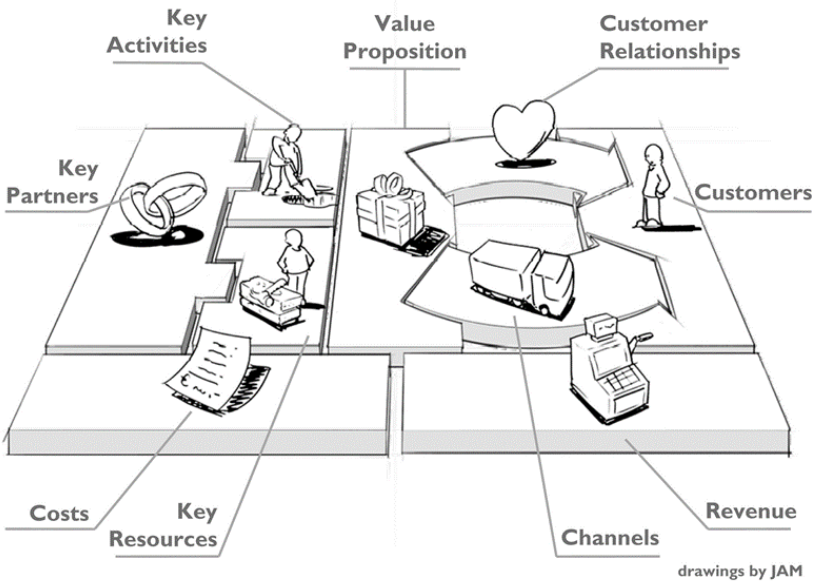
BUSINESS MODEL CANVAS for food design (synergies between food and ict, design and cultural and creative industries)

3. **Additional information if it is available**

„BUSINESS MODEL GENERATION“: a handbook for visionaries, game changers, and challengers (alexander osterwalder, yves pigneur)

4. **Short description of the technique and/or tool**

This technique is a strategic management and lean startup template for developing new or documenting existing business models. it is a visual chart with elements describing a firm's or product's value proposition, infrastructure, customers, and finances. it assists firms in aligning their activities by illustrating potential trade-offs. here below the tool:



In the framework of innovation and research collaboration and S3 implementation, in the Emilia Romagna region we are working on new forms, functions and applications for the craft products to provide the most extensive customization, in relation to the identity characteristics of the Made in Italy, to:

1. develop **innovative business models**, also with reference to new consumption models, to new distribution channels and new forms of customers relationship management;

2. improve the use of advanced technologies and skills for the **production of multi-platform contents** to stimulate the development of new solutions of usability of products/services;

3. favor the development of **new formats and innovative communication solutions** able to add to products and services a symbolic and identity, as well as relational and experiential value, apt to strengthen their competitive capacity in the reference markets;

4. increase the use of **participatory technologies** for the production of contents (co-design) with the objective to favor the customization and personalization of products/services;

5. favor **economies of scale** in the supply of products/services stimulating a larger diffusion of ICT tools and of design thinking and design management.

PRODUCTION PROCESS TO INVOLVE:
o Design thinking
o Design management
o Lean business model
o Graphic design and Content management
o Collaborative tools of fund raising/market promotion (crowdfunding)

BUSINESS MODEL – INPUT FOR NEW SOLUTIONS

o Crowdfunding and sharing economy platforms
o New consumption models
o New public typologies
o New collaboration modalities

5. **Availability, accessibility of the technique and/or tool**

Technique and tools are available and accessible as theory (manuals and web sites), but a facilitator/consultant needs to be involved for an effective use.

6. **Pre-requisite/s of the application**

You need entrepreneur or someone within the company management team available to work with the consultant; budget for action plan to be drafted; 2-7 working days for model/plan development.

7. **Cost-estimation**

It depends on the expert involved. in our experience it's about 800€/day.

8. **Novelties, benefits and added value**

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment		-
	Product performance and its assessment	+	
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other:		

9. **Lessons learned from the tool/technique**

This model enables to draft in a short period an action plan for micro and small companies.

2) DESIGN AND DEVELOPMENT PROCESS FOR FOOD-RELATED PRODUCTS - NON-FOOD SENSORY ANALYSIS

ID number of the tool/technique	3.3.1.2.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
	x			x	x	x	x	

Collected by: UNISEF

1. Specific need or problem being addressed by the tool/technique

The present development process of Food-related products is only occasionally organized as a correct and efficient procedure.
Most frequently the adoption of new materials / manufacturing techniques is the result of a "supplier push" innovation process. This is particularly true about food packaging: companies receive technical proposal by their (potential) suppliers and base their buying decisions on what they "feel" will be the impact on their consumers, trying to size it to a "reasonable" risk of success.
Any ring in the production chain takes care of the Standards and regulations about its very own field of operation. Interaction and coordination of the different contributions to the final product is very limited, if existing.
There is a widely diffused lack of habit and method in evaluating the perceptions end customers get from the final products they have to choose from.

2. Name of the technique and/or tool

Design and Development process for Food-related products. Non-food sensory analysis

3. Additional information if it is available

Food companies interviewed during this project, when asked about the process they currently adopt to design and develop new packaging solutions for their products, all report that there is a wide margin for improvement in planning and organizing their efforts.
Packaging is mostly not innovated by design. Innovation merely is the result of the choice a company makes among new materials/techniques proposed by its suppliers of packaging materials, on the basis of a more or less well founded opinion a company has of the needs/desires of its customers. Symmetrically, it appears that verification and validation of the resulting solutions are very rarely operated, neither on samples and prototypes during the design and development process or on the final product.
Thus, it seems that, while the process is push-oriented, there is not any methodically implemented tool to measure the real effects of these pushed solutions.
Packaging solutions for food and beverages might greatly improve the overall final result if they would be treated more as an integral part of the product they contain than as an unavoidable "appendix" to just protect and transport that very product.

4. Short description of the technique and/or tool

Any food-related product greatly affects the look-and-feel of the food it is related to. In this sense, food primary packaging really IS what the final customer physically sees and senses from the moment of choice to the moment of preparation / consumption.
Effective procedures must be enforced and reproducible data must be collected. All this information can serve as the proper basis to design effective packaging and to then verify the final result.
An effective procedure to design and develop packaging should envision a pull-oriented process, prescribing the early definition of the desired results (*brief*) in order to focus the following efforts towards that defined aim.
Sensory analysis can serve as the part of the process in charge of collecting data about user perceptions of the designed packaging solution.
Sensory evaluation standards[18] guide the assessment of consumer products by the use of the human senses (sight, smell, taste, touch, and hearing). The discipline of sensory analysis requires the use of a panel of human evaluators specifically trained to record their responses to the products under test. Statistical analysis is then employed to generate inferences and insights regarding the product. These sensory evaluation standards help developers and manufacturers in the evaluation of their goods to ensure product quality, consumer satisfaction, and marketing success.
The target users of the results of such analysis are market analysts, marketing managers, designers and production engineers, researchers and all those professionals that are to be involved in the development of a food-related product and its packaging solution.

5. Availability, accessibility of the technique and/or tool

A widely recognized base to establish correct design and development procedures is UN/EN 9001, sect. 7 *Product realization* and sect 8 ***Measurement, Analysis and Improvement.***

A Sensory analysis panel must be composed of 7-8 qualified panelists and is managed during the test session by a Panel Leader. A panelist becomes *qualified* after has successful completion of a mandatory 16-hour course.
Due to their strictly regulated operations, Sensory panels usually are supplied by Sensory analysis organization.

6. Prerequisite/s of the application

Prerequisite for implementation of a correct and effective Design and Development process is a written procedure, shared within the organization.
Prerequisites to operate a Sensory analysis panel are facilities, equipment and experience as regulated by UNI EN ISO 13299. Any good Sensory analysis organization has the required resources available at demand.

18 UNI EN ISO 13299:2016 Sensory analysis - Methodology - General guidance for establishing a sensory profile
ISO 13302:2003 Sensory analysis -- Methods for assessing modifications to the flavour of foodstuffs due to packaging

7. Cost-estimation

Every organization dealing with Product Design and Development should organize and document its own Design and Development procedure. UNI/EN/ISO 9001 is currently published and publicly available (see Tool n. 1) at a price in the range of €100.
The sensory analysis comparison of a product can be requested to a Sensory Analysis organization by anybody. The price of this service usually stays in the range of few thousand euros for each test, with a sizable variance according to type and dimension of product, quantity and recurrence of tests.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency		-
	Improving quality and its assessment	+	
	Improving risk assessment and risk management		-
	Regulations compliance and its assessment		-
	Product performance and its assessment	+	
	Information for users	+	
	User satisfaction and its assessment	+	
	User's feedback and reaction	+	
	Other Please specify:		

9. Lessons learned from the tool/technique

Proper Design and Development procedure are of common use in any organization certified under the ISO 9001 standard. Even if it is a substantial organizational effort for a company to fully implement the standard, payback in streamlined organization and quality control is tangible.
However, it is not necessary at all to implement the standard from scratch to the whole organization. More than 20 years of experience in companies worldwide demonstrates good results also when using the standard just as reference for the organization of a single department.
Sensory analysis tests have proved to provide reliable and repeatable data since many years. Historically Sensory tests have been initiated for application to food and beverage. However Sensory analysis has increasingly been applied to non-food products in the last 3 years and even if it is not of widespread use yet, results prove to be amazingly useful to the evaluation of the product performances as regarding human perceptions.

3) DESIGN FOR RECYCLING WEB PLATFORM DEDICATED TO THE GUIDELINES FOR DESIGNING MORE EASILY RECYCLABLE PACKAGING

ID number of the tool/technique	3.3.1.3.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x		x	x				x

Collected by: UNISEF

1. Specific need or problem being addressed by the tool/technique

Food packaging covers an important role in protecting from deterioration the food it contains. Data from World Health Organization (WHO) reveals that in recent years loss of food in developing countries due to damages related to transport and preservation failures has been in the range of 20% to 50%. In Europe, loss of food from the same reasons stays at 3%.
The EN/ISO body of Standards clearly identifies materials and procedures to be adopted for Food safety and hygiene. However, following these standards packaging has happened to be developed mostly on a single-use paradigm.
The increasing production of packaging-related waste has raised concerns in the European Community that since 1994 has stated goals for the good use of natural resources, protection of the environment and waste management. These goals are contained in Directive 94/62/CE, and then increased with Directive 2004/12/CE.
As it emerges also from the interviews data in D.T.1.2.2 *Food sector market trend analysis report*, food companies observe that an increasing share of consumers demonstrates a preference for more eco-friendly food packaging solutions.
Food producers, processing and distributing companies strives for new approaches to design more easily recyclable packaging.

2. Name of the technique and/or tool

"Design for recycling" web platform dedicated to the guidelines for designing more easily recyclable packaging.
"Linee guida per la facilitazione delle attività di riciclo degli imballaggi in plastica" (Italian version)

3. Additional information if it is available

www.conai.org/en/prevention/thinking-about-the-future/design-for-recycling/
www.progettarericiclo.com/docs/linee-guida-la-facilitazione-delle-attivita-di-riciclo-degli-imballaggi-plastica

4. Short description of the technique and/or tool

Design for recycling is the new web platform dedicated to the guidelines for designing more easily recyclable packaging. It is an action operated by CONAI, the Italian National Packaging Consortium.
CONAI is a private non-profit consortium joined by 1,000,000 Italian companies which produce or use packaging. It fosters an integrated nation-wide system based on the prevention, recovery and recycling of six packaging materials: steel, aluminum, paper, wood, plastic and glass.
The *Design for recycling guidelines* provide effective design directions originated by state-of-the-art information about the processes of selecting and recycling materials from products at end-of-life. They also integrate handy checklists to self-assess one's own level of understanding of the subject and to evaluate how much the product in development adheres to the guidelines.
The Design for recycling guidelines are targeted to designers involved in developing more recyclable packaging, together with professional and experts in the industry in charge of production, risk assessment, quality assessment.
CONAI's plan is to publish Guidelines for packagings made in plastic, steel, aluminum, paper, wood and glass. At the moment the available guidelines are those dedicated to the design of plastic packaging.

5. Availability, accessibility of the technique and/or tool

The first *Design for recycling guidelines* are very recent, having been published on 03 April 2017, and are available on line through CONAI's website at the address cited at par. 3.
The full-text in Italian is available also at the dedicated website www.progettarericiclo.com

6. Prerequisite/s of the application

Prerequisite to access the *Design for recycling guidelines* is any Internet-enabled device.

7. Cost-estimation

The *Design for recycling guidelines* are publicly available free of charge.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management		-
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other: demonstrates "green" attitude of product/manufacturer	+	

9. Lessons learned from the tool/technique

The tool is very recent and experience of its use is not available yet.
English (or other language) version has not been published as well.
Being this tool in its early introduction, it is a perfect chance to instantly start surfing on the front wave of the state-of-the-art.

4) ECOTROPHELIA COMPETITION

ID number of the tool/technique	3.3.1.4.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
		x	x	x				

Collected by: PTP

1. Specific need or problem being addressed by the tool/technique

The problem of SMEs (irrespectively of industrial sector) in their start-up phase is the lack of resources to satisfy the needs of the market and by that its smooth start. Beside financial means needed, either for investments in production or other costs to be covered, there is also a need of marketing activities; PR of the product/brand upon a business is based. To attract the attention and to get in touch with potential investors or bigger producers (investors in SMEs, or agent in distribution for smaller SME) various platforms and competitions are used, so when bigger players notice such entrepreneur, they have various approaches how to get involved and even how to transfer knowledge to such start-ups, also entering in their ownership structure, human resources policy, finances…to improve competences and skills of employees.

2. Name of the technique and/or tool

EcoTrophelia competition

3. Additional information if it is available

https://eu.ecotrophelia.org/ / https://twitter.com/ecotrophelia

4. Short description of the technique and/or tool

EcoTrophelia competition – a tool for collection of breakthrough innovative eco food products and solutions, financed through EU project platform and with national coordinators (CAFÉ is a coordinator for Slovenia).
EcoTrophelia competition is an EU financed project which in years became close to sustainable platform (still project funding is needed) and is oriented towards students with new eco-products innovations. Is a good tool to explore the market for new niche products, with stimulus for young researches to step out of academia and enter the world of entrepreneurship.
For years it has been known (and financed from an EU project), where multiple countries perform national contests choosing best ideas and sending best qualifiers to internationally known events for PR and possible commercialization. Two biannual fairs are used for the promotion, Anuga, Cologne in Germany and Paris, France.

The problem tool (competition) solves is a marketing leverage of potential start-ups in eco-food businesses, to attract the investors, to make a pre-market testing via various trainings and verifications by selection commission.
Limitations: currently limited to students only, but could be easily introduced for SMEs with breakthrough products that fit the criteria.

How the solution works and who are target users: the explanation could be given by one case from 2011 fitting the I-CON design topic:
A group of 4 students came to an idea to produce and innovative product, based on traditional domestic and eco raw materials, where innovative character is represented the bag with millet flakes in small packaging for easier dosage, and where this material used as "a bag" for flakes is made of bio-polymer xylan which is edible. As soon as the bag with millet flakes is covered with yoghurt, milk or fruit juice, this bag starts to dissolve and mixes with the flakes is safe to be eaten by consumer. Another issue at this packaging is to help user to calculate caloric values easier (dosage with standard Nutritional values).
The product and team was rewarded 3rd on Ecotrophelia Fair in Paris, France. This idea is still for sale (one of students can be contacted anytime for possible IPR)!

5. **Availability, accessibility of the technique and/or tool**

The competition is available at https://eu.ecotrophelia.org/ or any national partner who performs the 1st level competition and trainings.
Concrete solutions from participants also.

6. **Pre-requisite/s of the application**

Regarding competition as tool is appropriate for start-ups, or individual persons who intent to start the business, however in Slovenia PTP and CAFÉ made a regional test also for existing companies and ideas 8not only students) and out of another project financed the award for a winner. Naturally this "competition" was out of the Ecotrophelia "franchise" and it was used just for the testing of idea and tool/methodology to be used also among SMEs. We believe this could be a tool to be used also on transnational level if original initiators and their partners would be interested. Might be that another source of financing the competition should be found (maybe a project idea to start with).

7. **Cost-estimation**

Competition as a tool for promotion is free, however limited for targets and limited to success in 1st stage, before going international.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency		-
	Improving quality and its assessment		-
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify:		

9. Lessons learned from the tool/technique

Model of coaching competitors, competition and promotion itself – most of effects wanted is the one of scouting good market ideas among young creatives and help them to establish business models upon. Those are seen as strengths, however weakness is the current practice using only students as target group, but it has a potential to spread it to the segment of young SMEs /start-up (also as spin-outs/offs from current businesses.

5) EDIBLE, BIODEGRADABLE FOOD PACKAGING

ID number of the tool/technique	3.3.1.5.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
	x					x		

Collected by: PTP

1. Specific need or problem being addressed by the tool/technique

Vast quantities of waste in food industry are consequence of not used products in due time or its packing materials, which are made of environmentally unfriendly materials. Industry is following the development of 1) active packaging, 2) bio-based/edible materials, 3) intelligent packaging and 4) high-barrier materials. Bio-plastics deriving from animal or agro based proteins are widely used for testings. In bio-plastics development intensively goes toward edible packaging (still in trial but many concrete solutions exist). The problem is in mentality of producers, legislation (to certain extend) and most poof all petrol lobbies. New technologies of bio-plastics give a lot of hope in casein milk protein.

2. Name of the technique and/or tool

Edible, Biodegradable Food packaging

3. Additional information if it is available

https://www.youtube.com/watch?v=wt32GgQGTcl

4. Short description of the technique and/or tool

Proteins represent a class of biomacromolecules employed for edible films and coatings. They can have impressive barrier properties to oxygen, carbon dioxide, oil and fats. However, mechanical and water vapor barrier properties of films produced from these materials are inferior to those of synthetic origin.

Both agro- and animal-based proteins such as wheat gluten, corn zein, soy protein, whey proteins, casein, egg white, keratin, collagen, gelatin and myofibrillar proteins have been **used to prepare films and edible coatings by using the solvent casting process**. Very few publications have reported on the thermoplasticization and the extrusion of these proteins to produce films. The development of extrusion-based technologies with good reproducibility and control over the molecular architecture and spatial conformation of the natural macromolecule is among the main scientific and technological challenges to exploiting the use of protein-based films and coatings.

5. Availability, accessibility of the technique and/or tool

Various producers – in research phase. Edible films and coatings are other strategies widely investigated to meet consumer demands for more natural foods and environmental protection. They can be developed using agricultural commodities and/or wastes of industrial food production, creating additional values from biomass. **Edible coatings and films are not studied with the aim of substituting traditional packaging materials. Due to their distinctive properties, they can be used to provide additional functionalities to the food**. Food preservation can be therefore improved, and one may also reduce the cost and amount of traditional packaging used.

The biopolymer used to develop edible films and coatings is usually based on hydrocolloids, such as polysaccharides like cellulose, starch, alginates, chitosan, gums, pectins and proteins, from vegetable or animal origin. Their functional properties can be used to modify the barrier to gases and moisture and, in more advanced developments, serve as carriers of food additives and nutrients. Blends or composites with other additives and fillers are also developed to optimize the barrier properties or to control the release kinetics of substance.

The most important property these natural biopolymers must possess is the possibility of forming films with suitable mechanical and barrier properties. The chemical, molecular and supramolecular structures are, therefore, important features of natural biopolymers that permit design of the physicochemical properties of the films as well as the processing technology for the manufacture of the products.

6. Pre-requisite/s of the application

First of all, food assortment/products that can apply such foil without health hazardous bacteria to develop on the surface of the product are the criteria for potential use. Secondly no production line for automatic packing is introduced yet, so manual application is required. Also set ups (temperature regime) are needed for standard packaging machine for adaptation to casein foil application (very limited temperature span e.g. from -20°C to +40°C).

7. Cost-estimation

As the application is in research phase no such concrete calculations have been made; partly this is a problem, since the legislation has yet to be defined for commercial use. For the testing processes the technology and equipment is available, but not for industrial use yet. It has been however tested for smaller producers and in their own retail channels.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency		-
	Improving quality and its assessment	+	
	Improving risk assessment and risk management		-
	Regulations compliance and its assessment		-
	Product performance and its assessment		-
	Information for users		-
	User satisfaction and its assessment	+	
	User's feedback and reaction		-
	Other Please specify:		

9. Lessons learned from the tool/technique

Application (research only known to PTP) has a potential in agro-food industry, however its use is still in various stages of verification – technologically seen already exist solutions and products appropriate – dairy industry – cheeses and in home-made sweets – small producers) . Weakness: only big companies will be able to produce the foil in standard quality and market yet (also legislation) has to adapt to the offer. Technically products have shown characteristics adequate to similar plastic packaging made of petrol/oil.

6) EN EUROPEAN STANDARDS AND SPECIFICATIONS BY: CEN EUROPEAN COMMITTEE FOR STANDARDIZATION WEBSITE - WWW.CEN.EU

ID number of the tool/technique	3.3.1.6.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x	x	x				

Collected by: UNISEF

1. Specific need or problem being addressed by the tool/technique

A wise manufacturer developing a product to be placed on whichever market knows that the safest way to acquire a basic level of acceptance is to comply with established standards and specifications.
Where standards have not been established, markets frequently adopt standards from similar markets: i.e., standards established in a different country or in a contiguous field.
The established bodies of regulations mostly deal with safety and measurement of performances.
Any product placed on the European market must comply with the applicable European Union harmonization legislation at the moment of the placing on the market. Food-related products - i.e. dishware kitchenware and packaging - can be seen as "tools to allow food consumption" and thus must comply with any harmonized standard connected to food and food-processing. Most of these food-related standards deal with safety.
This is the very first tool designers, manufacturers, distributors can make reference to in order to firstly check and then propagate features and performances of their products/services/processes.

2. Name of the technique and/or tool

EN European Standards and Specifications
by: CEN European Committee for Standardization website - www.cen.eu

3. Additional information if it is available

CEN European Committee for Standardization website: www.cen.eu
As reported by its website, CEN has been officially recognized by the European Union and by the European Free Trade Association (EFTA) as being responsible for developing and defining voluntary standards at European level in relation to various kinds of products, materials, services and processes.
CEN, alongside CENELEC and ETSI, is recognized by the European Union as a European Standardization Organization. The legal framework for this cooperation is set out in EU Regulation 1025/2012, which entered into force on 1 January 2013.
CEN supports standardization activities in relation to a wide range of fields and sectors including: air and space, chemicals, construction, consumer products,

defense and security, energy, the environment, food and feed, health and safety, healthcare, ICT, machinery, materials, pressure equipment, services, smart living, transport and packaging.

4. Short description of the technique and/or tool

Standards are widely shared and published "consensus-built, repeatable way of doing something", released and published by CEN official Committees.
Manufacturers must be comfortable that the products they make (we use) are safe and reliable. They also must achieve compatibility when necessary, so that different appliances and pieces of equipment can connect and work together as intended.
Established standards can thus prove fundamental through the whole life of a product/service, from its early stages of development until end of production-and-assistance.
Standards and related Technical Specifications, Technical Reports, Guides are documents that specify the performances to be achieved and the complying methods and tools to be used to check those achievements.
Target users of Standards are all professionals who must gather information in order to assess safety and performance levels of a product/service to be introduced in the market. This comprehends primarily manufacturers, designers, production engineers and all professionals dealing with the development and manufacturing processes, as well as researchers, regulatory authorities and risk assessors involved in the field.

5. Availability, accessibility of the technique and/or tool

European (EN) Standards and Specifications are developed, published and maintained by the European Committee for Standardization.
"A published European Standard must be given the status of national standard in all member countries, who also have the obligation to withdraw any national standards that conflict with it."[19]
EN Standards and other Technical Documents have to be bought by users at the various CEN National Members. The most convenient way they can be ordered and paid for is through the online shop of the National Standardization Body of each member country. The documents can be obtained either in paper or electronic format.

6. Pre-requisite/s of the application

Pre-requisites of the application are:

- the availability of a normal Internet access to connect to the website of CEN or of one of CEN national members;
- product/service development and maintenance processes that encompass adequate use of established standards.

19 from "Publication of the EN" in "Developing a European Standard", retrieved from: Home/What we do/Standards development/How are standards developed https://www.cen.eu/work/ENdev/how/Pages/default.aspx

7. Cost-estimation

EN Standards and Specifications are publicly available, but it is always necessary to buy the document to obtain full access to its content. Most often prices are in the range of €20 to €200.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify:		

9. Lessons learned from the tool/technique

EN Standards prove to be quite effective on any activity they deal with: expert and operators of the field find a clear path to follow to perform their activity. Widespread adoption of recognized standards improves the average level of any field of operation, increasing the minimum level of performance that any product in the market must provide.
However, it can be noticed that present Standards, be them European EN as well from other recognized sources (i.e.: AAMI and FDA from USA, ISO worldwide) take into account only measurements of objects and processes. Most of the available Standards make operators just look at the product of their activity and consider only measurable physical data.
Notable exception is the selected body of Standards about Sensory Analysis, unique in setting the common ground for the evaluation of how a product is perceived - not "measured" - by the people it is intended for.

7) PRETO RYBA ŽILINA CHANGES LOGO, PACKAGE DESIGN AND HAS NEW MARKETING STRATEGY FOR ITS PRODUCT - COD IN MAYONNAISE

ID number of the tool/technique	3.3.1.7.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x	x	x	x	x	x	x	x	

Collected by: SCCI

1. Specific need or problem being addressed by the tool/technique

Company PRETO Ryba Žilina Ltd. belongs to one of the leading producers of fish and delicatessen products in Slovakia. It is the oldest continuously functioning fish processing company, which has been operating since 1924. Company is also an important distributor of frozen goods, such as:
- frozen fish
- frozen vegetables
- semi-finished goods
- meat products.

PRETO Ryba Žilina, the largest producer of cod in the mayonnaise in Slovakia, changed its logo lately. Along with the logo itself the change is undergoing in the daily production and packaging of traditional product - cod in mayonnaise.

In the production of this product company follows current trends in nutrition, such as the phase-out of artificial sweeteners and preservatives, use of healthy rapeseed oil to make own mayonnaise or replace gluten-free wheat starch with potato starch. Cod in the mayonnaise is made from the meat of Alaska cod, which is caught in a standard location between North America and Asia. Company has a wide offer of product from cod and other fishes and now is even available also gluten- free version of the product.

Traditional cod in mayonnaise is nowadays healthier, tastier and offered in new packaging. The company improved the recipe of products. The share of cod fish meat is higher up to 45-percent. Instead of saccharin as a synthetic ingredient natural sugar is used. Content of sugar does not exceed 3% and product is rich in omega 3 acids.

Cod in mayonnaise is made only in Slovakia in the highest quality. Average production of Cod Exkluziv is 100 tons per month. PRETO Ryba Žilina, Ltd. is holder of the BRC GLOBAL STANDARD for FOOD SAFETY certificate since 2011. The company is regularly certified by the Moody International Certification AS, which is prestigious certification company and by QSCert, which is Management systems certification body.

2. Name of the technique and/or tool

PRETO Ryba Žilina changes logo, package design and has new marketing strategy for its product - cod in mayonnaise.

3. Additional information

Official web page of the company: http://www.rybazilina.sk/en/

4. Short description of the technique and/or tool

According to a recent survey that company implemented, cod in mayonnaise is consumed up to 98% of inhabitants aged 15-65 years. The survey reveals that 74% of the Slovak population buys this salad at least once a month and nearly 20% of Slovaks enjoy this delicacy at least once a week. It is important to say that once this product was considered as traditional and cheap dish of students.
Typical way how Slovaks eat cod in mayonnaise is with traditional Slovak bread roll.

5. Availability, accessibility of the technique and/or tool

Available web page concerning information about specific product of the company – cod in mayonnaise : http://treskaslovenska.sk/
Available video (only in Slovak language) about this product that was awarded in the category "Idea" in competition Digital Pie:
https://www.youtube.com/watch?v=9vaYiX5TftA

6. Pre-requisite/s of the application

Company in cooperation with research agencies made a market survey. One of the fact that company found out was that customers perceive graphic goldfish as corporate and brand cognitive element of company PRETO Ryba Žilina. The survey also showed that customers are in the buying process and recognizing products from the competition an important distinguishing element of the word PRETO in our brand.

Based on the results of this survey company has undertaken a logo redesign of brand fish salads and fish products. Along with the graphical changes of the eyelid is a significant innovation and a crucible itself, which has a more modern shape and design and at the bottom it is for the first time used tangible emboss PRETO Ryba Žilina.

7. Cost-estimation

Prices of products of company PRETO Ryba Žilina are very favorable for consumers.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment	+	
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users	+	
	User satisfaction and its assessment	+	
	User's feedback and reaction	+	
	Other Please specify:		

9. Lessons learned from the tool/technique

Company tends to use the highest quality inputs in the production, because satisfied customer and product quality is their priority. Long – term tradition together with the newest technological equipment give customers the guarantee of the highest quality and excellent taste that company wants to offer. Products are nowadays packed into modern packages which help to increase the attractiveness for customers.

8) SEARCH STANDARDS" TOOL AT WEBSITE OF EUROPEAN COMMITTEE FOR STANDARDIZATION (CEN)

ID number of the tool/technique	3.3.1.8.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
		x	x	x				

Collected by: UNISEF

1. Specific need or problem being addressed by the tool/technique

Any product placed on the European market must comply with the applicable European Union harmonization legislation at the moment of the placing on the market. Food-related products - i.e. dishware kitchenware and packaging - can be seen as "tools to allow food consumption" and thus must comply with any harmonized standard connected to food and food-processing. The existing regulations and guidelines deal most entirely with safety, and span over three main branches:

- process safety
- materials safety
  mostly related to: material performances, food contamination
- user safety
  mostly related to: kids, labeling, food processors.

The number and variety of regulations and standards make the activity of locating, identifying and collecting those to comply with a daunting task.
This is the very first obstacle a designer, manufacturer, distributor must avoid to stumble upon.
The Committee itself and its National Members, one for each participating country, have activated common and local search tools to support professionals who must carry out these tasks.

2. Name of the technique and/or tool

"Search Standards" tool at website of European Committee for Standardization (CEN).

3. Additional information if it is available

CEN European Committee for Standardization website
www.cen.eu section "Search Standards"
https://standards.cen.eu/dyn/www/f?p=CENWEB:105::RESET::::
(as retrieved on 30 mar 2017)

4. Short description of the technique and/or tool

"Search Standards" is a CEN website function to search for official Standards released and published by its official Committees. Available standards and specifications form a vast realm where it is quite difficult to find your bearings, especially if the topic you're dealing with does not perfectly match with one of the committees. It is a generic tool, intended to serve as front-end of the site's web shop.
The scope of the application covers the ISO international standards, the European EN standards and the CEN national standards of each member country.
This sort of generic tools can be used to match your inquiry with any set of documents you must search through.
Searches can be conducted matching keywords with the publications' name, number or full text. If the user knows the necessary information, he/she can restrict the search to:

- specific committee
- type of deliverable
- Standard referenced to
- document's status (under draft, under approval, approved or published)
- international class of the standard.

Target users are the professional operators who are looking for officially released and published Standards and Specifications they must obtain in order to comply with the harmonized legislation for ANY product to be placed on a European market they are dealing with. These groups include companies' R&D departments, researchers, product developers, risk assessors, production engineers, quality assurance professionals, lab technicians, auditors and public authorities.

5. Availability, accessibility of the technique and/or tool

This tool is available accessing CEN European Committee for Standardization website. Similar tools are available on the websites of various CEN National Members. On ISO's (International Organization for Standardization) website there also is a similar tool, obviously limited to ISO standards and specifications.
In Italy, on-line screen-only (not hard-copy) consultation in full text of UNI/EN/ISO specifications was available until early 2016 through a network of 105 local points, but the service has since been discontinued.

6. Pre-requisite/s of the application

Pre-requisite of the application is the availability of a reasonably readable Internet-enabled device: personal computer, tablet, smartphone.

7. Cost-estimation

The Search tools themselves are publicly available and are free to use to anybody.
However the information they return is limited to the list of documents matching the inquiry; sometimes, there is a brief description of the content of the document.
It is always necessary to buy the Standard or Specification to obtain full access to its content. Most often the price of Standards ranges €20 to €200. It is frequently difficult to understand how each document in the list matches the specific need, and thus the buy-or-leave decision becomes errant.

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency		-
	Improving quality and its assessment		-
	Improving risk assessment and risk management	+	
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other Please specify:		

9. Lessons learned from the tool/technique

It is to be underlined that this Search Standard web service is a generic tool, mostly designed as a mere front-end of sites' web shop.
Searches, depending on a correct and sensible choice of terms to be searched for, frequently result erratic.
For instance:

- a query using "food" as search term and flagged for "approved" and "published" documents return a whopping 491 results;
- queries using "aluminum" (North American English) instead of "aluminium" (British English) return different results.

It must be also taken into account that quite frequently the formal terms found in legislation and standards do not match very well with the real-life language of the trades.
Hence, the user must adopt "creative" strategies to choose appropriate keywords to be used in free-form queries. So, professionals that are looking for documents in order to be guided toward an appropriate compliance of food-related products, have first to run multiple parallel queries and then carefully browse through the resulting hundreds of items manually selecting and matching them on the basis of document titles and short descriptions (when available). This process usually demonstrates to be frustrating and error-prone.
The experience is frequently negative. The user is overwhelmed and the outcomes are poor. Most important, an essential part of the value of sharing common Standards and Specifications is vanquished.

9) TECHNOLOGIES OF MULTI-MATERIAL PACKAGING PROCESSING

ID number of the tool/technique	3.3.1.9.

Novelties, benefits and added value								
a.	b.	c.	d.	e.	f.	g.	h.	i.
x			x	x				

Collected by: KIGPSiO

1. Specific need or problem being addressed by the tool/technique

Legal EU constraints significantly change the conditions for recycling of multi-material packaging and hazardous packaging. Therefore, it is justified to draw attention to the management of waste from the indicated types of packaging, including waste collection, processing potential and the ability to fulfill the recovery and recycling obligation. Particular attention should be paid to liquid food cartons, which are the dominant stream of multi-material packaging, as well as to packaging of hazardous substances other than plant protection products.
Thus, the design of the packaging is important in the context of food design.

2. Name of the technique and/or tool

Technologies of multi-material packaging processing

3. Additional information if it is available

N/A

4. Short description ofthe technique and/or tool

For the processing of multi-material packaging the following technologies have been identified:

1. PMP Recykl
    - 15 01 05 Multi-material packaging – containing only plastic (PET/PE), with a predominant plastic share (PE/AL, PP/AL, PET/AL), with a predominant paper and cardboard share (PE/PAPER/AL)/.
    - Mechanical process with usage of high pressure presses. Multi-material packaging are selected in proportions, washed, crushed and formed in plates for construction.
    - 2,5 – 3,0 thous. Mg

2. SARPI Dąbrowa Górnicza Sp. z o.o.
    - 15 01 05 multi-material packaging, 15 01 10* packaging containing or contaminated by hazardous substances
    - Incinerator for hazardous and non-hazardous waste

- High-temperature incineration installation (over 1100 °C) consisting of a rotary furnace, afterburning chamber, a boiler combined with a turbo-generator assembly and an exhaust gas treatment unit consisting of:
  - electrostatic filter;
  - bag filter with active carbon and calcium injection;
  - HCl scrubber;
  - SO2 scrubber;
  - carbon adsorber;
  - DeNOx catalyzer;
  - exhaust gas monitoring system.
- 15 01 05 – 14 thous. Mg/year, 15 01 10* - 5 thous. Mg/year

5. Availability, accessibility of the technique and/or tool

Very complex installation – project for several installations is required

6. Pre-requisite/s of the application

Very complex installation – project for several installations is required

7. Cost-estimation

N/A

8. Novelties, benefits and added value

		+	-
Mandatory to select by one of the two options + affirmative or - negative/no effect!	Improving cost efficiency	+	
	Improving quality and its assessment		-
	Improving risk assessment and risk management		-
	Regulations compliance and its assessment	+	
	Product performance and its assessment	+	
	Information for users		-
	User satisfaction and its assessment		-
	User's feedback and reaction		-
	Other		

9. Lessons learned from the tool/technique

Due to legal requirements for material recovery, the design of the packaging is important in the context of food design.

3.4. Cross reference tables for benefits

Table 1: Abbreviations of novelties, benefits and added values

a.	Improving cost efficiency
b.	Improving quality assessment
c.	Improving risk assessment and risk management
d.	Regulations compliance and its assessment
e.	Product performance and its assessment
f.	Information for users
g.	User satisfaction and its assessment
h.	User's feedback and reaction
i.	Other

Table 2: Color identification of relevant areas

	Food safety, quality and labelling
	Mechatronics
	Food design

Table 3: Cross-reference table of the collected tools and techniques

ID number of the tool/technique	Novelties, benefits and added value									
	a.	b.	c.	d.	e.	f.	g.	h.	i.	Other
3.1.1.1.	x	x	x							
3.1.1.2.	x	x	x	x	x					
3.1.1.3.	x	x	x	x	x					
3.1.1.4.			x	x	x	x	x		x	Food defense
3.1.1.5.		x	x	x	x	x	x			
3.1.1.6.		x	x	x					x	Food defense
3.1.1.7.	x	x	x							
3.1.1.8.	x	x	x							
3.1.1.9.	x		x	x						
3.1.1.10.		x		x	x	x				
3.1.1.11.	x	x	x	x	x	x	x			
3.1.1.12.		x	x	x		x				
3.1.1.13.		x	x	x		x				
3.1.1.14.	x	x	x							
3.1.1.15.					x	x	x			
3.1.1.16.				x		x	x			

ID number of the tool/technique	Novelties, benefits and added value									
	a.	b.	c.	d.	e.	f.	g.	h.	i.	Other
3.1.1.17.	x	x	x	x	x	x	x	x	x	Significant reduction of emission to environment, More efficient use of natural resources, Reduction of waste,Flexible adaptation of food businesses to rapidly changing environment.
3.1.1.18.	x	x	x	x	x					
3.1.1.19.		x	x	x		x	x	x		
3.1.1.20.		x	x	x	x	x				
3.1.1.21.		x	x	x		x				
3.1.1.22.		x	x	x		x				
3.1.1.23.	x		x	x						
3.1.1.24.	x	x	x	x	x	x	x	x	x	Protection of intellectual properties
3.1.1.25.	x		x	x						
3.1.1.26.	x	x	x	x	x					
3.1.1.27.	x	x	x	x	x					
3.1.1.28.	x	x	x	x	x	x				
3.1.1.29.		x	x	x	x	x	x	x		
3.1.1.30.	x	x	x	x	x					
3.1.1.31.	x	x	x		x	x				

ID number of the tool/technique	Novelties, benefits and added value									
	a.	b.	c.	d.	e.	f.	g.	h.	i.	Other
3.1.1.32.	x	x	x	x	x	x	x	x		
3.1.1.33.	x	x	x	x	x					
3.1.1.34.	x	x	x							
3.1.1.35.		x		x		x	x			
3.1.1.36.	x	x	x							
3.1.1.37.	x	x	x	x	x					
3.1.1.38.	x	x		x	x	x	x			
3.1.1.39.		x	x	x	x	x				
3.1.1.40.	x		x		x					
3.1.1.41.	x		x	x						
3.1.1.42.	x	x			x	x				
3.1.1.43.	x	x	x	x	x					
3.1.1.44.	x	x	x	x	x					
3.1.1.45.	x	x	x	x	x					
3.1.1.46.	x	x	x	x	x				x	Customer (trade) and US Export requirement
3.1.1.47.	x	x	x	x		x			x	Process performance
3.1.1.48.	x	x	x			x				
3.1.1.49.	x	x	x	x	x					
3.1.1.50.			x	x	x	x	x		x	Tracking & tracing, recall management

ID number of the tool/technique	Novelties, benefits and added value									
	a.	b.	c.	d.	e.	f.	g.	h.	i.	Other
3.2.1.1.	x	x	x		x				x	Exchange know-how and experiences, Networking with companies, intermediaries, R&D institutions
3.2.1.2.	x	x	x							
3.2.1.3.	x	x			x				x	Foster cooperation between SMEs and R&D, enhance innovativeness of SMEs
3.2.1.4.	x	x	x		x	x	x			
3.2.1.5.	x	x	x		x				x	Finding effective partnering opportunities
3.2.1.6.	x	x	x		x					
3.2.1.7.	x	x	x			x		x		
3.2.1.8.					x		x	x		
3.2.1.9.						x	x	x	x	Networking with companies, intermediaries, R&D institutions, Exchange know-how and experience
3.2.1.10.	x	x	x	x	x	x				
3.2.1.11.	x	x		x	x					

ID number of the tool/technique	Novelties, benefits and added value									
	a.	b.	c.	d.	e.	f.	g.	h.	i.	Other
3.3.1.1.	x	x	x		x					
3.3.1.2.		x			x	x	x	x		
3.3.1.3.	x	x		x	x				x	Demonstrates "green" attitude of product/manufacturer
3.3.1.4.			x	x	x					
3.3.1.5.		x					x			
3.3.1.6.	x	x	x	x	x					
3.3.1.7.	x	x	x	x	x	x	x	x		
3.3.1.8.			x	x	x					
3.3.1.9.	x			x	x					

4. Discussion (CBHU)

4.1. Types of tools and techniques

Several types of tools and techniques were collected by the partners, such as:

- Equipment, device
- Technology, method
- Guideline, recommendation
- ICT application,
- Network, expert group
- Training
- Database, inventory

Most of the tools and techniques fit to the type of guideline/recommendation (21 tools and techniques); technology/method (23 tools and techniques) or equipment/device (11 tools and techniques). In addition 6 network/expert groups, 4 databases/inventories, 3 ICT applications, and 2 trainings were collected (see Table 4).

Table 4: Types of tools and techniques

Cross-sector areas of the project	Types of tools and techniques						
	Equipment/ device	**Technology/ method**	**Guideline/ recommendation**	**ICT application**	**Network/ expert group**	**Training**	**Database/ inventory**
Food safety, quality and labelling	3.1.1.2[20] 3.1.1.3 3.1.1.30 3.1.1.31 3.1.1.33 3.1.1.37 3.1.1.43 3.1.1.44 3.1.1.50	3.1.1.4 3.1.1.6 3.1.1.7 3.1.1.10 3.1.1.14 3.1.1.18 3.1.1.26 3.1.1.27 3.1.1.32 3.1.1.34 3.1.1.40 3.1.1.42 3.1.1.45 3.1.1.46 3.1.1.49	3.1.1.5 3.1.1.9 3.1.1.12 3.1.1.13 3.1.1.15 3.1.1.20 3.1.1.21 3.1.1.22 3.1.1.23 3.1.1.24 3.1.1.25 3.1.1.28 3.1.1.29 3.1.1.36 3.1.1.38 3.1.1.39 3.1.1.41 3.1.1.48	3.1.1.19 3.1.1.47	3.1.1.1 3.1.1.8	3.1.1.11	3.1.1.16 3.1.1.17 3.1.1.35
Mechatronics	3.2.1.6 3.2.1.7	3.2.1.4. 3.2.1.8. 3.2.1.11.	3.2.1.10.	3.2.1.2	3.2.1.1 3.2.1.3 3.2.1.5	3.2.1.9	
Food design		3.3.1.1. 3.3.1.2 3.3.1.5 3.3.1.7 3.3.1.9.	3.3.1.3 3.3.1.6		3.3.1.4		3.3.1.8

[20] ID of tools and techniques

4.2. Novelties, benefits and added values of tools and techniques

The collected tools and techniques have several novelties, benefits and added values which can improve the competitiveness of the food businesses, especially the SMEs' performance and success on the market.

See Table 13 and Table 14.

1. Cost efficiency

68,00% of the tools and techniques improve the cost efficiency in the food safety, quality and labelling area, such as 3.1.1.32. IQ-Freshlabel/ Smart labelling; 3.1.1.38. PATHWAY-27 Industry Guidelines for developing products with health claims; 3.1.1.41. Simplified Industrial Risk Assessment, and 3.1.1.47. tsenso - temperature monitoring and last-mile disposition system for passive cooled delivery, etc.

81,82% of the tools and techniques improve the cost efficiency in the mechatronics area, such as 3.2.1.2. FRISBEE tool; 3.2.1.4. In-pack atmospheric cold plasma (ACP), and 3.2.1.7. Powerkure ™, etc.

55,56% of the tools and techniques in the food design area improve the cost efficiency. such as 3.3.1.1. Business model canvas, and 3.3.1.3. Design for recycling web platform.

ID of tools and techniques improving cost efficiency can be seen in Table 5.

Table 5: ID of tools and techniques improving cost efficiency

	Food safety, quality and labelling			Mechatronics	Food design
Improving cost efficiency	3.1.1.1. 3.1.1.2. 3.1.1.3. 3.1.1.7. 3.1.1.8. 3.1.1.9. 3.1.1.11. 3.1.1.14. 3.1.1.17. 3.1.1.18. 3.1.1.23. 3.1.1.24.	3.1.1.25. 3.1.1.26. 3.1.1.27. 3.1.1.28. 3.1.1.30. 3.1.1.31. 3.1.1.32. 3.1.1.33. 3.1.1.34. 3.1.1.36. 3.1.1.37. 3.1.1.38.	3.1.1.40. 3.1.1.41. 3.1.1.42. 3.1.1.43. 3.1.1.44. 3.1.1.45. 3.1.1.46. 3.1.1.47. 3.1.1.48. 3.1.1.49.	3.2.1.1. 3.2.1.2. 3.2.1.3. 3.2.1.4. 3.2.1.5. 3.2.1.6. 3.2.1.7. 3.2.1.10. 3.2.1.11.	3.3.1.1. 3.3.1.3. 3.3.1.6. 3.3.1.7. 3.3.1.9.

2. Quality assessment

82,00% of the tools and techniques improve the quality assessment in the food safety, quality and labelling area, such as 3.1.1.6. Biometric identification and access control; 3.1.1.22. Guide to the Management of Listeria in Food Processing, and 3.1.1.28. How to determine shelf life testing of food products, etc.

81,82% of the tools and techniques improve the quality assessment in the mechatronics area, such as 3.2.1.4. In-pack atmospheric cold plasma (ACP), and 3.2.1.6. New innovative technological equipment to ensure food production and packaging of finished products.

66,67% of the tools and techniques in the food design area improve the quality assessment, such as 3.3.1.5. Edible, Biodegradable Food packaging.

ID of tools and techniques improving quality assessment can be seen in Table 6.

Table 6: ID of tools and techniques improving quality assessment

	Food safety, quality and labelling			Mechatronics	Food design
Improving quality assessment	3.1.1.1. 3.1.1.2. 3.1.1.3. 3.1.1.5 3.1.1.6 3.1.1.7. 3.1.1.8. 3.1.1.10. 3.1.1.11. 3.1.1.12 3.1.1.13 3.1.1.14. 3.1.1.17. 3.1.1.18.	3.1.1.19 3.1.1.20 3.1.1.21 3.1.1.22 3.1.1.24. 3.1.1.26. 3.1.1.27. 3.1.1.28. 3.1.1.29 3.1.1.30. 3.1.1.31. 3.1.1.32. 3.1.1.33. 3.1.1.34.	3.1.1.35 3.1.1.36. 3.1.1.37. 3.1.1.38. 3.1.1.39 3.1.1.42. 3.1.1.43. 3.1.1.44. 3.1.1.45. 3.1.1.46. 3.1.1.47. 3.1.1.48. 3.1.1.49.	3.2.1.1. 3.2.1.2. 3.2.1.3. 3.2.1.4. 3.2.1.5. 3.2.1.6. 3.2.1.7. 3.2.1.10. 3.2.1.11.	3.3.1.1. 3.3.1.2. 3.3.1.3. 3.3.1.5. 3.3.1.6. 3.3.1.7.

3. Risk assessment and risk management

88,00% of the tools and techniques improve the risk assessment and risk management in the food safety, quality and labelling area, such as 3.1.1.39. Practical risk analysis, testing and action levels 2013 (Campden BRI UK), Allergen management guideline; 3.1.1.41. Simplified Industrial Risk Assessment; 3.1.1.46. Threat Assessment Critical Control Points (TACCP), and 3.1.1.48. Understanding High Risk, High Care, and Ambient High Care.

63,64% of the tools and techniques in the mechatronics area, such as 3.2.1.1. Experience exchange circle.

55,56% of the tools and techniques in the food design area improve the risk assessment and risk management, such as 3.3.1.1. Business model canvas.

ID of tools and techniques improving risk assessment and risk management can be seen in Table 6.

Table 7: ID of tools and techniques improving risk assessment and risk management

	Food safety, quality and labelling			Mechatronics	Food design
Improving risk assessment and risk management	3.1.1.1. 3.1.1.2. 3.1.1.3. 3.1.1.4. 3.1.1.5. 3.1.1.6. 3.1.1.7. 3.1.1.8. 3.1.1.9. 3.1.1.11. 3.1.1.12. 3.1.1.13. 3.1.1.14. 3.1.1.17. 3.1.1.18.	3.1.1.19. 3.1.1.20. 3.1.1.21. 3.1.1.22. 3.1.1.23. 3.1.1.24. 3.1.1.25. 3.1.1.26. 3.1.1.27. 3.1.1.28. 3.1.1.29. 3.1.1.30. 3.1.1.31. 3.1.1.32. 3.1.1.33.	3.1.1.34. 3.1.1.36. 3.1.1.37. 3.1.1.39. 3.1.1.40. 3.1.1.41. 3.1.1.43. 3.1.1.44. 3.1.1.45. 3.1.1.46. 3.1.1.47. 3.1.1.48. 3.1.1.49. 3.1.1.50.	3.2.1.1. 3.2.1.2. 3.2.1.4. 3.2.1.5. 3.2.1.6. 3.2.1.7. 3.2.1.10.	3.3.1.1. 3.3.1.4. 3.3.1.6. 3.3.1.7. 3.3.1.8

4. Regulations compliance and its assessment

78,00% of the tools and techniques help the companies in regulation compliance in the food safety, quality and labelling area, such as 3.1.1.5. Best Practice Guide on Food Transparency and Inventory of best practices on Food transparency; 3.1.1.35. National nutritional database; and 3.1.1.36. New nutritional recommendations for optimal health and quality of life in European elderly, etc.

18,18% of the tools and techniques in the mechatronics area.

66,67% of the tools and techniques in the food design area help the companies in regulation compliance. such as 3.3.1.2. Design and Development process for Food-related products; and 3.3.1.3. Design for recycling web platform.

ID of tools and techniques improving regulations compliance and its assessment can be seen in Table 8.

Table 8: ID of tools and techniques improving regulations compliance and its assessment

	Food safety, quality and labelling			Mechatronics	Food design
Regulations compliance and its assessment	3.1.1.2. 3.1.1.3. 3.1.1.4. 3.1.1.5. 3.1.1.6. 3.1.1.9. 3.1.1.10. 3.1.1.11. 3.1.1.12. 3.1.1.13. 3.1.1.16. 3.1.1.17. 3.1.1.18.	3.1.1.19. 3.1.1.20. 3.1.1.21. 3.1.1.22. 3.1.1.23. 3.1.1.24. 3.1.1.25. 3.1.1.26. 3.1.1.27. 3.1.1.28. 3.1.1.29. 3.1.1.30. 3.1.1.32.	3.1.1.33. 3.1.1.35. 3.1.1.37. 3.1.1.38. 3.1.1.39. 3.1.1.41. 3.1.1.43. 3.1.1.44. 3.1.1.45. 3.1.1.46. 3.1.1.47. 3.1.1.49. 3.1.1.50.	3.2.1.10. 3.2.1.11.	3.3.1.3. 3.3.1.4. 3.3.1.6. 3.3.1.7. 3.3.1.8. 3.3.1.9.

5. Product performance and its assessment

60,00% of the tools and techniques in the food safety, quality and labelling area, such as 3.1.1.4. Anti-tampering smart labels; 3.1.1.32. IQ-Freshlabel/ Smart labelling; and 3.1.1.38. PATHWAY-27 Industry Guidelines for developing products with health claims, etc.

72,73% of the tools and techniques in the mechatronics area, such as 3.2.1.4. In-pack atmospheric cold plasma (ACP) and 3.2.1.7. Powerkure ™.

88,89% of the tools and techniques in the food design area improve the product performance. such as 3.3.1.1. Business model canvas for food design; and 3.3.1.4. EcoTrophelia competition.

ID of tools and techniques improving product performance and its assessment can be seen in Table 9.

Table 9: ID of tools and techniques improving product performance and its assessment

	Food safety, quality and labelling			Mechatronics	Food design
Product performance and its assessment	3.1.1.2. 3.1.1.3. 3.1.1.4. 3.1.1.5. 3.1.1.10. 3.1.1.11. 3.1.1.15. 3.1.1.17. 3.1.1.18. 3.1.1.20.	3.1.1.24. 3.1.1.26. 3.1.1.27. 3.1.1.28. 3.1.1.29. 3.1.1.30. 3.1.1.31. 3.1.1.32. 3.1.1.33. 3.1.1.37.	3.1.1.38. 3.1.1.39. 3.1.1.40. 3.1.1.42. 3.1.1.43. 3.1.1.44. 3.1.1.45. 3.1.1.46. 3.1.1.49. 3.1.1.50.	3.2.1.1. 3.2.1.3. 3.2.1.4. 3.2.1.5. 3.2.1.6. 3.2.1.8. 3.2.1.10. 3.2.1.11.	3.3.1.1. 3.3.1.2. 3.3.1.3. 3.3.1.4. 3.3.1.6. 3.3.1.7. 3.3.1.8. 3.3.1.9.

6. Information for users

50,00% of the tools and techniques in the food safety, quality and labelling area, such as 3.1.1.5. Best Practice Guide on Food Transparency and Inventory of best practices on Food transparency; 3.1.1.19. fTRACE service; and 3.1.1.35. National nutritional database, etc.

36,36% of the tools and techniques in the mechatronics area, such as 3.2.1.4. In-pack atmospheric cold plasma (ACP); and 3.2.1.7. Powerkure ™.

22,22% of the tools and techniques in the food design area provide information for the users, such as 3.3.1.2. Design and Development process for Food-related products.

ID of tools and techniques providing information for users can be seen in Table 10.

Table 10: ID of tools and techniques providing information for users

	Food safety, quality and labelling			Mechatronics	Food design
Information for users	3.1.1.4. 3.1.1.5. 3.1.1.10. 3.1.1.11. 3.1.1.12. 3.1.1.13. 3.1.1.15. 3.1.1.16.	3.1.1.17. 3.1.1.19. 3.1.1.20. 3.1.1.21. 3.1.1.22. 3.1.1.24. 3.1.1.28. 3.1.1.29.	3.1.1.31. 3.1.1.32. 3.1.1.35. 3.1.1.38. 3.1.1.39. 3.1.1.42. 3.1.1.47. 3.1.1.48. 3.1.1.50.	3.2.1.4. 3.2.1.7. 3.2.1.9. 3.2.1.10.	3.3.1.2. 3.3.1.7.

7. User satisfaction and its assessment

26,00% of the tools and techniques in the food safety, quality and labelling area, such as 3.1.1.15. ESN Consumer Testing Guidelines; and 3.1.1.19. fTRACE service.

27,27% of the tools and techniques in the mechatronics area, such as 3.2.1.4. In-pack atmospheric cold plasma (ACP).

33,33% of the tools and techniques in the food design area improve the user satisfaction, such as 3.3.1.2. Design and Development process for Food-related products; and 3.3.1.5. Edible, Biodegradable Food packaging.

ID of tools and techniques improving the user satisfaction can be seen in Table 11.

Table 11: ID of tools and techniques improving the user satisfaction

	Food safety, quality and labelling			Mechatronics	Food design
User satisfaction and its assessment	3.1.1.4. 3.1.1.5. 3.1.1.11. 3.1.1.15.	3.1.1.16. 3.1.1.17. 3.1.1.19. 3.1.1.24.	3.1.1.29. 3.1.1.32. 3.1.1.35. 3.1.1.38. 3.1.1.50.	3.2.1.4. 3.2.1.8. 3.2.1.9.	3.3.1.2. 3.3.1.5. 3.3.1.7.

8. User's feedback and reaction

10,00% of the tools and techniques in the food safety, quality and labelling area, such as 3.1.1.19. fTRACE service; and 3.1.1.32. IQ-Freshlabel/ Smart labelling.

27,27% of the tools and techniques in the mechatronics area, such as 3.2.1.4. In-pack atmospheric cold plasma (ACP).

22,22% of the tools and techniques in the food design area collect user's feedback and reaction, such as 3.3.1.2. Design and Development process for Food-related products; and 3.3.1.5. Edible, Biodegradable Food packaging.

ID of tools and techniques collecting user's feedback and reaction can be seen in Table 12.

Table 12: ID of tools and techniques collecting user's feedback and reaction

	Food safety, quality and labelling	Mechatronics	Food design
User's feedback and reaction	3.1.1.17. 3.1.1.19. 3.1.1.24. 3.1.1.29. 3.1.1.32.	3.2.1.4. 3.2.1.8. 3.2.1.9.	3.3.1.2. 3.3.1.5. 3.3.1.7.

9. Other

14,00% of the tools and techniques in the food safety, quality and labelling area

- Food defense (3.1.1.4. Anti-tampering smart labels; 3.1.1.6. Biometric identification and access control)
- Significant reduction of emission to environment (3.1.1.17. FoodManufuture - Integrated summary of long and short-term future needs for research infrastructure),
- More efficient use of natural resources (3.1.1.17. FoodManufuture - Integrated summary of long and short-term future needs for research infrastructure),
- Reduction of waste (3.1.1.17. FoodManufuture - Integrated summary of long and short-term future needs for research infrastructure),
- Flexible adaptation of food businesses to rapidly changing environment (3.1.1.17. FoodManufuture - Integrated summary of long and short-term future needs for research infrastructure),
- Protection of intellectual properties (Guideline on effective knowledge and technology transfer activities to SMEs in the food sector with particular focus on traditional food manufacturers),
- Customer (trade) and US Export requirement (3.1.1.46. Threat Assessment Critical Control Points (TACCP)),
- Process performance (3.1.1.47. tsenso - temperature monitoring and last-mile disposition system for passive cooled delivery).
- Tracking & tracing, recall management (3.1.1.50. New labeling printing device)

36,36% of the tools and techniques in the mechatronics area

- Foster cooperation between SMEs and R&D (3.2.1.3. Innovation Voucher),
- Enhance innovativeness of SMEs (3.2.1.3. Innovation Voucher),
- Finding effective partnering opportunities (3.2.1.5. Knowledge transfer within Industrial Research Laboratories, Innovation Centres, Technopoles and SMEs, in particular related to the development of synergies 'with and for' mechatronics companies, towards INDUSTRY 4.0.),
- Networking with companies, intermediaries, R&D institutions (3.2.1.1. Experience exchange circle; 3.2.1.9. Symposium with accompanying small trade fair),
- Exchange know-how and experience (3.2.1.1. Experience exchange circle; 3.2.1.9. Symposium with accompanying small trade fair).

11,11% of the tools and techniques in the food design area

- Demonstrates "green" attitude of product/manufacturer (3.3.1.3. Design for recycling web platform dedicated to the guidelines for designing more easily recyclable packaging).

Table 13: Novelties, benefits and added value (numbers)

Number of tools and techniques	Novelties, benefits and added value								
	a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**	**i.**
	Improving cost efficiency	**Improving quality assessment**	**Improving risk assessment and risk management**	**Regulations compliance and its assessment**	**Product performance and its assessment**	**Information for users**	**User satisfaction and its assessment**	**User's feedback and reaction**	**Other**
Food safety, quality and labelling	34	41	44	39	30	25	13	5	7
Mechatronics	9	9	7	2	8	4	3	3	4
Food design	5	6	5	6	8	2	3	2	1

Table 14: Novelties, benefits and added value (percentage)

Percent of tools and techniques	Novelties, benefits and added value								
	a.	b.	c.	d.	e.	f.	g.	h.	i.
	Improving cost efficiency	Improving quality assessment	Improving risk assessment and risk management	Regulations compliance and its assessment	Product performance and its assessment	Information for users	User satisfaction and its assessment	User's feedback and reaction	Other
Food safety, quality and labelling	68,00%	82,00%	88,00%	78,00%	60,00%	50,00%	26,00%	10,00%	14,00%
Mechatronics	81,82%	81,82%	63,64%	18,18%	72,73%	36,36%	27,27%	27,27%	36,36%
Food design	55,56%	66,67%	55,56%	66,67%	88,89%	22,22%	33,33%	22,22%	11,11%

5. Conclusions and recommendations (CBHU)

In sum 49 tools and techniques in the food safety, quality and labelling area, 9 tools and techniques in the mechatronics area, and 8 tools and techniques in the food design area were collected by the project partners.

Among the tools and techniques equipment, devices, technologies, methods, guidelines, recommendations, ICT applications, networks, expert groups, trainings, databases, and inventories can be found.

The collected tools and techniques have several novelties, benefits and added values which can improve the competitiveness of the food businesses, such as:

- Improving cost efficiency,
- Improving quality assessment,
- Improving risk assessment and risk management,
- Regulations compliance and its assessment,
- Product performance and its assessment,
- Information for users,
- User satisfaction and its assessment,
- User's feedback and reaction,
- Other:
    - Food defense,
    - Significant reduction of emission to environment,
    - More efficient use of natural resources,
    - Reduction of waste,
    - Flexible adaptation of food businesses to rapidly changing environment,
    - Protection of intellectual properties,
    - Customer (trade) and US Export requirement,
    - Process performance,
    - Foster cooperation between SMEs and R&D,
    - Enhance innovativeness of SMEs,
    - Finding effective partnering opportunities,
    - Networking with companies, intermediaries, R&D institutions,
    - Exchange know-how and experience,
    - Demonstrates "green" attitude of product/manufacturer.

The next task of the I-CON project is to compare and reconcile the regional needs for capacity building and knowledge transfer (identified in Task 1 phase of the project by the Regional Partners) with available advanced tools and techniques (collected in Task2 phase of the project by Regional and Knowledge partners).

The results of the comparison will be reported in Deliverable D.T2.1.2 Capitalization report.