

Ultrasound application – homogenization and pasteurization

D2.1 Template for description of innovative solutions for Short Food Supply Chains (draft prepared by Campden BRI Hungary)

Version 1
14. 05. 2019



Project code:

Project acronym: Smart Food Supply Chains

Internal template:

Template for good practice cases

Work package number: T2

WP leader: CBHU

Work package title: Technological and non-technological innovations

Document issued by:

Delivery month:

Version:

Document language: ENG

Dissemination Level		
PU	Public	
PP	Restricted to other program participants	
RE	Restricted to a group specified by the consortium	
CO	Confidential, only for members of the consortium	

1. Title of the case description

Ultrasound application-Homogenisation and pasteurisation

2. Indicate your role in the Smart Food Supply Chain:

- individual member of the chain:
- chain operator:
- network operator:
- association:
- technical, scientific, or management expert:
- advisor:
- policy maker:
- other:

3. Indicate the region (if applicable): [world-wide supplier network](#)

4. WP2 Cross-reference table

Please indicate with an X in the relevant box of the matrix for which needs and the steps / functions of the supply chain the described innovative solution is applicable

		Individual steps of the SFSC							Short food supply chain as whole						
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Needs of the consumers (citizens)	food safety														
	food quality														
	trust														
	ethical aspects														
	accessibility														
Needs of the chain actors	fair price														
	increased negotiating power														
	shared use of available resources														
	product development support														
	access to markets and consumers														
	access to infrastructure														

- 1: Farming**
- 2: Primary production**
- 3: Transport**
- 4: Processing and packaging**
- 5: Storage**
- 6: Logistics**
- 7: Sale**
- 8: Product integrity, authenticity, transparency**
- 9: Marketing concepts**
- 10: Food chain management and networking for enhancing cooperation among chain actors**
- 11: Business modelling**
- 12: Policy environment**
- 13: Legal requirements**
- 14: Labelling**

5. Short description of the innovative solution

- **Describe the specific need or problem being addressed by the case and please explain what is the novelty of this innovative solution**

In the 21. century for the develop of the field production in the food industry, new methods must be applied. The new method's and technology's advantages should be use as well by the small producers and small enterprises too in the aim of more effective production and cost efficiency.

In the food production it's a significant, existing expectation to reduce the microbe's cell number on the surface or in the bulk of the food to extend the shelf life and ensure the quality, for producing safety food.

The Industry 4.0.'s strategy is to modernize the Hungarian food industry in the area of organizing effective processes, optimize material streams, coordinating operation in the food industry, or modernize in the area of digitalization.

The food industry uses conventional thermal pasteurization and sterilization techniques in order to inactive microorganism and enzymes and to increase the shelf life of many products.

The application of the ultrasound measurement system can be one of the new methods to reduce the CFU in the food products.

Affected area:

- liquid: each emulsified and/or homogenized liquids (e.g. dairy products-yoghurt, fruit juices, beverages, liquid marmalade)

- **Describe the enabling function(s) and the practical benefit(s) - (e.g. for which types of problems and opportunities is used and can it be used, and how)**

The benefits from the use of ultrasound include an increase in the shelf life of liquids and the reduction of contaminating microbes/bacteria and moulds.

New opportunities for development (in the area of production, microbiology) can be opened by a technology which were not used by the organization before.

A part of the digitalization and automatization must be done before the use of Industry 4.0.

The digital methods offer a number of opportunities to solve better the current tasks (problems) through the new methods.

- Describe the method/procedure/technology/solution implemented. (Please explain, whether the innovative method is a product / service / process / marketing or organizational / management innovation) After completing the description, please indicate, whether this innovation is a technological or non-technological one.**

Use of ultrasound as an alternative method of processing dairy and liquid fruit products react the physical, functional properties, food safety, shelf life and food quality too. By combining sonication with high pressure homogenization stable nano-emulsions were produced with much lower particle sizes and with much reduced energy demands for the emulsification process in the case of milk and fruit juices.

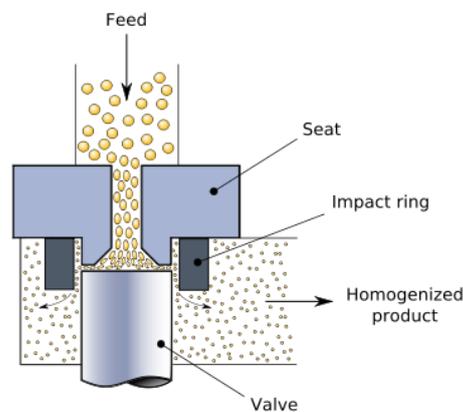
Ultrasound induces mechanical, chemical and biochemical effects in liquids or on the surface of products.

The ultrasonic effects in food liquids are monitored via the examination of the physico-chemical parameters of milk and beverages in terms of qualities such as color, viscosity, brix index, pH and acidity.

The reduction in microbes loading is a common feature which extends the safety storage and shelf life.

technological

non-technological



- **Describe the business, which implemented the innovated solution (size, country, region, location, type of food)**

- **Describe the distribution channels of the product(s)**

- **Describe what makes the innovation work.**
 - no additives are used
 - enhancement of the physical properties of the milk and fruit juice products
 - enhancement of sensory properties (color, taste, character)
 - vitamin, bioactive, nutritionally beneficial compounds/ingredients are preserved due the enabling use of lower heat treatment temperature
 - enhanced shelf life

- **Describe the specific prerequisites for the business related to the implementation of the method and/or related to the location, method, procedure, solution**
 - a: **List the relevant necessary resources (including the estimated cost) for the specific innovation.
Please list the relevant ones only (list is annexed)**

 - b: **List the relevant necessary capabilities for the specific innovation.
Please list the relevant ones only (list is annexed)**

- **The method/technology was established by**

6. Describe the results, achievements and typical failures

Ultrasound is viable to ensure milk and fruit juices sensory quality retention. It's an alternative processing technique where stable emulsions can be prepared in the absence of any emulsification enhancers, it leads to more stable additive free products.

7. Summarize what makes the case to a good practice for the members of the SFSCs (e.g. lessons learned)

The benefits of using ultrasound to process liquid foods are clear. Enhanced emulsification and sterilization can be achieved at much lower temperatures than conventional processing, thus producing more stable product, whilst preventing deterioration and retaining many beneficial bioactive ingredients.

Ultrasonically enhanced fat fractionation, casein disruption and production of dairy probiotic drinks offers the potential of reduced processing times, and as a result economic savings, as well as possible products

8. Aspects, methods for transfer of methods for other SFSC members

9. Recommendations for members of other SFSCs for further applications

10. More information is available at (web), if it is relevant

Applications of ultrasound in processing of liquid foods: A review
<https://doi.org/10.1016/j.ultsonch.2016.12.025>

Annex

1. Checklist for necessary resources (tangible and non-tangible):

- materials (access to: raw materials/ ingredients - including volume, land – including size, packaging materials)
- human: labour force: size, knowledge & skills (production, technical, marketing, managerial, ICT, financial, etc.)
- technology: patents, know-how, trademarks, copyrights, trade secrets
- infrastructure, equipment, facilities, - size, minimum volume of production/sales, IT infrastructure
- information, reputation, brand, trust
- financial*

*: estimated cost:

0 - 10 000 Eur
10 001 - 50 000 Eur
50 001 - 100 000 Eur
100 001 - 300 000 Eur
300 001 – 1 000 000 Eur
1 000 000 Eur above –

- other specific necessary resources for the application of the specific innovation

2. Checklist for the necessary capabilities

- **food safety:**
 - basic skills to comply with the EU food safety regulations
 - ability to understand what makes the product safe (the key controls, which ensure the safety of the product – biological, chemical and physical hazards, providing the safety shelf life of perishable products)
 - food safety culture (motivation, responsibility for food safety) and basic skills for the implementation of HACCP

- **food quality:**
 - ability to define the target segments of consumers for SFSCs
 - ability to define the product characteristics which are (tacit) basic requirements for the target segment(s) of consumers;
 - ability to define which product attributes/levels and augmented services represent an added value for the target segments of consumers;
 - food quality culture (motivation, responsibility for food quality);
 - production experiences which help to provide the expected quality reliably, uniformly;
 - ability to provide distinguishable quality which meets the needs of the targeted consumer segment;
 - meeting (local) legal requirements, application of the labelling rules;
 - ability to access the consumer willingness to pay for specific products of SFSCs.

- **trust:**
 - ability to ensure product integrity, authenticity and transparent information for the consumers (including systems, tools);
 - ability to access external trust enhancers (third party certification, internal certification system, participatory guarantee systems);
 - application of the labelling rules and branding (mandatory and voluntary);
 - ability to meet third party certification requirements

- **ethical aspects**
 - ability to understand consumer needs for ethical behaviour related to the specific product(s) of the SFSCs;
 - culture for ethical food production and supply;
 - ability to implement necessary measures to ensure ethical food production and supply;
 - ability to access the consumer willingness to pay for products meeting ethical aspects

- **accessibility to consumers:**
 - ability to organize logistics efficiently and to exploit innovative solutions and distribution channels;
 - efficient, innovative sales methods;

- ability to develop and implement new business models for ensuring access of consumers to products and augmented services;
- **fair price:**
 - collecting marketing information;
 - ability to enhance and maintain cooperation among chain actors including the combined use of available complementary resources, capabilities, competences of SFSCs actors, networking, understanding the principles of food value chain management;
 - ability to define, develop or maintain unique quality of products and augmented services;
 - ability to develop and implement new business models;
 - ability to access the consumer willingness to pay for fair price
- **increased negotiation power:**
 - collecting marketing information;
 - ability to enhance and maintain cooperation among chain actors including the combined use of available complementary resources, capabilities, competences of SFSCs actors, networking, understanding the principles of food value chain management, cooperation culture;
 - ability to define, develop or maintain unique quality of products and augmented services;
 - ability to develop and implement new business models;
- **shared use of available resources:**
 - ability to enhance and maintain cooperation among chain actors including the shared and combined use of available complementary resources, capabilities, competences of SFSCs actors, networking, understanding the principles of food value chain management, cooperation culture;
 - the level of value chain management culture;
 - ability to access the consumer willingness to pay for food with reduced environmental impacts

- **input for R+D:**
 - ability to monitor, research, evaluate, and understand the needs and wants of customers and consumers;
 - ability to develop new products, processes, packaging, preservation techniques, systems and access to new markets, including in other categories;
 - access to innovative technologies; distribution and marketing solutions and methods. management systems;
 - access to local input for R+D covered by other aspects

- **access to markets: and market success**
 - effective promotion, customer service, efficient and innovative sales methods;
 - ability to understand consumer's needs;
 - ability to organise logistics efficiently and to exploit innovative solutions and distribution channels,
 - unique value propositions;
 - ability to develop and implement new business models for ensuring access of consumers to products and augmented services, develop the market accessibility for the suppliers.
 - stock control;
 - ability to access to required raw materials within a restricted geographical area

- **access to infrastructure:**
 - ability to use existing own infrastructure in a focused way to serve consumer needs or to combine it with complementary infrastructures of other SFSC actors, cooperation culture;

- **management:**
 - to implement management systems for vision, planning, implementing), coordinating, controlling, monitoring, continuously;
 - improving; ability to motivate, authorize staff;

- **production, processing:**
 - management system, production experience, specific controlling, monitoring, continuously;
 - willingness to consider and ability to evaluate the adoption of TECI and NTI in the current production processes;
 - any additional specific resources necessary for the application of the specific innovation.