

# HIGH-PRESSURE PROCESSING (HPP) TECHNOLOGY FOR FOOD PRODUCTION

UoB

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<b>Dissemination Level</b>		
<b>PU</b>	<b>Public</b>	
<b>PP</b>	<b>Restricted to other programme participants</b>	
<b>RE</b>	<b>Restricted to a group specified by the consortium</b>	
<b>CO</b>	<b>Confidential, only for members of the consortium</b>	<b>CO</b>

**1. Title of the case description**

***HIGH-PRESSURE PROCESSING (HPP) TECHNOLOGY FOR FOOD PRODUCTION***

**2. Indicate your role in the Smart Food Supply Chain (UoB, Project partner):**

- 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): .....**

#### 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		X		X	X			X	X					
	food quality		X		X	X			X	X					X
	trust														
	ethical aspects														
	accessibility		X		X	X			X	X					
Needs of the chain actors	fair price		X		X	X			X	X					
	increased negotiating power		X		X	X			X	X					
	shared use of available resources														
	product development support		X		X	X			X	X					X
	access to markets and consumers		X		X	X			X	X					X
	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 production of various food products is crucial to keep and preserve their quality until consumption. The problem represents preservation of food without any additives, which are at the same time full of nutrients sensitive on high temperature. Traditional thermal pasteurization technology negatively affects sensorial properties, flavours and colours, and nutritional contents of food. The novelty proposed is the non-thermal food processing technologies as alternative to conventionally heat treatments in high quality foods with fresh-like sensory and additive-free characteristics. As the most successfully commercialized non-thermal processing technology, HPP eliminates food pathogens at room temperature and extends the shelf life. HPP is officially approved as a non-thermal pasteurization technology that can replace traditional pasteurization in the food industry (US Food&Drug Administration).

- **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)**

Conventional thermal pasteurization negatively affects sensorial and nutritional properties, flavours and colours. HPP could be used in the production of various food products such as juices, fresh cut fruit and vegetables, meat, seafood, and dairy products. This technology eliminates pathogens at room temperature and extends the shelf life of foods circulated through the cold chain. Also, this technology is compatible with existing trends in food industry and diets, organic food, health food or clean label, and thus can boost the further development in the food market.

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

Application of HPP technology: food is hermetically sealed in a flexible container under an high pressure of 100-600 MPa applied at room temperature, using a liquid, usually water, as the medium for pressure transfer, subjecting the interior and surface of the food to even pressure to achieve pasteurization. During HPP the pressure is being used and applied uniformly and simultaneously in all directions.

It is important to highlight that pasteurization effect of HPP is not affected by the packaging form and volume of the food, and thus foods of different volumes can be processed in the same batch. HPP is performed at room temperature, reducing energy consumption associated with heating and subsequent cooling. In addition, the food is in packaged form and does not directly contact the processing devices, preventing the secondary contamination of food after pasteurization. Additionally, the pressure transfer medium can be recycled after processing.

With the advantages of low energy consumption and low contamination risk, HPP technology is an environmentally friendly processing technology.

Therefore, HPP technology is recognized as a minimal processing technology that ensures both food safety and quality.

technological x

non-technological

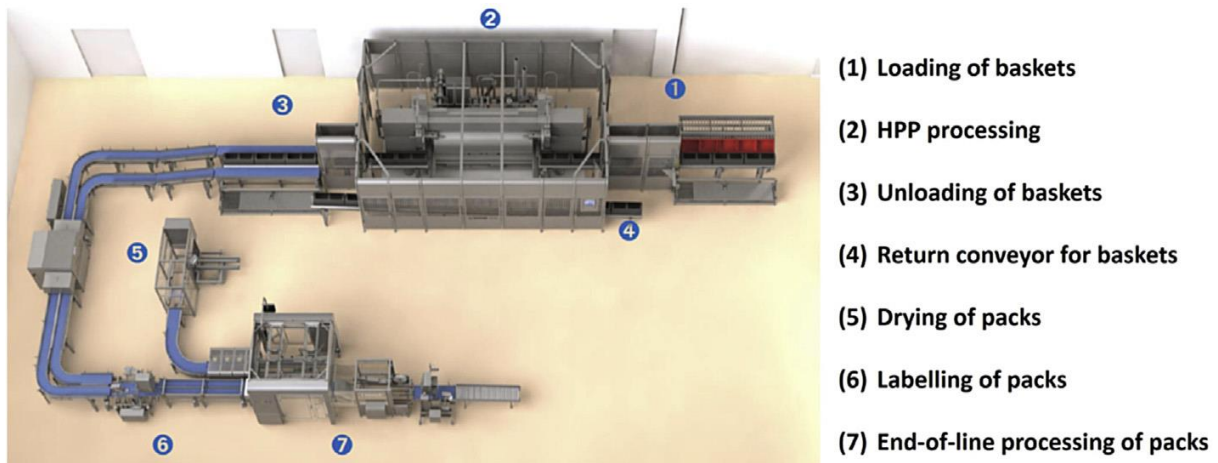


Figure 1. A horizontal HPP production systems (Multivac, German)

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

This novel technology can be used for small and medium sized business as well as for big companies. The capacity and type of required HPP depends on the production volume.

Country, region and location are not a limiting factor for HPP to be implemented in some company. Type of food to be processed is various and not limited with moisture content or any other parameters of food. It is typical to use for food rich in vitamins, colour, flavour, organic food, health food, and clean label products (fruit and vegetables, meat and dairy products, seafood, juices and beverages, salads and dips...).

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

HPP has clearly emerged as the technology of choice for bringing a wide variety of innovative "upmarket" quality products into a broad range of food product distribution channels. After applied HPP technology, eliminated food pathogens at room temperature and prolonged the shelf life, foods should be circulated through the cold chain.

- **Describe what makes the innovation work.**
  - This technology preserve the quality of the products
  - Minimally processed food with destroyed microorganisms
  - Save on energy costs, since HPP is performed at room temperature, so energy consumption associated with heating and subsequent cooling typical for conventional technologies is significantly reduced

- The pressure is being used and applied uniformly and simultaneously in all directions
  - No need for thermal processing
  - No need for chemical additives
  - Type of food is not limited
  - Different volume of food and packaging can be combined at same bench
  - There are different types, size and capacities of HPP systems so it can be adopted to required capacity
  - One person can control the process
- **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)**

**MATERIALS:**

- Fruit and vegetables, meat and dairy products, seafood, juices and beverages, salads and dips etc
- Packaging (usually plastic materials). Due to plastics good flexibility, elasticity and water barrier properties, those materials commonly used. There are many polymers included in this classification such as PP, HDPE, PET, C-PET, etc.

**HUMAN:**

- Human resource for operation, 1 person (it depends on capacity). Provider of the know-how or technological center should develop procedure for each type of food products

**TECHNOLOGY:**

- required capacity is related to the size of HPP system

**FINANCIAL:**

- By the end of 2015, more than 300 units of HPP equipment were operating globally. Despite the high price and high barriers to investment, the specialized original equipment manufacturer service sector has been gradually increasing, and the annual output value of global HPP market has approached \$10 billion.

**b: List the relevant necessary capabilities for the specific innovation. Please list the relevant ones only**

**FOOD SAFETY:**

- Food safety culture
- Ability to understand what makes the product safe

**FOOD QUALITY:**

- Ability to define the product attributes/levels and augmented services represent an added value for the target segments of consumers.
- Ability to provide distinguishable quality which meets the needs of the targeted consumer segments
- Ability to access the consumer willingness to pay for specific products of SFSCs
- Food quality culture

**TRUST:**

- Application of labeling rules and branding

**INPUT FOR R+D:**

- Ability to develop new products, processes, packaging, preservation technologies, systems and access to new markets, including in other categories

**ACCESS TO MARKET AND MARKET SUCCESS:**

- Ability to understand consumer's needs
- Ability to organize logistics efficiently and to exploit innovative solutions and distribution channels
  - **The method/technology was established by**

NAME: Avure

ADDRESS: 2601 South Verity Parkway, Middletown, OH, USA,

DEALER AND SERVICE POINTS: USA, Canada, South Africa, Sweden, Italy, France, Greece, Spain, Germany, Bulgaria

NAME: Hiperbaric

ADDRESS: Poligono Industrial Villalonquejar C Condado de Trevino 6 09001, Spain

DEALER AND SERVICE POINTS: USA, New Zealand, Mexico

NAME: MULTIVAC Sepp Haggemüller SE & Co. KG



ADDRESS: Bahnhofstraße 487787 Wolfertschwenden, Germany, (formerly Uhde High Pressure Technologies, merged with Multivac in 2011)

DEALER AND SERVICE POINTS: Europe, North and South America, Africa, Near East, Asia and Pacific

## **6. Describe the results, achievements and typical failures**

- Shelf life prolonged/extended
- Clean label foods/ free from additives
- Pasteurization of fresh and natural food
- Used to process liquid and solid food
- Minimally processed food
- Food eliminated of microorganisms
- Vitamins, pigments aroma preserved
- Save on energy costs
- No need for thermal processing
- No need for chemical additives
- Application in all type of food
- Different volume of food and packaging combined at same bench
- Increase the market

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

HPP technology offers final product of high quality and safety. Namely, this technology ensures the microbial safety of food without the addition of preservatives and allows the processed food to maintain the natural flavors and nutritional value of the original food material.

In addition, clean label foods, which claim to be natural and fresh as well as free from chemical additives, have gradually gained attention among consumers.

## **7. Aspects, methods for transfer of methods for other SFSC members**

HPP technology is applicable to numerous SFSC members. Due to investment costs, some types of cooperation and association should be considered. Especially, since this technology has application for different products, different volumes, different packaging even in the same bench.

## **8. Recommendations for members of other SFSCs for further applications**

HPP technology can be used for small and medium as well as for big companies where the goal is to improve or keep level quality of various food, extending its shelf life at the same time.

In the case that some company does not use full capacity (e.g. small business), the sharing of technology with other SMEs can be considered as one of solutions. Collective financing can be efficient way to implement this technology for small business.

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

<https://www.avure-hpp-foods.com/>

<https://www.hiperbaric.com/>

<https://de.multivac.com>

<http://eng.coldpressok.com/>

## **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.