

# INNOVATIVE DEHYDRATION TECHNOLOGY FOR NEW FOOD PRODUCTS

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**Project acronym: Smart Food Supply Chains**

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**Template for good practice cases**

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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**

**INNOVATIVE DEHYDRATION TECHNOLOGY FOR NEW FOOD PRODUCTS**

**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): .....**

#### 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 food production one of its essential issues is to keep and preserve their nutrients until they reach final consumers. The problem represents preservation process of food rich in nutrients which are high temperature sensitive. Traditional thermal processes include application of high temperature which negatively affects characteristics such as flavour and colour, and nutrients, in general. The proposed innovative technology is a rapid, low temperature drying method. Food product's colour, flavour and nutrients this way are staying maintained. This technology represents vacuum-microwave technology that enables uniform drying with flexible moisture content.

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

Firstly, practical benefit of this technology is high speed processing since drying is rapid and thus with significant time savings over other dryings technology (e.g. air drying and freeze drying). Secondly, benefit of this technology is scalability since machine can scale from research and design level, batch production to continuous commercial production. In addition, this technology allows a range of moisture content in final product. Namely, uniform volumetric drying allows control over final moisture content and texture achieving shelf stable final products in parallel. This drying technology has been already applied in different food categories: fruit and vegetables; ready to eat meals and snacks; dairy products; meat and seafood etc.

- **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.**

This technology includes drum- or tray-based machinery. In case of the first one the product load tumbles in rotating drums, moving through the vacuum microwave chamber, as the microwave energy is used to homogeneously dehydrate the product load to a desired residual moisture content. This is suitable for the dehydration of organic materials that can be tumbled without breaking, typically discrete pieces of food (for example: fruits, vegetables, meat products, dairy products, spices, herbs and grains). On the other hand, in the case of tray-based machinery the process begins by placing product loads into microwave transparent trays outside the dryer under ambient pressure. Those trays are then fed into the vacuum chamber via a belt, through a double sluice entry. Within the dryer the trays are transported continuously one behind the other. The product is discharged via a final horizontal sluice. The dried product load is then removed from the trays outside the machinery. This system is much more suitable for products with higher liquid content and for products that are more fragile.

Technological X

Non-technological

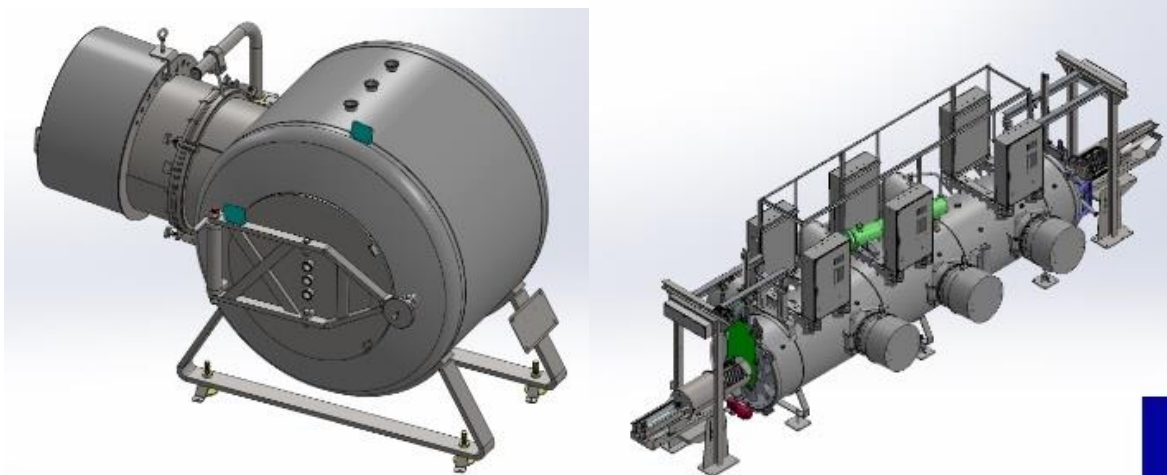


Figure 1. Small-scale and large-scale machines (<https://www.enwave.net>)

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

This novel technology can be used for market trials, small-scale producers, as well as for larger-sale producers and high volume and continuous production. It is being used in different types (drum/tray) and capacity (~10/55/110 kg water removal per hour). The capacity and type of required machinery depends on the production volume.

Country, region and location are not a limiting factor for this drying method and its implementation. Type of food that can be processed this way is various and not limited with final moisture content. Some of examples are: whole pieces and inclusions of fruit and vegetables, cheese puffs, powdered dairy products, yogurt snacks, single or multi-ingredient snacks and meals, meat jerky, protein chips, pet food.

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

After drying process the new food products can be easily and regularly distributed in ambient temperature all over the world food market. The reason is reduced moisture and prolonged shelf life.

- **Describe what makes the innovation work**

- Application of the vacuum which advantages are lower boiling point, low temperature processing, rapid water removal

- Ability to “puff” products
  - Application of the microwaves which advantages are efficient energy transfer, fast and uniform volumetric heating, precise temperature regulation
  - Reduced water content and chance for microorganisms growth
  - Reduced energy requirements
  - Type of food and its moisture percentage is not limiting factor
  - Easy to 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**

**MATERIALS:**

- Fruit and vegetables, meat and dairy products, seafood, pet food etc

**HUMAN:**

- Human resource for operation, 1 person (it depends on capacity) with technical skills. Provider of the know-how can develop procedure for different categories of food products.

**TECHNOLOGY:**

- Required capacity is related to the type and size of machine (pilot-scale, large-scale, continuous) and capacity (~10-110 kg<sub>H2O</sub>/h). Microwave power is from 10 to 100 kW and vacuum from 16 to 400 mbar.

**FINANCIAL:**

- Estimated costs are depending on the type (tray/drum) and size of machine (pilot-scale, large-scale, continuous) and capacity (~10-110 kg<sub>H2O</sub>/h).

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

**FOOD SAFETY:**

- Ability to understand what makes the product safe

**FOOD QUALITY:**

- Ability to define the target segments of consumers for SFSCs
- 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
- Ability to access external trust enhancers
- Ability to meet third party certification requirements

**FAIR PRICE:**

- Ability to define , develop or maintain unique quality of products and augmented services
- Ability to develop and implement new business models

**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 innovative technologies

**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: ENVAWE

ADDRESS: Unit 1 – 1668 Derwent Way Delta, BC, Canada V3M 6R9

DEALER AND SERVICE POINTS/PARTNERS: Europe, Australia, USA

**Describe the results, achievements and typical failures**

- Shelf life prolonged/extended
- Clean label foods
- Used to process fresh and natural food
- Minimally processed food
- Food eliminated of moisture and conditions for growth of microorganisms
- Vitamins, pigments, flavours preserved



- Save on energy costs
- Save on time due to rapid drying
- No need for thermal processing
- Increase the market of novel food products

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

This drying technology offers final food products of high quality and safety. Namely, this technology ensures the microbial safety due to reduced moisture content and retain near fresh flavour and colour.

This means that companies incorporating this innovative drying technology could reach new markets and increase the sale of seasonal products. Like it is explained earlier this drying technology thanks to application of vacuum and microwave offers final food products of very high quality.

It can be used to dry a variety of different products on the same machine allowing for maximum usage.

**Aspects, methods for transfer of methods for other SFSC members**

This innovative drying technology is applicable to different SFSC members. Some of producers offer technologies and various capacities that adapts to different needs. Due to investment costs for larger scale machinery are higher, some kind of cooperation and/or association can be considered.

**Recommendations for members of other SFSCs for further applications**

Recommendations are to develop clean label premium snacks with high margins. Also, recommendation is to leverage excess raw material for additional income streams. Since uniform volumetric drying allows for high level control over final moisture and texture while still achieving shelf stable end products are possible to suit your customer's preferences (crunchy or chewy). Furthermore, this innovative drying technology is compatible with trends in food industry and diets, natural food, nomad food, organic food, health food and/or clean label, and thus can increase the further development of the novel food products.

**More information, if it is relevant**

<https://www.enwave.net/>

## **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.