

Acoustic Extra Freezing (AEF) for food chain in Finland



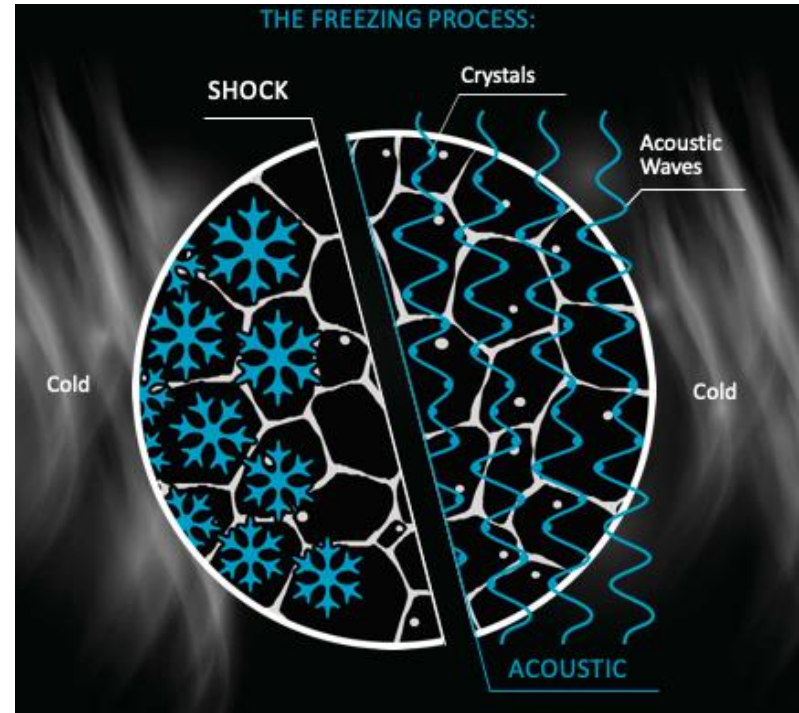
EL PAÍS

‘In addition to being faster than conventional systems, the sound waves of AEF Technology prevent the breakage of cells and the deterioration of food, until now inevitable ’

https://retina.elpais.com/retina/2018/06/04/innovacion/1528120328_475491.html

The Problem

- The quality of conventionally frozen food deteriorates because ice crystals damage cells
- Organoleptic and nutritive characteristics of frozen food are worse than that of fresh food
- The deterioration of quality continues in frozen storage chambers due to recrystallization, moisture loss, and oxidation of lipids and proteins
- In the EU, around 88 million tons of food waste are generated annually with associated costs estimated at 143 billion euros.



Shock freezing – ice crystals expand and damage cells
Acoustic freezing – small ice crystals, cells are intact

The Solution

The acoustic waves form nano-sized ice crystals, keeping all food cells intact.

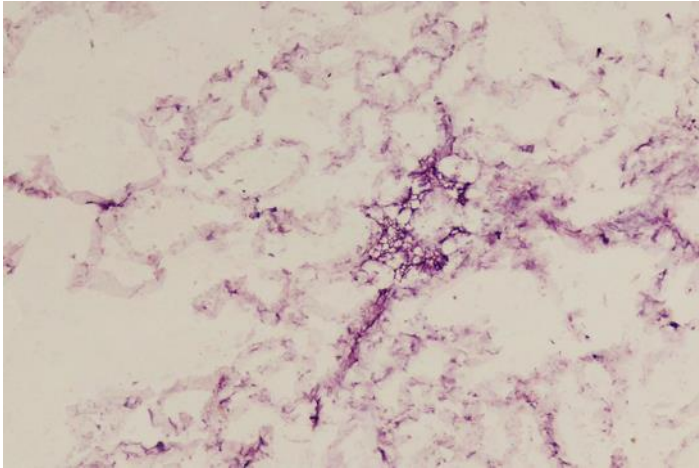


Benefits for customers:

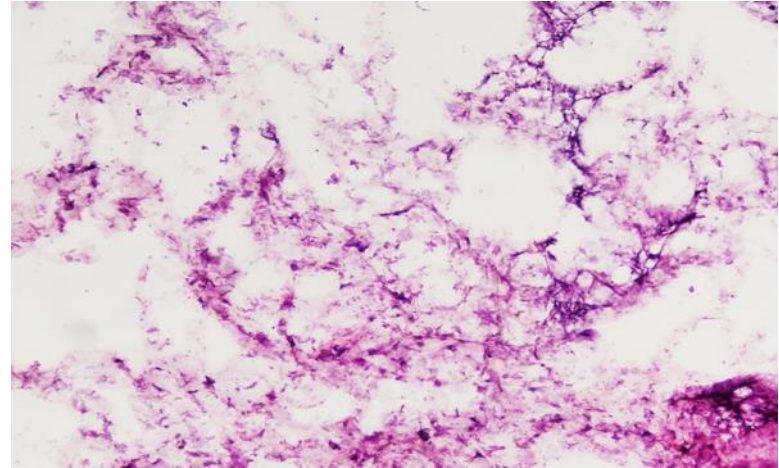
- The taste and texture of AEF frozen products is the same as that of fresh ones after defrosting / cooking
- 50 - 100 % increase in storage life of AEF frozen food
- Fresh seasonal ingredients can be bought, processed and AEF frozen in the harvest season at low costs
- Ready meals can be cooked and AEF frozen in the places of origin, then shipped and stored in a conventional cold chain (-18°C)
- AEF technology allows to reduce costs and food waste at all stages of food-value chain

The Strawberry Test

Conventional shock freezing



AEF freezing



”Traditional freezing causes fragmentation of cell membranes in the visual assessment of samples of approximately **60-70%** of the total number of external cellular structures... At the same time, the degree of destructive changes in the microstructure of strawberry tissues during microvibration (AEF) freezing is significantly less compared to traditional freezing, and at a visual assessment of the samples is approximately **25-35%** of the total number of surface cellular structures.”

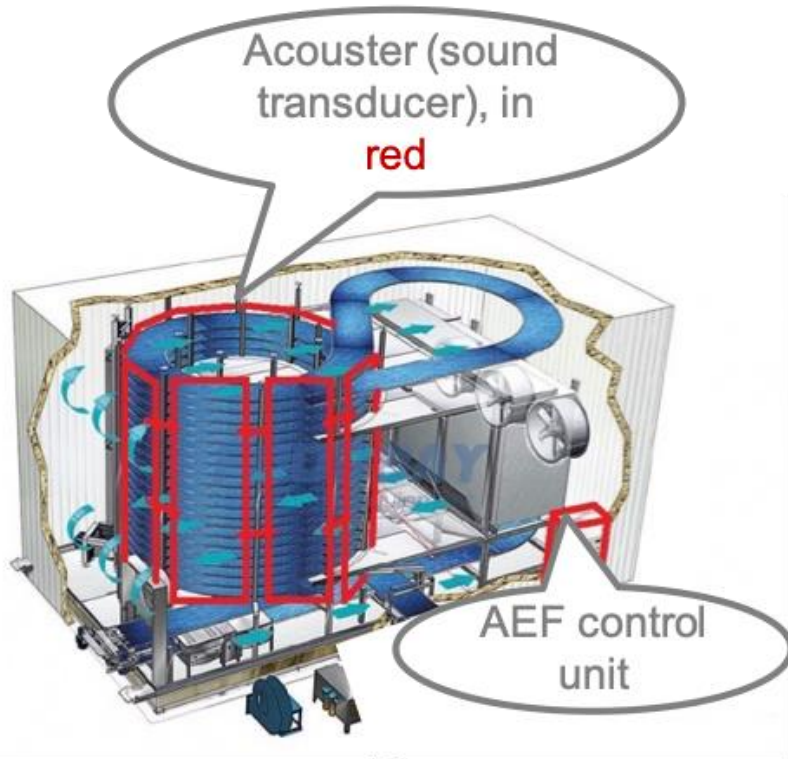
Source: *Freezing and freeze-drying of strawberries with an additional effect of microvibrations*. Semenov et al, *Molecular Biotechnology*, 2019

The AEF technology

- AEF equipment is integrated into ready-to-use shock freezers and freezing chambers with operating temperature of -18°C and lower
- The Acoustic waves do not 'produce cold', they just deal with emerging ice crystals
- We develop software and individual Freezing Algorithms for various types of food
- AEF technology platform includes:
 - hardware - Acousters (sound transducers), PCBs, sensors, etc.
 - software for running the Individual Freezing Algorithms in the Hardware
 - 3-D CAD for optimizing power and direction of acoustic waves and air flows



Examples of AEF installation



Project offering

Project 1. AEF Freezing for local food

Developing high-quality freezing solution for local berries, fish and ready meals in Kitee region. R&D is needed to optimize freezing algorithms for different types of local food.

Project 2. Frozen food lab

The testbed of innovative AEF freezing technology at Tukutori & Teurastamo. The project is aimed at local café, restaurants and food processing companies allowing them to cut costs and increase quality of ready meals.

Project 3. Sustainable food chain

Joining efforts of Finnish manufacturers of equipment for food processing industry to reduce food waste and cut costs in food chain. The project fits to Bio and Circular Economy program



Project 1. AEF freezing for local food

Goals of the project

- To Develop freezing algorithms for different types of local berries, fish and ready meals
- To perform a series of tests with a laboratory AEF freezing unit.
- To validate the results of freezing tests by an independent laboratory
- To make a prototype of freezing chamber with AEF for industrial use

Expected outcome and next possible steps

- To get a proven increase in quality of local food on industrial scale
- To scale the solution in the region and beyond

Benefits for Kitee Region

- To increase sales and profits for local manufacturers of berries, fish and ready meals
- To enter new markets, including export
- To develop new types of food products
- To create new jobs and increase tax revenue in the region

Timeline and actions

- May 19 - set up AEF testbed and lab in Kitee
- June - July 19 - perform series of tests and validate the results
- Aug 19 - make the first industrial prototype
- 2020-2021 – scaling and upgrading

Project 2. Frozen food lab

Goals of the project

- To create the testbed of innovative AEF freezing technology for local café, restaurants and food processing companies at Tukkutori & Teurastamo

Expected outcome and next possible steps

- To cut costs and increase quality of ready meals
- To scale the solution in the region and beyond

Benefits for Helsinki Region

- To reduce costs for local café, restaurants and food processing companies
- To create opportunity of scaling for local café, restaurants and food processing companies
- To develop new types of food products
- To create new jobs and increase tax revenue in the region

Timeline and actions

- June 19 - set up AEF testbed and lab in Helsinki
- June - Aug 19 - perform series of tests for local companies and validate the results

Project 3. Sustainable food chain

Goals of the project

- To evaluate a potential reduction of food waste in Finland due to new technologies
- To form a Consortium of Finnish manufacturers of equipment for food processing industry
- Processing food locally in the places of origin, supply ready meals via conventional cold chain to the places of consumption

Expected outcome and next possible steps

- To start producing freezing chambers with AEF in cooperation with Kometos Oy
- Reduced food waste due to processing food locally in the places of origin

Benefits for participants

- For consumers – frozen food tasting as fresh one; less time for food shopping and cooking; reduced carbon footprint
- For manufacturers of food processing equipment – new market opportunities
- For café, restaurants and manufacturers of food – reduced costs, increased efficiency, new market opportunities

Timeline and actions

- 2H19 – forming the Consortium - classification of manufacturers and technology solutions, technical feasibility assessment, sign agreements
- 2020 - a first export project of the Consortium
- 2021 - 2022 – scaling

Contact information



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