

FOCHR

HYDROCAVITATOR TECHNOLOGY

Fluid foods pasteurizer and homogenizer
based on Centrifugal Hydrocavitation Reactor



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The **FCHR project**, submitted in the **Seventh Framework Programme** of the European Commission under the 'Research for the Benefit of SMEs' call on 6th December 2011 **has received funding** from the **Research Executive Agency** and **officially started on 1st September 2012** under Grant Agreement no. 315134.

THE CONTEXT

The EU food and drink industry is the largest manufacturing sector in the EU, the dairy industry in particular being dominant in the world market. Furthermore, the EU is the biggest exporter of dairy products in the world and the export value is continuously growing. The sector is made up of about 310.000 companies, and provides jobs for more than 4 million people, even if dairy farming is structured differently from member State to member State.

However, this sector is demanding for technological solutions to two main challenges:

1. Improving competitiveness of the processors, and
2. Delivering innovations linked to the health and well-being of consumers

Alternative, non-thermal solutions for realizing pasteurization and homogenization are being studied worldwide (such as pulsed electric field – PEF, or sonication through ultrasounds – US, etc.). These approaches are indeed more efficient in energy terms with respect to common thermal treatments, but present the main drawback of the difficult scalability.



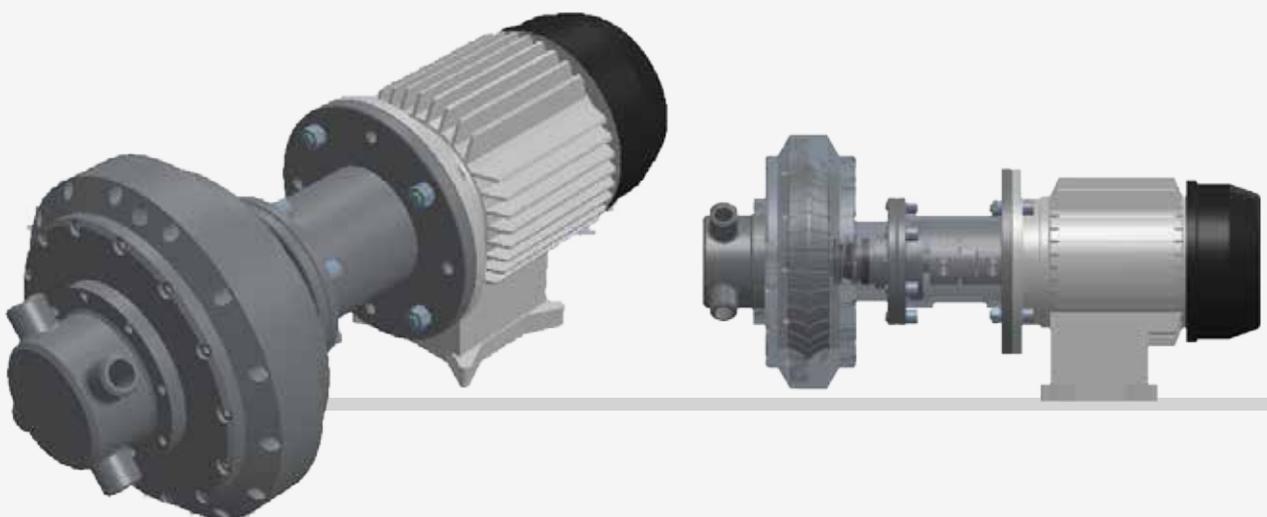
A growing need for innovation is therefore emerging, mostly related to the customers' need for novel, **more efficient and more sustainable food treatment processes** – like pasteurization and homogenization – to yield an improved impact on the nutritional content and quality of food; innovation around processes such as pasteurization and homogenization could potentially have an enormous impact on SMEs in particular, as these represent the highest percentage of companies involved in milk processing and dairy and beverage productions.

THE PROJECT OBJECTIVES

In **FCHR project** we propose the implementation of an **integrated pasteurizer and homogenizer** for fluid foods based on an alternative approach induced only by mechanical means: **controlled hydrodynamic cavitation**, which consists in the generation of huge amounts of energy in the form of shock waves, due to the turbulence produced in a fluid by pressure fluctuations.

Starting from the promising results obtained in other applications, in fact, the intention of the project partners is that of specializing the concept of the Centrifugal hydrocavitation reactor (CHR) to the needs of the food sector, producing a reactor that can act both as pasteurizer and homogenizer in a single process step, with an outstanding advantage for the food manufacturers in terms of energy efficiency and quality of the product.

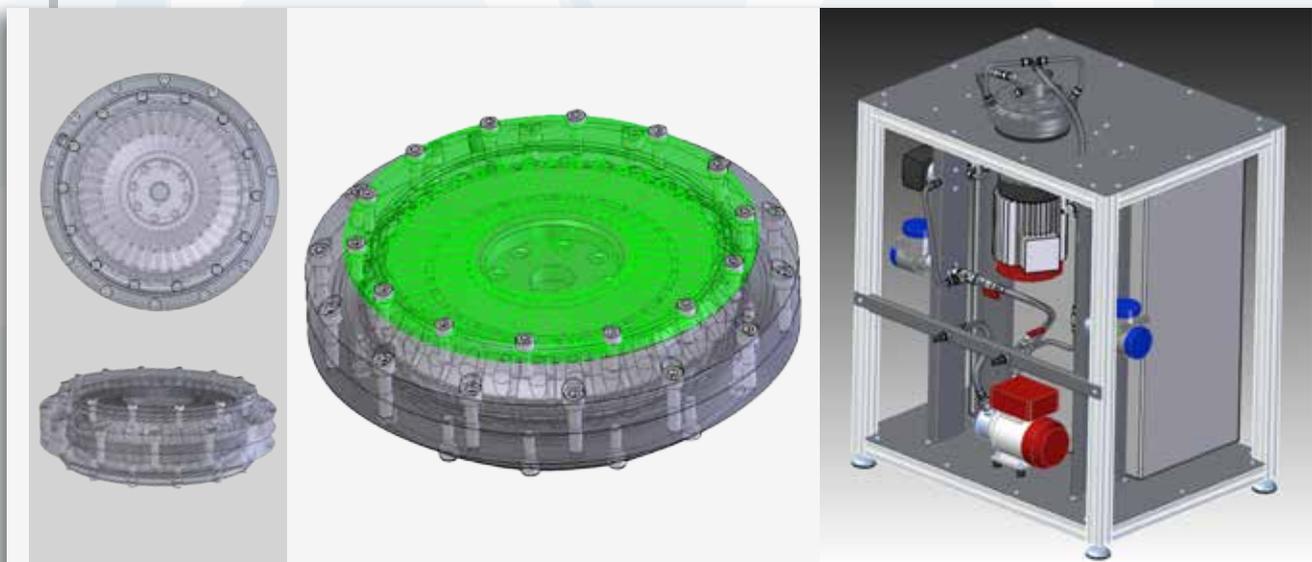
The strategic value statement of the project is that of increasing the competitiveness of fluid foods producers, thanks to process intensification and energy efficiency while keeping the integrity of food nutritional and flavour attributes unchanged.



THE BENEFITS OF THE FCHR TECHNOLOGY

As a mechanical treatment, the innovative process we want to introduce with the FCHR will bring the following advantages to the dairy and the Food & Drink EU companies:

- **High scalability:** the system will be easily scalable, with potential for use of parallel reactors with flow rates of several thousand liters per hour.
- **Energy saving:** it has been estimated that the FCHR process will allow for **an energy saving of about 20%** with respect to the actual expenditure for a milk processor; this is an important advantage of the FCHR technology, as pasteurization is the most energy-demanding process, and so energy saving becomes a crucial target for the project;
- **Quality of food:** Lower temperatures may be needed to achieve the same pasteurization effect, thanks to the cavitation energy at lower temperatures. This reduces the degradation of the nutrients and preserves the flavour of the food (e.g., white colour being enhanced, while quality problems such as “sweet curdling” due to enzymatic action and oxidation is minimized). The new process might grant higher digestibility, especially in the case of milk.
- **Energy Efficiency:** thermal efficiency of heating $> 90\%$, as in conventional heat exchangers.



With respect to state of the art technologies for pasteurization and homogenization, the FCHR technology will therefore bring to:

- The implementation of 2 processes in the same device,
- Lower operation temperatures to achieve the same pasteurization grade,
- An improvement in the product quality,
- A balanced microbiological and enzyme inactivation, in line with conventional thermal processes,
- A reduced fouling during processing of whey protein-enriched dairy-based beverages,
- An easy design and plant scalability.

The FCHR technology will potentially be applicable to **all fluid foods in which pasteurization and homogenization is needed:**

- all products in the dairy industry
- emulsions of flavourings
- fruit nectars
- vegetables puree
- egg yolks
- sauces and tomato sauces
- Infant formula, etc.

PROJECT DETAILS

Start date of the project: 1st September 2012

Duration: 24 months

Total EC funding: 895.000€

The FCHR Consortium:



www.wixta.com



www.fenco.it



www.eletricars.com



www.labor-eu.net



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UCC

University College Cork, Ireland
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www.ucc.ie/en/fns



www.glenilen.com

Università di Roma



Tor Vergata

web.uniroma2.it

Message from the SMES

Fenco is a manufacturer of food processing plants; in traditional pasteurisation processes the products are stressed by heat and holding time at the a pasteurisation temperature to reach the microbiological inactivation . Our customers are very sensitive to reduce the thermal exposure of the fruit juices or puree to the minimum. The treatment of such products by means of the FCHR reactor having the target of pasteurizing products with a minimum increase of temperature, will represent a very important step for the stabilisation of the quality and of organoleptic aspects that our customers will surely appreciate.

Electricars Ltd is a company located in Malta, that entered the Consortium for its interest in the revolutionary objective of technological advancement that the FCHR might bring to the food industry at a global level. Electricars will put great efforts in the identification and the implementation of the best solution for electronics and control system, supplying the reactor with a special control which is able to optimize the performances of the reactor itself in terms of electric efficiency and usability, by means of a simplified user interface.

Epleblomsten as, the Norwegian producer of apple juices of the FCHR Consortium, is promoting and publicizing their involvement in this project, whose preliminary and promising results on the cavitation phenomena represent a huge potential for the apple juice treatment and production to show even higher quality, at a reduced energy consumption and associated costs.

Glenilen Farm are delighted to be involved in this exciting project which if successful will make dairy processing much more sustainable than the traditional methods we know now. Also it will yield products with their natural taste and nutritional value preserved to a greater degree than if processed in the traditional manner.

Wixta Industries, as Project Coordinator and first proposer of the FCHR, after years of intense research focused on the implementation of a hydrocavitation reactor in order to obtain the best production with a high energy efficiency, without losing any nutritional quality of the treated food, which is what the company is expecting as a result from the project. The hydrocavitation effect, in fact, applied to fluid foods, is promisingly revolutionary and aims at obtaining more efficiency in the existing pasteurization and homogenization processes, thus making them cheaper, and allowing for high quality of the process and of the final product.

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