Seafood sustainability: Reducing energy, water and costs in seafood processing

SEAFOOD TOMORROW
NUTRITIOUS, SAFE AND SUSTAINABLE SEAFOOD FOR CONSUMERS OF TOMORROW


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SUMMARY

Seafood processing is an industry which demands high volumes of water to transport, clean and preserve seafood, and high amounts of energy for power, cooling, cooking, drying and sterilizing equipment. This knowledge output provides two novel strategies for use in processing ready-to-eat seafood products (i.e. fish soup) to 1) save energy and 2) save water. These strategies can also be adapted for other equipment. The protocols are based on innovative technologies for drying, pasteurising and sterilising, which save energy and are more environmentally friendly, while maintaining the original beneficial properties of the food and eliminating pathogenic and spoilage microorganisms. The research compared the amount of energy and water used in conventional technologies to alternative innovative technologies, while also considering food safety and quality. The results show that implementation of this knowledge has the potential for significant economic and environmental savings in the medium to long term. However, high initial investment costs are a challenge.

KNOWLEDGE NEED

The food and drinks industry are energy and water intensive, accounting for approximately 1.8% of Europe's total water use, and 5.3% of global energy use. In particular, the seafood industry requires large volumes of water for processing (19.5m^3 of water per ton of fish). Similarly, large amounts of energy are needed for various processing steps. The reduction of energy and water consumption and compliance with the Industrial Emissions Directive (2010/75/EU) is a serious challenge to the fish processing industry in Europe. There is an urgent need for more cost-effective and environmentally friendly technologies or protocols to ensure sustainability of the seafood sector, to improve consumer perception, and to support growth in the industry.

RESULTS

To date, very few studies have been carried out to compare innovative and conventional technologies for food processing. In this study, technologies used for processing ingredients and preparing a commercially available ready-to-eat fish soup were assessed in terms of energy and water consumption. Freeze drying, the conventional method used to dry ingredients, was compared with Refractive Window Drying (RWD). Ultra-Heat Treatment (UHT), the conventional method used to pasteurise or sterilize the soup, was compared with High-Pressure Processing (HPP), Radio frequency heating (RF) and Thermal solar energy (TSE). The technologies were compared on both energy and water consumption as well as physicochemical and sensory characteristics of the final product, shelf life, nutritional value, investment cost, and operating cost. The results show that the commercial application of the alternative technologies can save the industry both energy and water costs. These technologies have no negative impact on product quality or safety, and, in some cases, sensory properties of ingredients were improved. Initial investment costs appear to be the main barrier in implementing this knowledge output.

IMPACTS

This knowledge contributes towards ensuring sustainable production and processing of aquaculture-derived food products and improving consumer perception of the seafood industry. After the initial investment, this knowledge output has the potential to reduce water consumption by 85% and energy by 75% and save €60/m^3.

Contributes to the UN Sustainable Development Goal 12: Responsible consumption and production.

END-USERS & APPLICATIONS

Seafood producers: can use the knowledge to reduce water and energy use and promote aquaculture as a sustainable and environmentally friendly sector

Scientific community: researchers working in the area of seafood sustainability can use the knowledge and data to support further Research and Development on other alternative technologies and to extend this assessment to other food products.

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DISSEMINATION AND EXPLOITATION

Exploitation activities for seafood industry:

- Horizon Results Platform: seafoodtomorrow.eu/horizon-results-platform
- Seafood manufacturers have been reached in France, Spain and Belgium through project activities, and through video demonstrations at the **SEAFOOD**TOMORROW demonstration workshops in France and Spain (February, March 2021).

Dissemination activities for consumers:

- Managers, regulators and policy makers will be reached through the final **SEAFOOD**TOMORROW event, EC info session, and a dedicated EU policy event.

Scientific publications:

- Harrison Tetteha, Israel Muñoz, David Alonso Baptista de Sousac, Maria Dolors Guardiab, Geertrui Vlaemynckd, Marta Schuhmchera, Carmen M. Torres. Environmental impact evaluation through LCA of novel ready-to-eat seafood processing methods to reduce energy and water consumption. *Manuscript in preparation*
- Israel Muñoz, David A. Baptista de Sousa, Maria Dolors Guardia, Carlos J. Rodriguez, Maria Leonor Nunes, Helena Oliveira, Sara C. Cunha, Susana Casa, Antonio Marques, Ana G. Cabado. Comparison of different technologies (conventional thermal processing, radiofrequency, thermal solar energy and high-pressure processing) for high quality and sustainable fish soup pasteurization. *Manuscript in preparation*
- Open access versions of publications: please see seafoodtomorrow.eu
- Open access validated datasets: please see seafoodtomorrow.eu

Dissemination activities for society / all users:

INNOVATION STATUS

Technology Readiness Level 7 - system prototype demonstration in operational environment

Patents and IPR: Not applicable

FUTURE RESEARCH

Further testing is needed to fully evaluate the potential of Thermal Solar Energy as an energy saving strategy for year-round use. The potential impacts must be showcased to seafood processors using conventional methods who might be interested in piloting the new technologies to save on production costs.

CONTACT AND CONTRIBUTORS

Contact: Israel Muñoz Moreno **israel.munoz@irta.cat**

Contributors: IRTA, ILVO, ANFACO, CIIMAR, IPMA and the University of Oporto

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