

Seafood

HIGH PRESSURE PROCESSING (HPP) is a **non-thermal** process able to keep fresh attributes of food products.

Fresh, processed or cooked seafood products are introduced into a high pressure vessel, and subjected to a high level of hydrostatic pressure (isostatic pressure transmitted by water). **Shape and integrity remain unchanged because pressure is identical on every part of the product.** Like putting your product in the bottom of a really deep ocean.

HPP is an all natural, clean, environmentally friendly technology. HPP machines only require electricity and water, which is recycled.



Crustacean meat extraction

HPP is the only existing option to extract raw meat from rigid shell crustaceans (lobsters, king crab, snow crab...) avoiding the need of cooking. Yield is maximised and you can enter the market with a fresher new value proposition – meat without the shell that the final user will cook for the first time.

Small raw meat parts (legs, antennae) are completely extracted and allow further industrial processing for higher added value.



Extending shelf life

HPP offers potentialities for new value propositions in fish, shrimp, crayfish... With stocks depleted worldwide and huge costs related to product returns/rejects due to short shelf-life, HPP offers alternatives for New Product Development, more flexible supply chain and stock management through an extended shelf life.

Oysters, clams, mussels, lobsters, crab, shrimp, cod, hake, RTE seafood meals, these are only some examples of a wide range of seafood products that can be processed by HPP, a technique with two major applications:

- Mollusk and crustacean shucking/meat extraction.
- Cold postpackaging pasteurization for shelf-life extension, keeping freshness, maintaining higher sensorial qualities, functional properties and improving food safety.

Mollusk opening/shucking

HPP allows opening of bivalves such as oysters, mussels, clams etc. High isostatic pressure at *moderate* levels for some seconds induces relaxation of the adductor muscle responsible of keeping bivalve mollusks closed. The shells open and meat is released with maximum yield.



Ready to eat seafood meals

HPP controls microbial safety in RTE seafood. Shelf-life is increased, maintaining all the freshness of natural, original ingredients.

One of the most successful commercial HPP applications nowadays is food with a **clean label** – without sacrificing food safety or shelf life



Effects and Benefits

Elimination of micro-organisms and shelf-life increase

High pressure, between 400 MPa/ 58,000 psi and 600 MPa/ 87,000 psi from 1 to 5 minutes, reduces several logs of spoiling micro-organisms (yeast, moulds, lactic acid bacteria, psychotrophic bacteria) and pathogens (*E.coli*, *Listeria*, *Salmonella*, *Vibrio*, *Anisakis*...) in seafood products.

Shelf life is multiplied by 2 to 4 times comparing with the same product without HPP stored at same temperature. Sensorial quality is maintained much longer due to micro-organism destruction and inhibition of amines formation.

Functional & nutritional values retained

One of the main trends that is making HPP successful is the development of natural, organic, preservative-free, and functional products. HPP, as a non-thermal delicate post-packaging lethality intervention, allows development of healthier foods, bringing a higher level of functionality and nutritional values to new products.

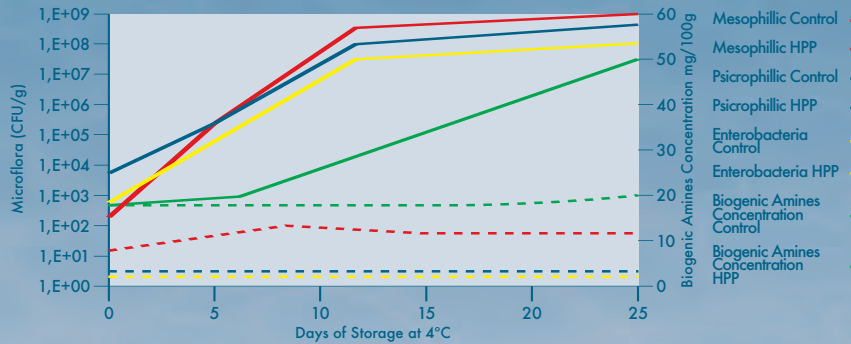
Non-thermal shucking and meat extraction

Isostatic pressure (between 200MPa/30,000 and 350MPa/40,000psi) is able to shuck mollusks or extract crustacean meat without use of heat, achieving significative yield increases from 20 to 50 % more, and greatly reducing hand labour.

During HPP shucking/extraction some of the contaminant flora present on the products is destroyed, thus extending shelf life.

An assistance and a functional approach to the process, a tool for innovation.

Total microflora of sea bream and Biogenic Amines Concentration, control vs pressure processed during 4 min at 600 MPa/87,000 psi



HPP advantages

- Shucking and meat extraction: ➤ **Better yields, less hand labor.**
- Increases shelf-life maintaining product freshness: ➤ **Expand markets.**
- Post packaging pasteurization: ➤ **Secure products.**
- Effective in eliminating pathogenic flora: ➤ **Protect the brand.**
- No impact on nutritional and functional properties: ➤ **Healthier, higher value propositions.**

Some examples of HPP products in the market

Product type	Product	Country	Pathogen control	Shelf-life increase	Yield increase / labour reduction
Mollusks	Gulf oysters	USA	✓	✓	✓
	Pacific oysters	Japan	✓	✓	✓
	Clams	Japan	✓	✓	✓
	Whelk	Japan	✓	✓	✓
	Oysters	Australia	✓	✓	✓
	Greenshell mussels	New Zealand	✓	✓	✓
Crustaceans	Lobsters	Canada	✓	✓	✓
	Lobsters	USA	✓	✓	✓
	King crab	USA	✓	✓	✓
	Crab & crayfish	USA	✓	✓	✓
Ready-to eat seafood	Salmon fillets, cooked	Spain	✓	✓	✓
	Hake fillets, cooked	Spain	✓	✓	✓
	Crab cake	USA	✓	✓	✓
	Desalted cod	Italy	✓	✓	✓
	Shrimp with vegetables	Spain	✓	✓	✓

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