

**HIGH PRESSURE PROCESSING (HPP)** is a **non-thermal** process able to retain fresh attributes of food products. HPP is an all-natural, clean, environmentally friendly technology which only requires electricity and water, which is recycled.

Raw, processed or cooked seafood products are placed 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.

Oysters, clams, mussels, lobsters, crab, shrimp, cod, hake, Ready-to-eat (RTE) seafood meals, 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.
- Non thermal antimicrobial process for shelf-life extension of RTE seafood & fish based meals, 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 a few seconds induces relaxation of the adductor muscle responsible of keeping bivalve mollusks closed. The shell will open and meat is released with maximum yield.

### 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 maximized 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 are completely extracted and allow further industrial processing for higher added value.



### ◀ READY-TO-EAT SEAFOOD MEALS

HPP controls microbial safety in RTE seafood. Shelf-life is increased, maintaining all the freshness of natural, original ingredients. Presently, one of the most successful commercial HPP applications is food with a clean label which does not compromise on food safety or shelf-life.

### EXTENDING SHELF-LIFE ▶

HPP offers the potential 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.

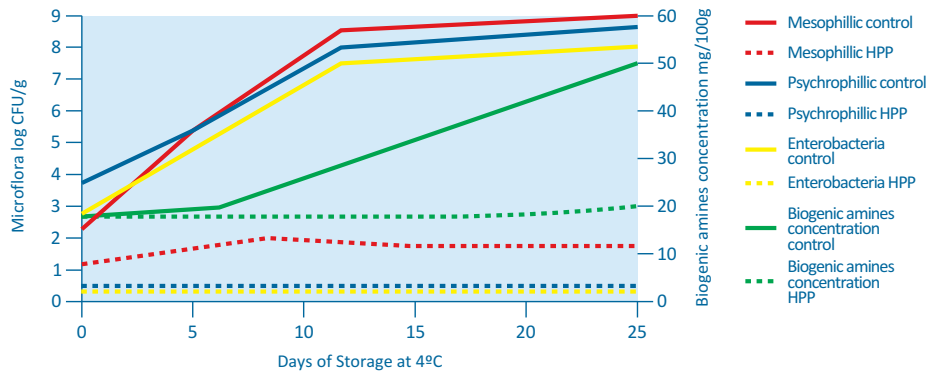


## ELIMINATION OF MICRO-ORGANISMS AND SHELF-LIFE INCREASE

High pressure, between 400 MPa / 4000 bar / 58,000 psi and 600 MPa / 6000 bar / 87,000 psi from 1 to 5 minutes, reduces several log of spoiling micro-organisms (yeast, molds, 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.

**Total microflora of sea bream and biogenic amines concentration, control vs pressure processed during 4 min at 600 MPa/6000 bar/87,000 psi**



## 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, which allows for the 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 200 MPa / 29,000 psi and 350 MPa / 50,000 psi) is able to shuck bivalves or permit crustacean meat extraction without use of heat, achieving significant yield increases from 20 to 50% more, and greatly reducing hand labor.

## HPP ADVANTAGES

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|---|---|--|
| • Shucking and meat extraction:                       | ➤ | <b>Better yields, less hand labor.</b>       |
| • Increases shelf-life maintaining product freshness: | ➤ | <b>Market expansion.</b>                     |
| • Post packaging lethality process:                   | ➤ | <b>Safe products.</b>                        |
| • Effective in eliminating pathogenic flora:          | ➤ | <b>Protect the brand.</b>                    |
| • No impact on nutritional and functional properties: | ➤ | <b>Healthier, higher value propositions.</b> |