

A close-up, high-angle shot of a speedometer. The needle is black and points to the 6000 mark on a light blue dial. The dial has several tick marks, and the number '6000' is printed in large, bold, black font. The speedometer is housed in a metallic, brushed metal casing.

6000

MULTIVAC HPP

An innovative preservation technology



MULTIVAC
BETTER PACKAGING

HPP Principle

The primary aim of treating foods with High Pressure Processing (HPP) is to reduce or eliminate the relevant foodborne microorganisms, thereby extending the shelf-life and enhancing the food safety.

With HPP, food producers can meet the rising consumer demand for foods that are safe and nutritious, free from additives, good tasting and have a long shelf life. This gives customers extra convenience. Fresh and processed food or ready-to-eat meals with a superior quality can be stored and consumed over an extended period of time.

Each HPP system consists of one or more HPP vessels and a pressure-intensifier system. For HPP, typical pressures up to 6000 bar (87000 psi) are used to destroy undesired spoilage microorganisms in foods, even at room temperature. By this processing technology, degradation of vitamins and flavor is reduced to a minimum.

A fundamental advantage of HPP is that the high pressure is applied in an homogeneous manner over the entire product, unlike heat processing, where temperature gradients are unavoidable.



Advantages of the HPP process

- Increased product shelf life – even for food which is sensitive to heat
- Low-temperature preservation method: no loss in product quality compared to heat pasteurization
- Enhanced food safety due to inactivation of spoilage organisms and relevant foodborne pathogens
- Processing in final consumer packaging is possible (no recontamination)
- Additive-free preservation of food by using only pressure
- Production of “natural”, safe value-added food with a superior quality
- Homogenous effect of HPP:
Results are independent of product size and geometry
- Further benefits like large yield increase compared to traditional processes (e.g. extraction of lobster meat from the shell)
- Waste-free and environmentally friendly, sustainable technology – only water and electricity are needed

HPP-treated products already successful on the market.

Typical areas of applications:

- All kinds of meat products
- Ready-to-eat meals
- Vegetables
- Sauces, marinades
- Fruits, fruit juices and desserts
- Dairy products
- Processed fish and seafood
(mostly for shucking and yield increase)
- Applications for Research & Development



HPP solutions by MULTIVAC

High Pressure Processing is in principle suitable both for modified atmosphere (MAP) and vacuum packaging. A combination of MAP with HPP requires special know-how. With 50 years experience in packaging, MULTIVAC has enhanced HPP in combination with MAP. MULTIVAC offers packaging solutions suitable for HPP, which makes them unique in the world.

In many cases MAP outperforms a vacuum package, e.g. in terms of product appearance or convenience, but can be technologically more challenging in combination with HPP. On the other hand, it can lead to positive synergistic effects in terms of shelf life extension.

Important issues for all HPP-packaging solutions are:

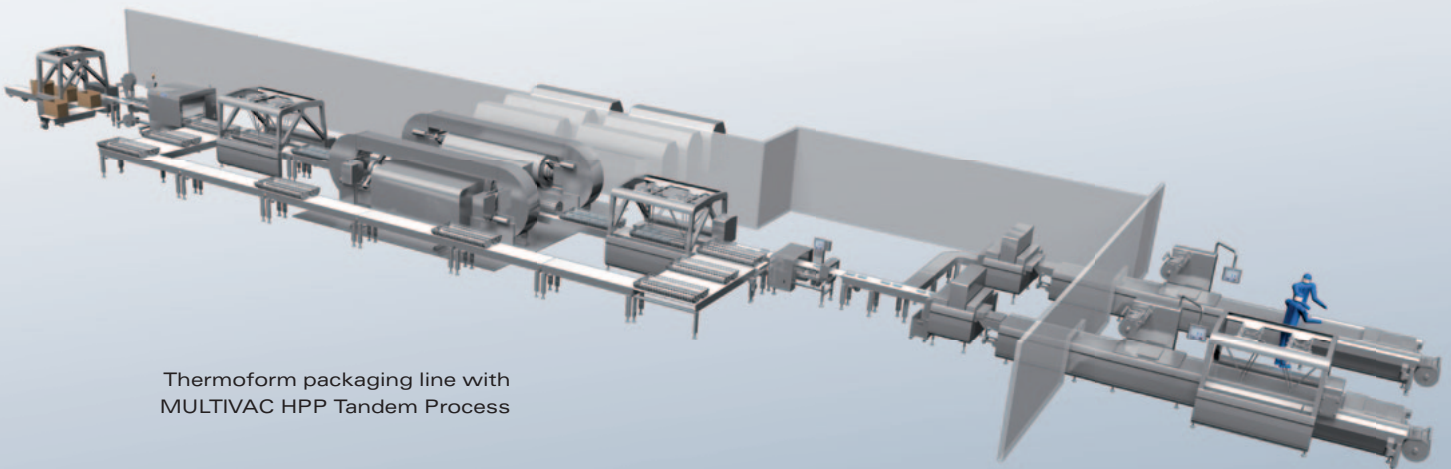
- Overall HPP process control – MULTIVAC HPP (patents pending)
- Package design, geometry and format
- Packaging films and film laminate structure
- Type and formulation of product

MAP or vacuum packaging requires a sophisticated packaging solution. Suitable concepts especially for High Pressure Processing with MAP-packages are crucial to prevent negative side effects for both product and packaging. With decades of expert knowledge in packaging solutions, MULTIVAC can assist you in finding the best packaging solution.



MULTIVAC packaging lines for HPP

- Fully automated and integrated HPP packaging lines
 - MULTIVAC offers efficient, fully automated and integrated production lines for maximum throughput
 - Continuous production flow
 - All necessary modules integrable, e.g. loading and unloading robot, inspection, labeling, weighing, metal detector, cartoner, etc.
 - Higher filling degree by optimized automated loading patterns
 - Savings in personnel costs
- Turn-key solutions from MULTIVAC
 - Shortens reaction times and enhances information flow
 - Optimized integration of all line modules
 - High throughput with balanced performance for better durability
- Integrated MULTIVAC quality control and inspection systems:
 - For absolute product and process safety
- Highest safety standards and ASME/ISO certification for HPP
 - MULTIVAC and Uhde High Pressure Technologies (HPT) are able to respond to all demands of our customers on an international level
- MULTIVAC: one of the world's leading suppliers of packaging solutions
 - Highest hygienic standards for food safety
 - Quickest reaction time and spare parts delivery in the market
 - Over sixty subsidiary companies on all continents
 - More than 800 technical experts and service technicians worldwide
- Uhde HPT: 80 years experience in high pressure technology
 - Engineering quality "made in Germany"
 - Uhde High Pressure Technologies – a company of ThyssenKrupp AG



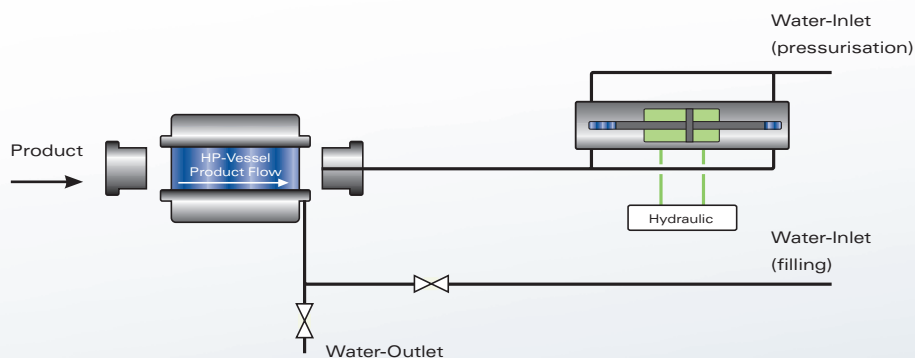
Thermoform packaging line with
MULTIVAC HPP Tandem Process

Process description

HPP can be easily integrated into your typical manufacturing process. The product is pressure treated in its final packaging.

1. The loading baskets are filled with your packaged product.
2. The loaded baskets are transported into the high pressure vessel.
3. The vessel is closed and filled with water.
4. Everything within the vessel is compressed to the desired final pressure (up to 6000 bar / 87000 psi).
5. The pressure is held for a precise period of time (typically 3 minutes).
6. The vessel is depressurized to atmospheric pressure (1 bar / 14,7 psi).
7. Finally, the loading baskets are removed from the vessel and the products are unloaded. The vessel is ready for the next cycle.

HPP systems from MULTIVAC provide semi-continuous or batch processes with capacities ranging from 55 to 700 (2x 350) liters.



HPP Tandem Process

By using a HPP-Tandem unit with two 350liter vessels working together intermittently (one vessel is being pressurized while the other vessel is emptied and refilled with packages), the overall system is semi-continuous to ensure highest throughputs of up to 4 tons of product/hour.

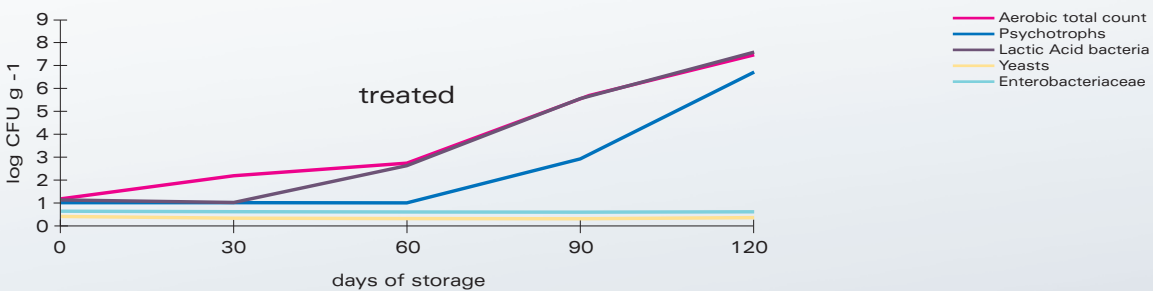
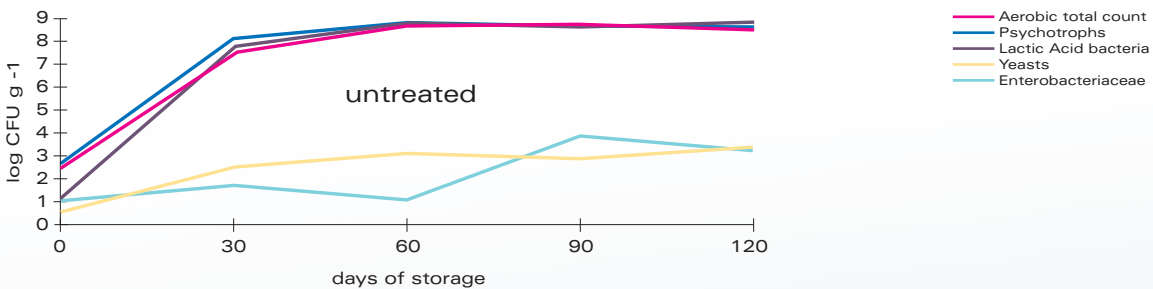
Scientific background

RTE meats: No deterioration in sensory quality or difference in consumer acceptability, 10^4 CFU/g reduction in *Listeria monocytogenes* (600 MPa, 20°C for 3 min.), extension of refrigerated shelf life (Hayman et al., 2004)

Hot dogs: Reduction of infectivity of prions in inoculated hot dogs, thus ensuring safety of processed meat products from Bovine Spongiform Encephalopathy (Brown et al., 2003)

Raw sausage: Complete inactivation (10^8 CFU/g) of *E. coli* (500 MPa for 10 min.) and *Listeria innocua* (300 MPa for 15 min.); no *Salmonella* or *Listeria* in samples detectable (Krzikalla, 2007)

Example for shelf life extension by HPP (sliced vacuum-packed cooked ham)



Data source: M. Garriga, N. Grébol, M.T. Aymerich, J.M. Monfort, M. Hugas, Microbial inactivation after High-Pressure Processing at 600 MPa in commercial meat products over its shelf life. *Innovative Food Science and Emerging Technologies* 5 (2004), p. 451 – 457

Machine portfolio	Mono Process			Tandem Process
	HPP 055	HPP 160	HPP 350	HPP 700
Vessel volume:	55 L	160 L	350 L	2x 350 L
Maximum pressure:	6000 bar (87000 psi)	6000 bar (87000 psi)	6000 bar (87000 psi)	6000 bar (87000 psi)
HPP System dimension approx. (LxW): * (without pump system)	7,5 x 3,0 m	8,5 x 4,0 m	14,0 x 4,0 m	14,0 x 9,0 m
System weight approx. (t):	17	45	55	100
Max. treatable volume: (typical filling degree)	< 240 liter/h (35 - 60 %)	< 1000 liter/h (60 - 80 %)	< 1,900 liter/h (60 - 80 %)	< 5,000 liter/h (60 - 80 %)
Cycle time: ** (incl. 3 min. pressure holding time)	7,0 - 8,5 min	7,2 - 8,3 min	7,0 - 9,0 min	3,5 - 5,0 min

* Depends on customer installation

** Cycle duration depends on number of pressure intensifiers, kind of product, filling degree of the loading baskets, process pressure, holding time

MULTIVAC and Uhde HPT



To offer HPP as a new preservation technology to our customers, MULTIVAC has entered a strategic partnership with a specialist in high pressure solutions.

Uhde High Pressure Technologies is a German associated company of ThyssenKrupp AG.

As the world market leader in thermoform packaging machines, MULTIVAC is proud to set and continually raise the standards in hygienic design, performance and value for every category of machinery we build. Over sixty subsidiary companies on all continents and a worldwide sales and service network guarantee our customers the best support in the industry.

Uhde HPT has more than 80 years experience in design, fabrication, erection, commissioning and world-wide support for high pressure equipment.

MULTIVAC is your first address when it comes to HPP.
Challenge MULTIVAC to produce your superior packaging solutions.

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