

FresherTech: Next Generation HPP

High pressure processing (HPP) technology has not significantly advanced since its invention in the 1950's. The most common chamber design has remained essentially unchanged. This technology has been transplanted into the food industry without major reengineering to accommodate the different requirements that food and beverage production place on HPP systems.

The great weaknesses of first generation HPP are the high cost, low capacity and the now-apparent problems with safety and reliability. The FresherTech HPP system addresses all of these weaknesses to such an extent that it truly represents the next generation of HPP. Although these improvements are modest and incremental in a technical sense, they are so profound in their effect that they will truly revolutionize HPP in the food industry.

The cost savings achieved by the FresherTech system come from several different sources. Together, they stand to reduce costs dramatically. Capital cost savings are 40-60% or more relative to the competition. FresherTech's multi-chamber design allows continuous operation without requiring the prohibitively expensive purchase of two complete systems. This means crews can work more continuously with less stoppage.

FresherTech has also added small but significant touches like custom baskets designed to fit particular products and carts designed to carry the baskets. A basket that is designed to handle a particular package can be loaded and unloaded more quickly than an open basket. Rather than careful placement in the basket by a trained crewmember, the package is merely dropped into the slot in the basket. Times can be reduced by up to 10% or more. Because loading/unloading is a significant percentage of the cycle time, this results in noticeable increases in throughput. The carts improve ergonomic efficiency and can reduce cycle time even further.

Another benefit of using custom baskets is the capability to automate the loading and unloading process. Some HPP crews comprise a dozen people or more. In those cases it may make sense to automate the loading/unloading process. FresherTech North America can provide complete turnkey solutions including full automation. Automation provides the greatest improvement in throughput and efficiency.

Even when automation is not chosen, comprehensive design of the entire process is critical to achieving maximum efficiency. That involves everything from the processing line itself to the packaging to ergonomics. HPP vendors have generally been weak in some or all of these areas. FresherTech learned this as a former customer of one of the largest HPP vendors and decided to become a solution-oriented company rather than a hardware-oriented company. Only the most sophisticated companies are able to successfully transition to HPP without support. Some HPP vendors have not been as solution-oriented as customers need them to be. FresherTech has learned that lesson and focuses on customer success.

FresherTech North America provides the systems expertise needed to take the average customer all the way through to an efficient, smoothly running HPP operation. That includes engineering and construction as well as consultation in formulation, packaging and regulatory requirements like HACCP. It is a truly comprehensive solution.

These are not the only ways that FresherTech is reducing costs. FresherTech offers numerous sizes and configurations in a flexible and modular architecture. With chamber sizes in 100, 200, 300, 400 & 500

liters and 1, 2 or 4 chamber designs (and several smaller R & D systems), there are an amazing number of options available to the customer. Furthermore, the modular plug-and-play architecture and pricing is designed so that customers may quickly and easily upgrade from a one-chamber system to a two-chamber system with almost no penalty versus buying a two-chamber system. This allows customers to right-size the system for both current need and future growth. Anyone who has worked with the other HPP vendors knows that upgrades are both expensive and painful.

Another benefit of the FresherTech system's modular design and light weight is that it can be placed in a wider range of footprints and does not typically require upgrades like thicker footings which is common with the heavier systems offered by the competition. In many cases, the time and cost involved with these improvements is simply too much.

The final cost factor is the life expectancy and operational cost of the system. The FresherTech system is surprising low maintenance and is expected to run 10 years before a major refit is required. Most HPP vendors run 4 to 8 intensifiers which are relatively high maintenance and require rebuild after a short number of years. FresherTech uses a 2 intensifier system for each chamber that is expected to last more than 10 years with nothing more than periodic seal replacement. The intensifier runs quietly and is co-located with the chamber rather than being placed in another room like other HPP systems.

Saving the best for last, the greatest improvement that FresherTech has introduced is its chamber design. This improvement is so important that eventually all HPP vendors will be forced to incorporate some variation of this design.

The vendors that currently dominate the North American and European markets use the original HPP chamber design that utilizes an un-stressed steel cylinder wound with thin wire. This design works well for many of the industrial processes such as industrial diamond manufacturing that drove the development of the technology many years ago.

It was believed that this design would sufficient for the food processing industry. Unfortunately, this has not proven to be true. Industrial processes have long cycle times while food processing has a cycle time of 8-10 minutes. That translates into many times the number of cycles and a corresponding reduction in the life of the cylinder. To make matters worse, food plants tend to have much more moisture and moisture trapped in the windings can lead to corrosion. High cycle fatigue and corrosion can lead to failure of the chamber. Such failures on wire wound systems are occurring more frequently and within a short cycle life. Addressing the problem by adding more metal will make the chambers even heavier and more costly.

FresherTech has taken a completely different approach to chamber design. The FresherTech cylinder starts with a process call autofrettage. A die is driven into the cylinder with great force. This stretches the cylinder beyond the elastic limits (i.e. it is permanently stretched). The inner wall of the cylinder is stretched more than the outer part, so that when the cylinder tries to return to its original size, the outer part of the cylinder squeezes the inner wall. This is a permanent compression stress on the inner wall. Now, in order for the inner wall to experience tension, the cylinder must be stretched again past the point where it is exerting compression stress on the inner wall. Under normal operating pressures this will never happen.

The result is that fatigue is greatly reduced and the cycle life of the chamber is extended accordingly.

The next step in the process involves taking a heated outer sheath and sliding it over the cylinder.

When the outer sheath cools it squeezes the entire cylinder even further. In the unlikely circumstance where the cylinder cracks, the outer sheath provides a more resilient containment mechanism than thin wire windings. It is not nearly as subject to corrosion or failure as a thin wire.

After the outer sheath is applied, a final proprietary process is used to further improve the strength and reliability of the chamber.

The chamber itself is held inside a laminated steel frame. Instead of a single casting that fails entirely if it is flawed at any point, a laminated frame consists of several castings. The weakest points of each casting are in different places, so that as a whole the frame is unlikely to have any weak points. The lamination process is an advanced process that is unlike the lamination used by some of the competitors. It produces a much lighter frame using less material while retaining the same strength.

FresherTech call these advanced processes REETech™ or Resource Efficient Engineering Techniques. These advanced manufacturing techniques are the result of a unique technology sharing arrangement with the Chinese government. This technology allows FresherTech to produce lighter systems at a lower cost than the competition. REETech™ also makes the FresherTech system dramatically safer and more reliable than the competition.

The FresherTech system is not an all-Chinese solution, however. It is a best-of-breed system that uses Japanese controls, American sensors and Swedish hoses. The Omron PLC is standard but can be substituted with Allen Bradley, Siemens or any other PLC on Request. High efficiency motors are optional and will be standard in the next series of models.

FresherTech's best-of-breed approach pays off when it comes to maintenance. Using industry standard maintenance cost estimates, a 2 chamber system with 300 liter chambers will cost around \$2.60 per cycle for a 2-shift operation. That compares to over \$6 per cycle for the major competitors.

FresherTech has created a system that is stronger, lighter and safer than the competition - and more affordable. FresherTech North America is delivering a comprehensive solution to ensure customer success. This is truly the next generation of HPP.

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