



EXTENSION

FAPC-259

High-Pressure Processing (HPP): Reducing food loss, managing risk and extending shelf life

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Purpose

This fact sheet provides Oklahoma food processors with an applied overview of High-Pressure Processing (HPP) as a food safety and shelf-life extension technology. Emphasis is placed on food loss reduction, regulatory considerations and risk management, consistent with FAPC's mission to support value-added food manufacturing and market readiness.

What is High-Pressure Processing?

HPP, also referred to as high hydrostatic pressure processing, is a nonthermal food preservation technology that uses extremely high pressure — typically 300 to 600 MPa — applied uniformly to sealed, flexible food packages. The process inactivates vegetative foodborne pathogens and spoilage microorganisms without the use of heat.

Because HPP is applied after packaging, it reduces the risk of post-process contamination and allows foods to retain a fresh-like quality while achieving significant refrigerated shelf-life extension. HPP is primarily used for refrigerated foods and does not produce shelf-stable products.

HPP is generally most effective for foods with higher moisture content because pressure is transmitted through water. Product formulation, package design and storage conditions can affect process effectiveness and final product quality.

Flexible packaging that withstands high-pressure conditions without seal failure is required for HPP applications.

Relevance to Oklahoma food processing

Many Oklahoma food businesses operate within regional refrigerated supply chains and produce foods with limited code life. Short refrigerated shelf life can restrict distribution distance, limit market access, increase product discard and reduce profit margins.

When validated and properly implemented, HPP can address these challenges as part of a comprehensive food safety and quality system.

How HPP extends shelf life

HPP inactivates vegetative microorganisms and selected spoilage enzymes while maintaining product safety and quality. Peer-reviewed research demonstrates two- to four-fold increases in refrigerated shelf life, depending on formulation, packaging and storage conditions.

- Ready-to-eat meats: approximately 4 weeks to 8–10 weeks
- Cold-pressed juices and smoothies: approximately 7–10 days to 30–60 days
- Fresh salsas and guacamole: approximately 10–14 days to 30–45 days

Actual shelf-life outcomes vary by product formulation, packaging and storage conditions.

Shelf-life extension and food loss reduction

Shelf-life expiration is one of the most common causes of food loss in refrigerated product categories. Extending safe refrigerated shelf life can allow longer selling windows, reduce retail returns, improve inventory turnover and lower processor write-offs.

Estimated impact on food loss

Based on national food waste analyses, approximately 66 million tons of edible food are wasted annually in the United States. Roughly one-quarter of this waste occurs in refrigerated product categories suitable for HPP.

Conservative estimates suggest that 1.6 to 3.3 million tons of food per year could remain in commercial channels through shelf-life extension enabled by technologies such as HPP.

Products commonly evaluated for HPP at FAPC

- Refrigerated ready-to-eat meat and poultry products
- Fresh or refrigerated beverages
- Dairy-based drinks
- Fresh salsas, sauces and dips
- Plant-based purees and prepared foods
- Seafood and specialty protein products

Food safety and regulatory considerations

HPP is a process control and does not replace required food safety programs. Processors must continue to follow Good Manufacturing Practices, HACCP or Preventive Controls and all applicable FDA or USDA regulations.

USDA-FSIS recognizes HPP as a post-lethality intervention for ready-to-eat meat and poultry products. FDA considers HPP a process control that must be scientifically validated and documented.

Insurance and risk management considerations

There is no peer-reviewed evidence demonstrating direct insurance premium reductions attributable solely to the adoption of HPP. Insurance pricing is based on overall risk exposure, including recall probability, loss severity and liability history.

When properly validated and integrated, HPP may reduce pathogen prevalence, improve post-lethality control and lower recall risk — factors commonly evaluated by insurers.

Economic considerations for processors

Potential benefits associated with HPP adoption include reduced losses from expired code dates, expanded market opportunities, improved production flexibility, enhanced sustainability performance and potential improvements in buyer or insurer confidence.

Capital and operating costs should be carefully evaluated alongside anticipated reductions in food loss and market expansion opportunities.

Key points

- HPP is a validated nonthermal technology for refrigerated foods.
- Shelf-life extension is a major driver of food loss reduction.
- HPP does not guarantee insurance discounts, but can reduce risk exposure.
- Product-specific validation is essential.
- FAPC can assist with feasibility evaluation and technical guidance.

FAPC support

The Food and Agricultural Products Center provides technical assistance related to product and process feasibility, shelf life and food safety considerations, regulatory pathway guidance, process authority coordination and market-readiness assessment.

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Peer Reviewed

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