

H I G H - P R E S S U R E P R O C E S S I N G

J U I C E & B E V E R A G E S



***Fresher Under Pressure*® Provides the Highest Quality Juice with Extended Shelf Life**

***Fresher Under Pressure* Provides What Consumers Want and Producers Need**

Consumers expect premium juice not only to be safe, but also to have fresh, just-squeezed appearance, flavor, natural texture and nutrition without additives or preservatives.

Heat treatment and other processes typically change the taste and destroy vitamins. High-pressure processing (HPP) leaves juice tasting just like freshly squeezed. Extended refrigerated shelf life increases distribution opportunities, reduces returns and sensitivity to cool chain abuse, and allows more efficient production scheduling.

Juice is subjected to very high pressures (up to 87,000 psi) for less than a few minutes, resulting in the inactivation of spoilage organisms, including yeast and mold, and harmful pathogens, as well as the reduction of enzymatic activity.

HPP can achieve the FDA HACCP requirement of a 5 log reduction of microorganisms in fresh juice.

Fruit and vegetable juices retain the sensory qualities, texture, color and nutritional content of the fresh fruit product which adds great consumer value.

Juice Can be Packaged Before or After HPP

Juice can be pressurized in the final consumer package. The need for sterilizing the juice bottles prior to filling is reduced, as the microbe reduction takes place in the final consumer package. Post-intervention contamination risks are eliminated. Most plastic food packages can be used, including PET, PE bottles and stand-up pouches. Product handling can be fully automated, integrating with conventional production and packaging equipment.

It is also possible to use large bulk bags, utilizing the entire volume of the pressure vessel. The bags can be aseptically emptied into any consumer package.

Pumpable products can benefit from in-line production in the *Fresher Under Pressure* continuous system. Utilization of the full process chamber volume results in increased efficiency. After pressurization the juice is pumped to a tank, and can be aseptically filled into any package.

In-line pressurization is compatible with other hurdle steps and can be incorporated into a HACCP plan.

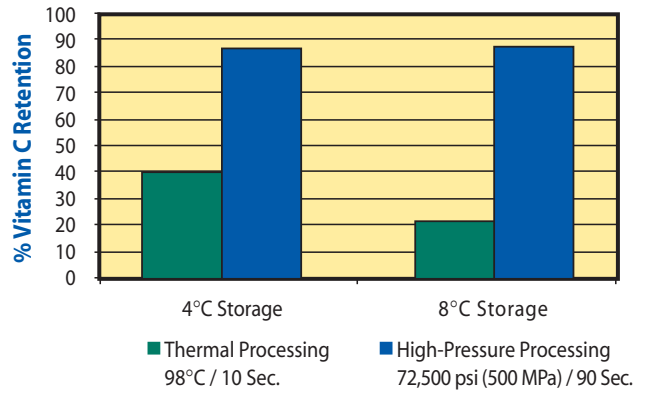
***“Fresher
under
Pressure”***

BATCH PRESSURIZATION in the Consumer Package



Cleaning > Extraction > Filling > HPP > Cold Storage/Distribution

VITAMIN C RETENTION Valencia Orange Juice After 20 Weeks Storage



Data source: University of Leuven, Belgium

FRESHLY SQUEEZED ORANGE JUICE

Pressure Inactivation of Foodborne Pathogens and Native Spoilage Organisms

Pressure	HPP Time (Seconds)	<i>E. coli</i> O157:H7 (12-Strain Mix)	<i>Salmonella</i> (13-Strain Mix)	<i>L. monocytogenes</i> (3-Strain Mix)	Aerobic Plate Count	Yeast and Mold
		MPN/ml			CFU/ml	
70,000 psi [483 MPa]	Not Treated	1.4 x 10 ⁷ CFU/ml	8.8 x 10 ⁷ CFU/ml	3.6 x 10 ⁸ CFU/ml	7.3 x 10 ⁴ CFU/ml	3.0 x 10 ³ CFU/ml
	15	0.4	<0.3	<0.3	<1.0	<1.0
	30	<0.3	<0.3	<0.3	<1.0	<1.0
	45	<0.3	<0.3	<0.3	<1.0	<1.0
	60	<0.3	<0.3	<0.3	<1.0	<1.0
80,000 psi [545 MPa]	Not Treated	1.4 x 10 ⁷ CFU/ml	8.8 x 10 ⁷ CFU/ml	3.6 x 10 ⁸ CFU/ml	7.3 x 10 ⁴ CFU/ml	3.0 x 10 ³ CFU/ml
	15	<0.3	<0.3	<0.3	<1.0	<1.0
	30	<0.3	<0.3	<0.3	<1.0	<1.0
	45	<0.3	<0.3	<0.3	<1.0	<1.0
	60	<0.3	<0.3	<0.3	<1.0	<1.0

Data source: The National Food Processors Association (NFPA), Dublin, CA

APPLE JUICE

Pressure Inactivation of Foodborne Pathogens in Apple Juice

Pressure	HPP Time (Seconds)	6 Hours Post HPP	24 Hours Post HPP	1 Week Post HPP	1 Month Post HPP
		MPN/ml			
<i>E. coli</i> O157:H7 (9-Strain Mix) at 2.8 x 10⁶ CFU/ml					
80,000 psi [545 MPa]	Not Treated	7.8 x 10 ⁵ CFU/ml	7.0 x 10 ⁵ CFU/ml	1.1 x 10 ⁵ CFU/ml	4.3 MPN/ml
	30	460	<0.3	<0.3	<0.3
	60	<0.3	<0.3	<0.3	<0.3
<i>Listeria monocytogenes</i> (2-Strain Mix) at 2.3 x 10⁶ CFU/ml					
80,000 psi [545 MPa]	Not Treated	4.2 x 10 ⁵ CFU/ml	1.7 x 10 ⁵ CFU/ml	1.2 x 10 ⁵ CFU/ml	2.7 x 10 ⁴ CFU/ml
	30	240	<0.3	<0.3	<0.3
	60	<0.3	<0.3	<0.3	<0.3
<i>Salmonella</i> (8-Strain Mix) at 9.45 x 10⁶ CFU/ml					
80,000 psi [545 MPa]	Not Treated	6.1 x 10 ⁵ CFU/ml	1.7 x 10 ⁵ CFU/ml	1.9 x 10 ⁴ CFU/ml	4.3 x 10 ² MPN/ml
	30	<0.3	<0.3	<0.3	<0.3
	60	<0.3	<0.3	<0.3	<0.3

Storage temperature: 4°C

Data source: The National Food Processors Association (NFPA), Dublin, CA / Avure Technologies Incorporated, Kent, WA



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