Juice and High Pressure Processing

Introduction

- History of HPP
- Why Use HPP
- Pasteurization vs. Pressurization
- HPP and Microorganisms
- How it Works
- [Video]
- HPP in the Food Industry

History of HPP

- High-Pressure Processing (HPP) is also known as
  - High Hydrostatic Pressure (HHP) processing
  - Pascalization
  - Bridgmanization
- First recorded use in 1899 to treat milk, meat, and fruit juices

Why Use HPP?

- Inactivate microorganisms
- Preserve the organoleptic properties of fresh juice
- Preserve the bioactive compounds that heat-treated juices degrade

Pasteurization vs Pressurization

- Inactivates Microorganisms
- Denatures Proteins
- Spores are resistant, except at extreme temperatures
- Affects color
- Affects flavor
- Can degrade vitamins and bioactive compounds

- Inactivates Microorganisms
- Denatures Proteins
- Spores are resistant, except at extreme pressures
- Does not affect color
- Rarely affects flavor
- Few vitamins and bioactive compounds are destroyed

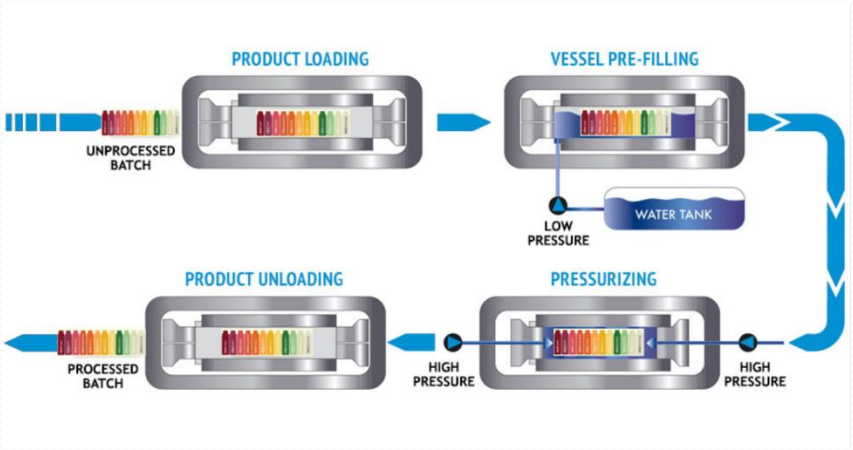
HPP and Microorganisms

- 300-400 MPa (40,000-60,000 psi) inactivate most bacteria and viruses
- Most bacterial spores are resistant to pressures up to 800 MPa

How Does this Happen?

- High pressures disrupt
  - Ionic bonds
  - Hydrogen bonds
  - van der Waals' forces
  - Proteins (denaturation)
- Leads to inhibition of bacterial gene transcription, protein synthesis, leakage of cell membrane, etc
- High pressures do not affect covalent bonds
- Leaves smaller molecules intact (vitamins, phytochemicals)

How HPP Works

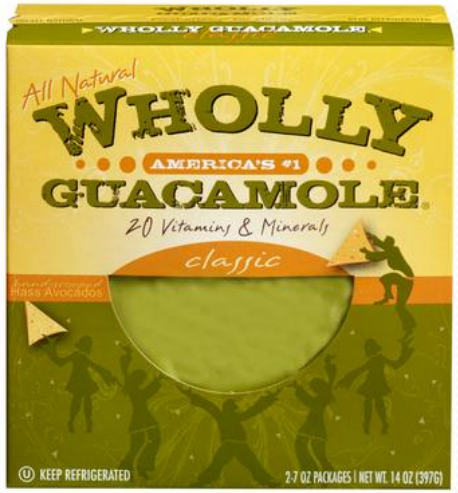


How HPP Works

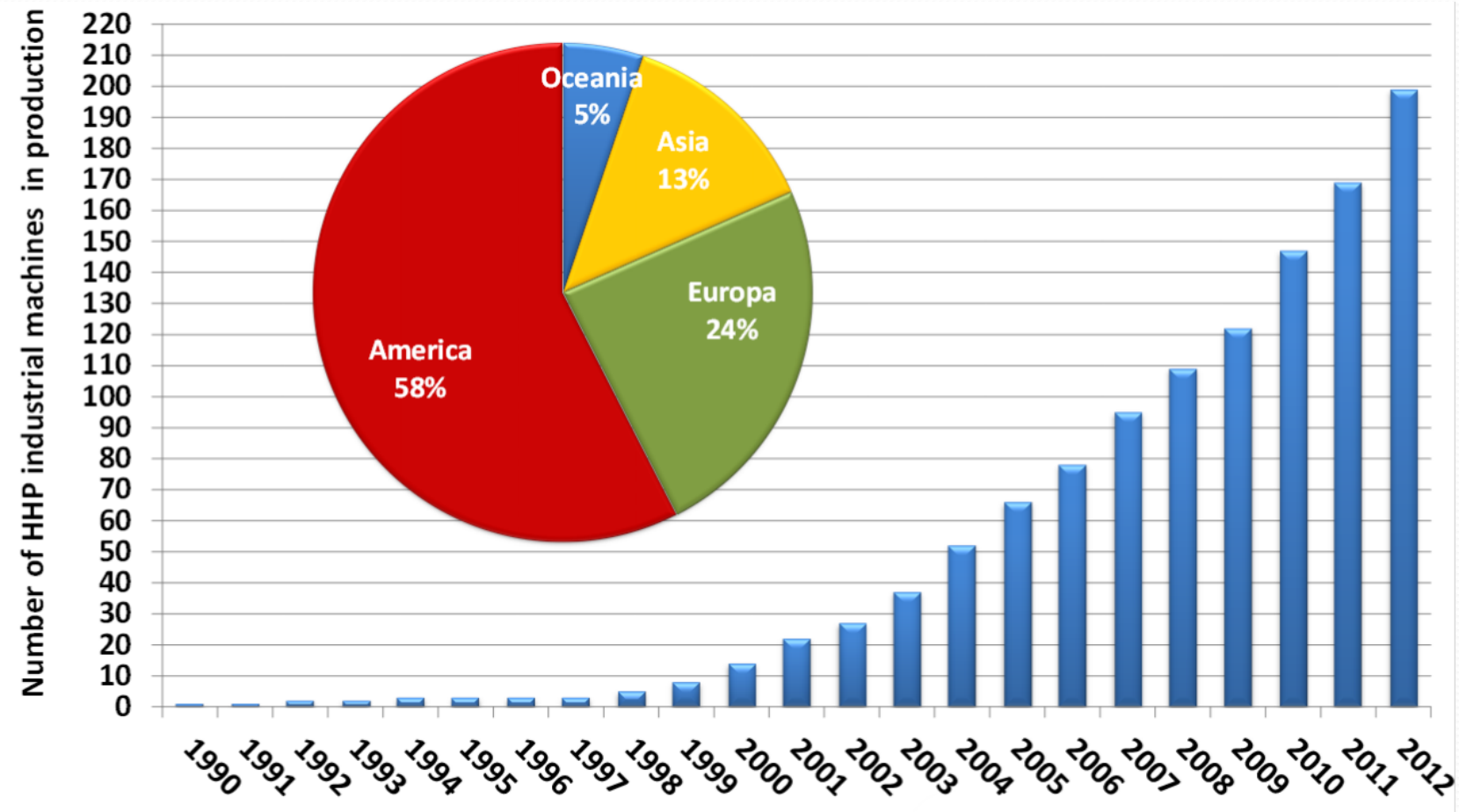
- https://youtu.be/G-BJPEmIrXY

HPP in the Food Industry

- HPP is used in common food products such as guacamole and vacuum-packed meats
- Leads to reduced preservatives (nitrites and sodium) and increased shelf life
- Increasingly used in fruit and vegetable juices



HPP in the Food Industry



Conclusions

- HPP is a process of treating juices that inactivates microbes while at the same time preserving the beneficial vitamins and phytochemicals as well as the organoleptic properties (flavor, color) of fresh fruit and vegetable juices