

2019



WEBINAR  
SERIES

# Energy Efficient Concentration of Food and Beverage Products

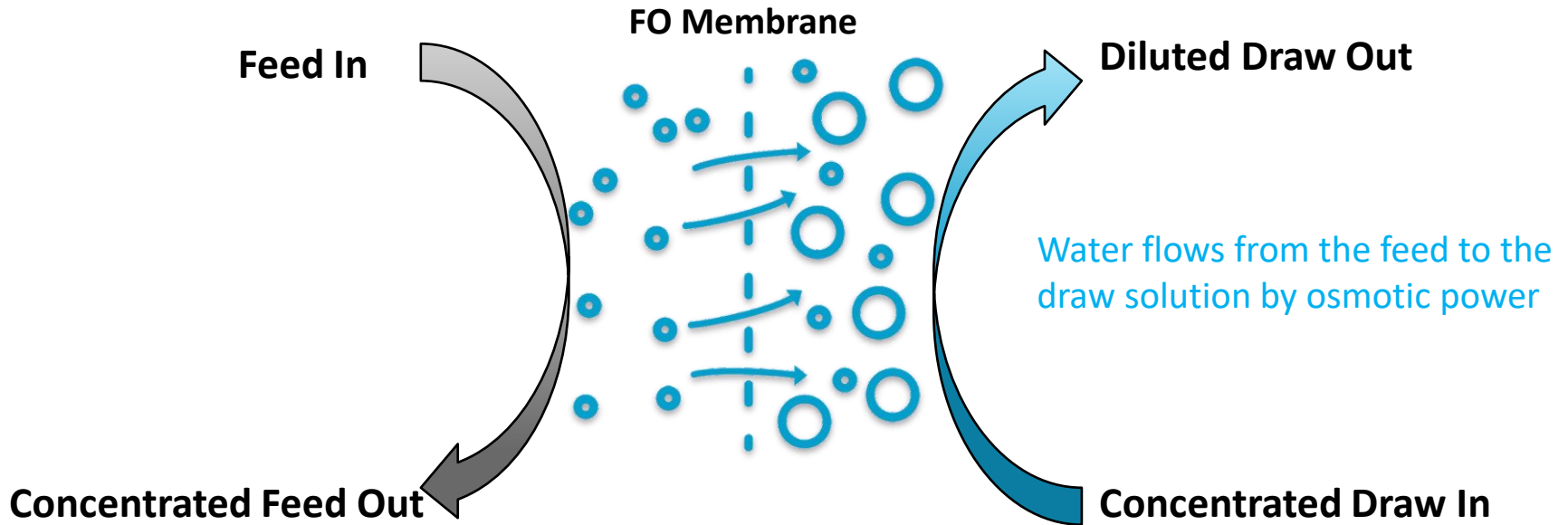
Erik Desormeaux  
Director of Process Development  
Porifera

## The Porifera Vision

- Water is a precious resource that should be efficiently managed.
- Our technology removes water by osmosis, without heat or pressure.

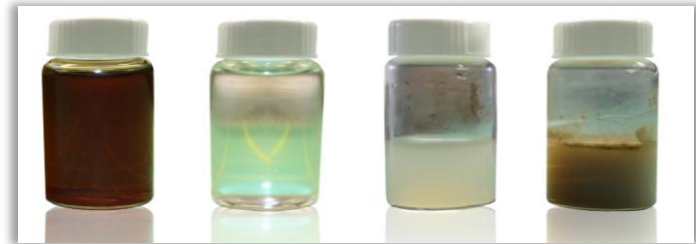


## What is Forward Osmosis (FO)?

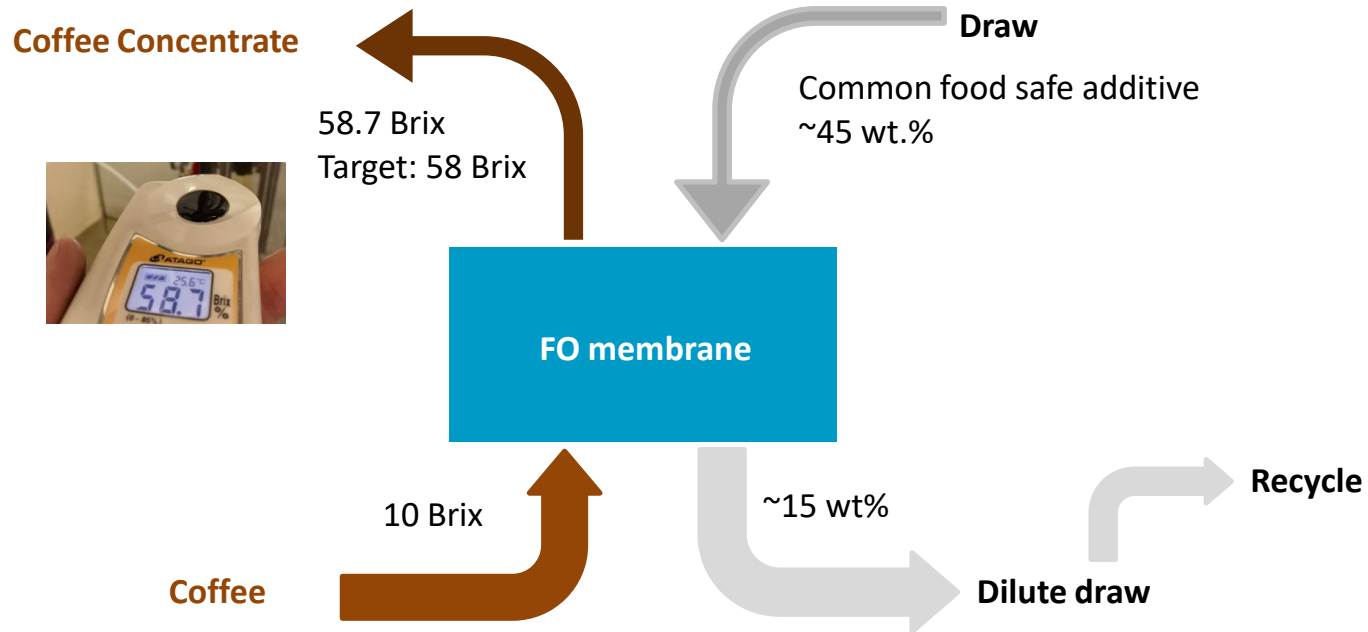


## Porifera technology can be applied to products *or* waste streams:

- **Concentrate products** without heat
  - Retain valuable components, including flavors and nutrients
- **Concentrate challenging wastes**
  - Extract as much as 95% of clean water for reuse

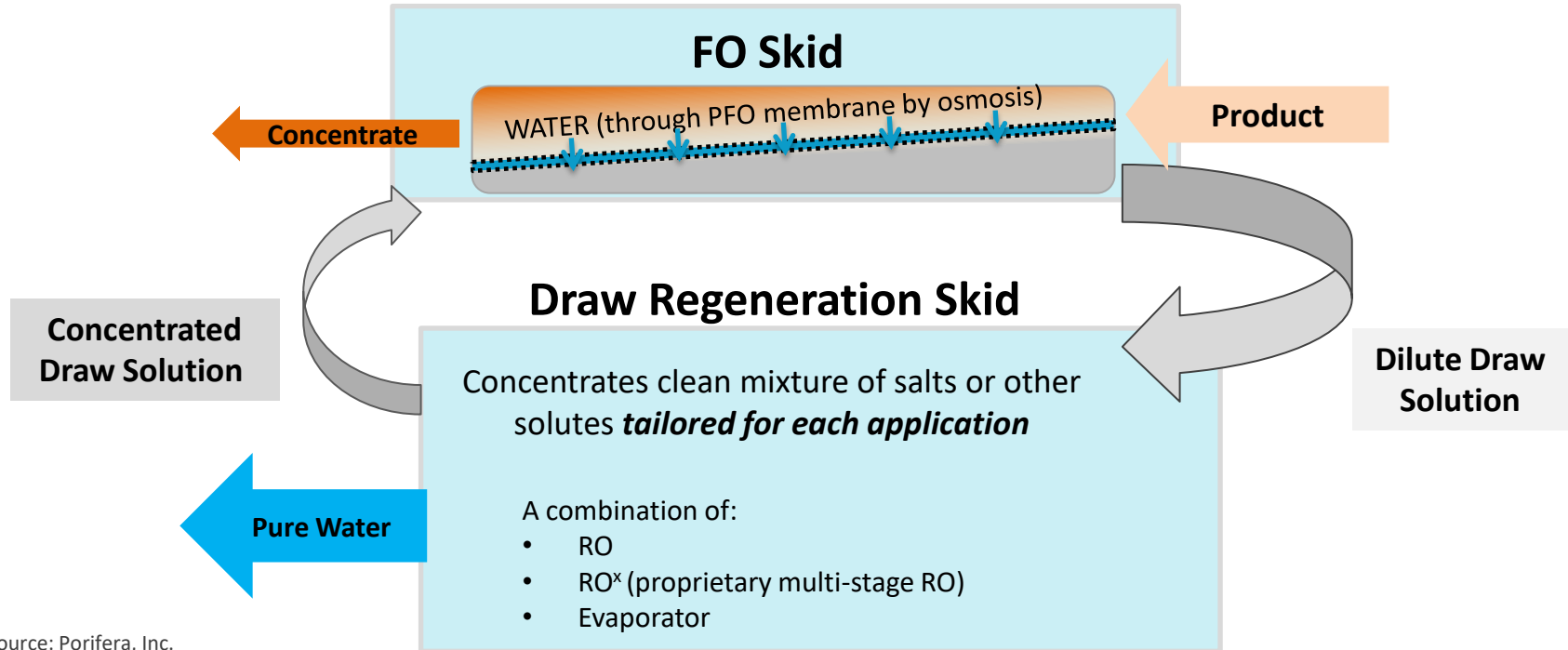


## Example Small FO Concentration Process



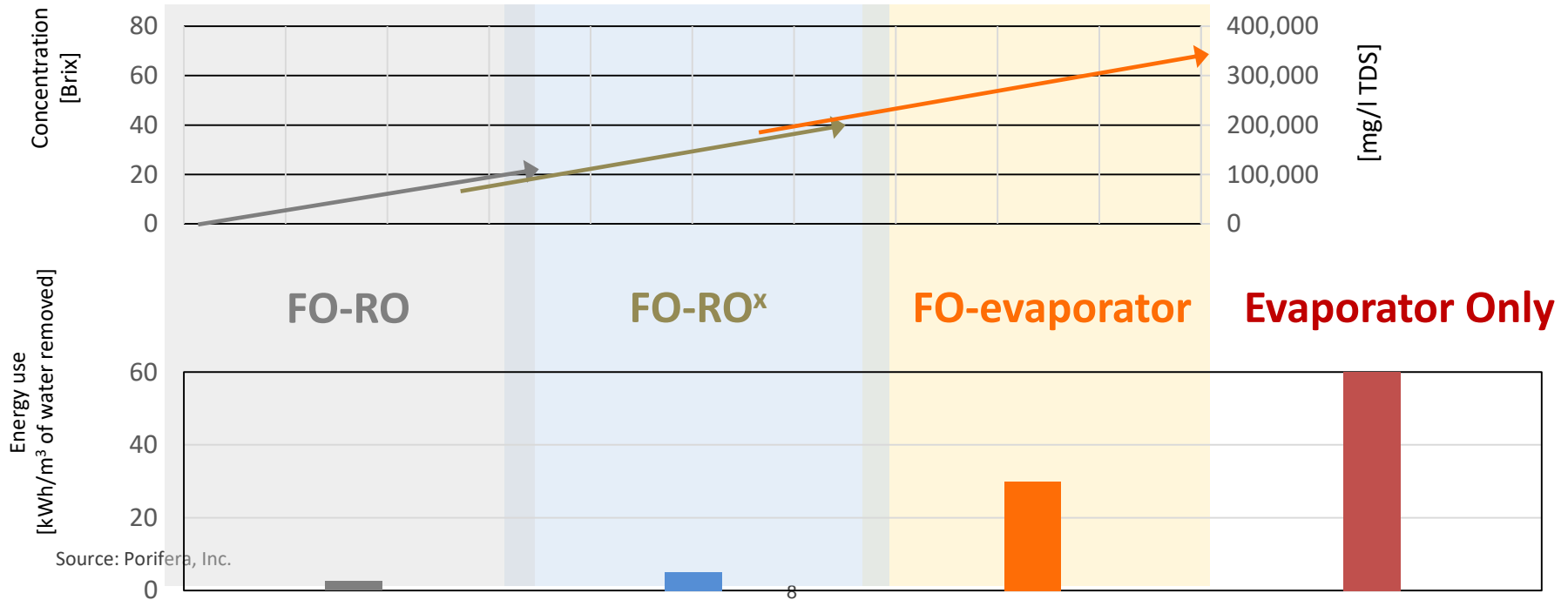
Source: Porifera, Inc.

## Total Solution Schematic



Source: Porifera, Inc.

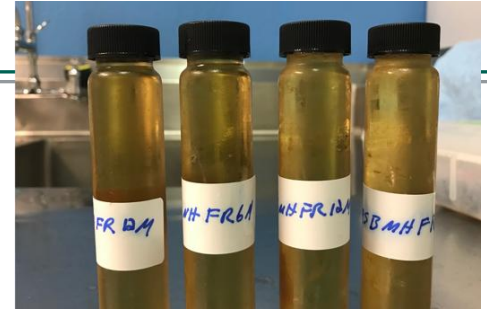
# FO System Configuration and Energy Use is Dependent on Osmotic Pressure of the Concentrate





## Example 1: Jackson Family Wines Project

- 2017: Sauvignon Blanc juice (20 → 50 Brix) for stability tests
- 2018: Chardonnay (25 → 53 Brix) to store and make wine
- Demonstrated energy savings at a winery via:
  - Reduced refrigeration from reduced volume
  - Reduced refrigeration from improved shelf-stability
  - Replacement of thermal evaporators for low sugar juice
  - Increased water reuse as a byproduct of juice concentration
- Annual energy savings for a winery from reducing 200k gallons → 100k gallons of 2x juice concentrate:
  - **47-72% energy savings by reduced chilling** *without* draw recovery
  - **38-63% energy savings by reduced chilling** *with* draw recovery

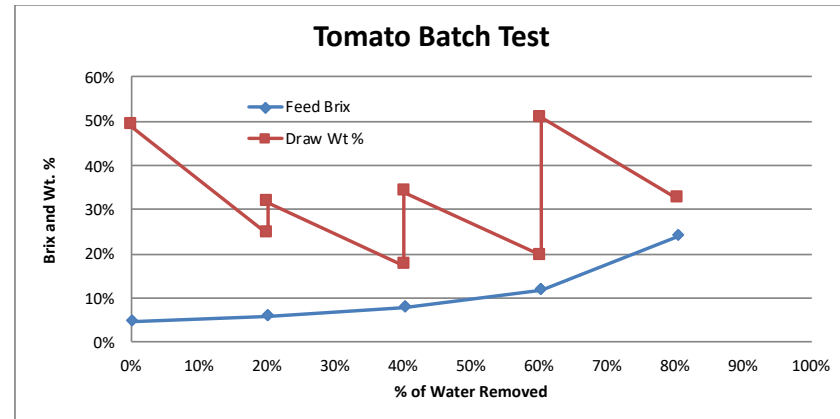


## Example 2: Los Gatos Tomato Paste Pilot

- Feed in: Screened tomato juice at 5 Brix
- Draw in: table salt (NaCl)
- Product Out: 26 Brix hot break tomato paste
- **Result: 5x less energy consumed to produce**



Source: Porifera, Inc.



## Estimated California Ratepayer Benefits

- Total energy savings opportunity from potential commercial implementation of the PFO Concentrator is estimated:
  - 19 - 740 GWh/year
  - 7 - 57 million therms/year
  - 44,000 – 548,000 metric tons of CO<sub>2</sub> emission/year.
- **Additional Benefits:**
  - Improved **product yields** of crops (drives down consumer costs)
  - **Job creation** as result of improved processing & product innovation
  - Increased value & **tax revenue** from production of new, high yield products
  - Improved **reliability** of water and wastewater infrastructure from reduced industrial demand (drought resilience)

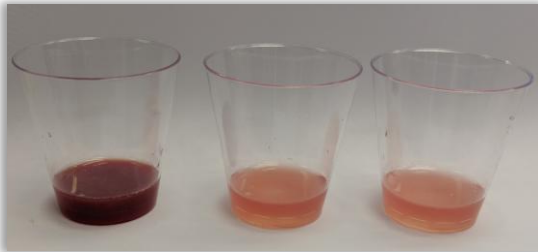
## Example 3: Van Groningen & Sons, Inc. Watermelon

- Summer 2019
  - In-house testing
  - USDA flavor and aroma panel testing and sample analysis
- September 2019
  - First season site test
- Summer 2020 & 2021
  - Commercial production demonstration

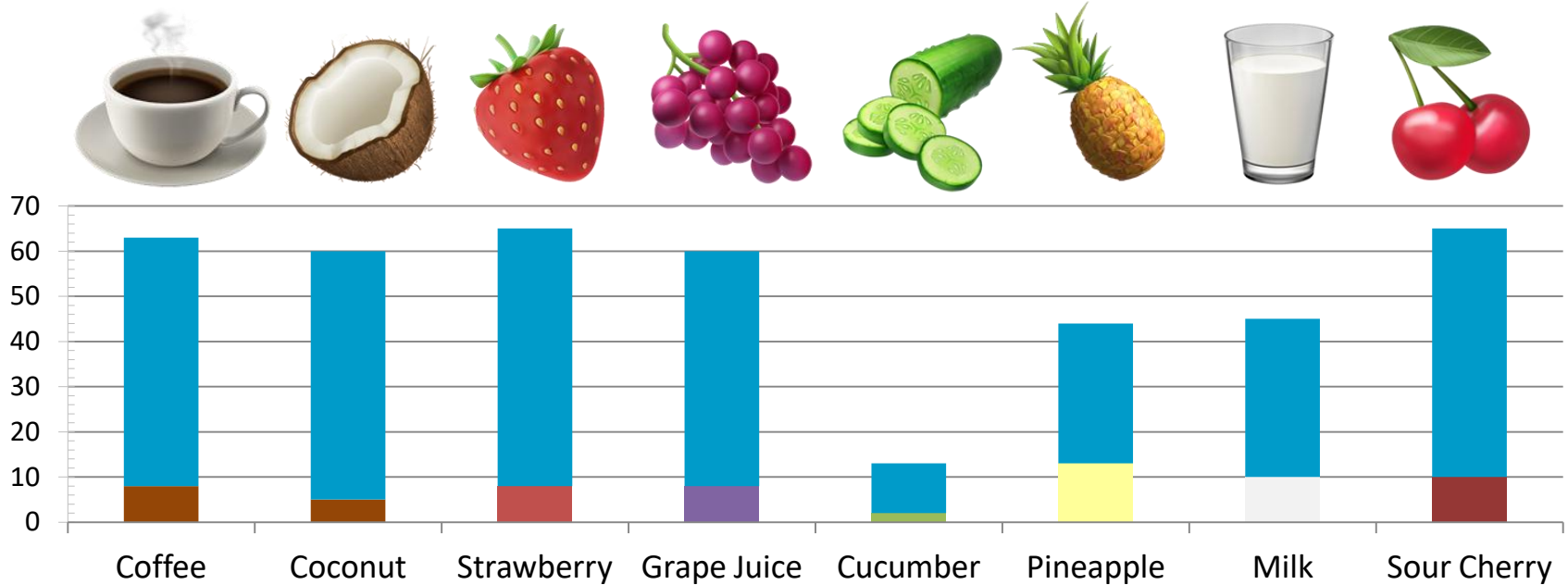


## Example 3: Van Groningen & Sons, Inc. Watermelon

- Summer 2019: In-house testing
- USDA flavor & aroma panel testing, sample analysis
- September 2019: First season site test
- Summer 2020 & 2021: Commercial production demonstration



## Example Products Processed with Porifera Technology



Source: Porifera, Inc.

*Note: Data shown is not the maximum possible concentration, but the target requested by customers*

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## Appendix



## Porifera's FO innovations are unique in that PFO can:

- Operate reliably on challenging liquids with high solids, pulps, sugars, fiber, etc.
  - Porifera is the only FO provider of spacerless elements suited to these applications.
- Achieve higher membrane **flux**, **rejection**, and **efficiencies** than competing technologies.
- Operate at high rejection and high efficiencies using an easily recyclable draw solution.
  - Competing FO technologies either require toxic draw solutions or allow too much leakage of the draw salt into the product.
- Operate at temperatures  $>80^{\circ}\text{C}$ .
  - Standard FO & RO membranes cannot exceed  $45^{\circ}\text{C}$ , which negates a significant amount of potential energy savings in food and beverage applications when some heating is needed for sterilization or finishing.

Source: Porifera, Inc.