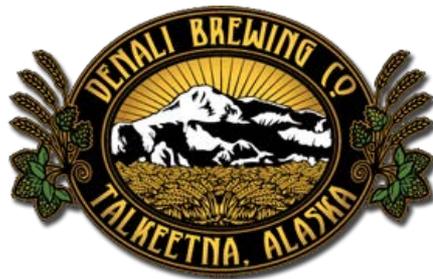
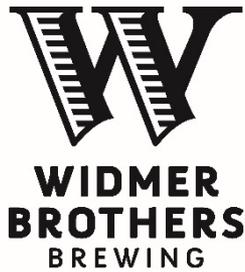


# Environmental Improvements and Innovations at Craft Brewers



Pacific Northwest Pollution Prevention Resource Center (PPRC)  
October 2016

# Some of our Brewery Acquaintances



# Some of our Technical Assistance Friends



College of Engineering

Energy Efficiency Center



DEPARTMENT OF ENVIRONMENTAL QUALITY



# Resounding Environmental Priorities and Efforts

- ◆ Energy
- ◆ Water Consumption  
(Reduce ratio of BBL water to BBL beer)
- ◆ Wastewater Reduction/ Management
- ◆ CO<sub>2</sub>
- ◆ Certifications: B Corp / Salmon Safe
- ◆ Benchmarking



# Energy & Fuel



- ◆ High-efficiency & Smart HVAC @Worthy
- ◆ Lighting retrofits – especially LEDs
- ◆ Compressed air leaks/optimization  
\$19,000/year savings for Redhook
- ◆ Insulation of steam & glycol systems & lines  
@Fort George = <1 year payback
- ◆ Solar panels to preheat water @Worthy
- ◆ Bike Friendly @Fort George, Payette
- ◆ Rapid rise “garage doors”



# Infrared Thermography Findings

## Steam Systems (Boiler, Traps, Piping, Etc)



296 dF



200 dF



315 dF

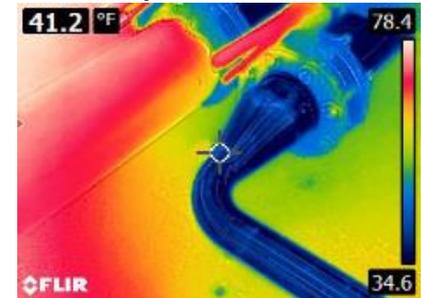
## Motors/Pumps/Belts



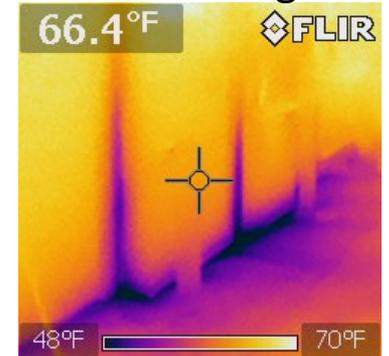
## Weatherization



## Glycol Lines



## Cold Storage



# Water

◆ Ionized air “rinse” for cans @Redhook Portsmouth

◆ Water broom

- **Use a water broom.** This device connects to a hose and is driven by standard water pressure. It can use 10% of the water of a hose alone.



Source: City of Portland  
Cleaning & Sanitation Factsheet

<https://www.portlandoregon.gov/water/article/372313>

◆ Lube-free conveyors avoids lube/water use



# Heated Water & Chemical Reduction

**Pilot Study** - Fog-In-Place sanitation (using PAA), 100% surface contact  
(@Widmer Brothers with Department of Ecology )  
Estimate reduction in water use by over 90%:  
Technology currently used in beverage production (e.g., OJ)

Aurratech's **Fog-in-Place®** can be used by food and beverage processors to sanitize equipment, piping, tanks and entire processing areas through the creation of a fragmented biocide known as Purifog™.



# Heated Water & Chemical Reduction

## Pilot Study: Electrochemically Activated Water Sanitation

(@Merrimack Ales)

Material	Units	Old Process	ECA Process	Reduction
Cleaner (PBW)	lb/week	10.77	5.387	50% reduction
Acid (Nitric/ Phosphoric) Cleaner	Gal/week	4.14	0.78	Eliminated except for special quarterly process
Sanitizer	Gal/week	0.673	0.048	Eliminated except for special quarterly process

Proposed ECA Process & Operating Costs				Weekly Cost for chemicals, water and energy
Tank	Steps	Materials Used	Weekly Cost for chemicals, water and energy	
Mash Tun	Rinse	Water	\$12.53	\$25.13
	Wash	50% reduced PBW + 30% catholyte		
	Sanitize	20% anolyte		
	Final Rinse	Water		
Brew Kettle	Rinse	Water	\$11.80	\$25.86
	Wash	50% reduced PBW + 30% catholyte		
	Sanitize	20% anolyte		
	Rinse	Water		
Fermenters	Rinse	Cold Water	\$28.56	\$50.26
	Rinse	Hot Water		
	Wash	50% reduced PBW + 30% catholyte		
	Sanitize	20% anolyte		
	Final Rinse	Cold Water		
Fermenters & Bright Beer*	Rinse	Hot Water	\$7.51	\$7.51
	Wash	PBW		
	Acid	Nitric/Phosphoric		
	Sanitize	StarSan/Saniclean		
Bright Beer	Rinse	Cold Water	\$2.19	\$11.47
	Sanitize	20% anolyte		
	Rinse	Cold Water		
Total Weekly Cost:			\$62.59	\$120.22
Total Monthly Cost:			\$266.03	\$510.95

◆ Pending: Electrostatic Spray Sanitation (using hypochlorus) (@Merrimack Ales)  
Merrimack Ales/Toxics Use Reduction Institute (TURI)

# Wastewater

Water conservation  
= Less Wastewater

- ◆ Segregate highest “strength” streams
- ◆ Solids interceptor
- ◆ Centrifuge - 5 -10% less beer loss
  
- ◆ Larger breweries make biogas, water
  - ◆ Co-gen offset 10% of natural gas @Redhook NH
  - ◆ Bio-electric provides energy (50% offset at Bear)
  - ◆ Bio-electric recovers water (40% of water footprint at Lagunitas)

[www.environmentalleader.com/2016/05/12/water-treatment-system-recycles-brewerys-wastewater/](http://www.environmentalleader.com/2016/05/12/water-treatment-system-recycles-brewerys-wastewater/)



Here's an out-of-control fermenter's blow off entering the drains. This material should be side streamed and land applied as fertilizer.

# Wastewater BMPs & Increased Permitting

- ◆ King County issuing BMPs for craft brewers in jurisdiction
  - <3,000 BBL expected to implement BMPs, no permit
  - >3,000 BBL expected to implement BMPs, permit pH & solids
- ◆ Look to cities/counties for assistance – Collaborative effort

Reno, NV: *“Lately we are the land of microbreweries. We issue a permit stating that they have to put filters on floor drains and no disposal of material in sewers”.*

Bend, OR - *“high strength” wastewater – defined by the City of Bend = over 2,000 mg per liter– can pose a problem for POTWs. ...can be extremely variable in pH, corroding pipes and water collection systems. As more Bend breweries produce higher volumes of beer and waste, they increasingly need to think about managing high strength waste.”*

# CO2

- ◆ Address leaks and losses in lines and storage
- ◆ Pinpoint Carbonator @ Hopworks Urban Brewery saves \$5k /year
- ◆ Hard lines (Flexible/soft tubing more subject to leaks, friction loss)
- ◆ CO2 recovery (*likely only cost-effective for larger*)
  - ◆ *Around 8-10 pounds CO2 per barrel of wort produced ([Energy Star](#))*
- ◆ Nitrogen (N2) generators @Mac & Jack's, Midnight Sun Brewing Company (MSBC)  
Replaces CO2 for headspace, purging kegs, cans, bottles, equipment, pipes
  - MSBC spent ~ \$70k on CO2, reduce by ~50%
  - + efficient air compressor with generator
  - ROI 2 years (less if bring air compressor on line)
  - Purity level important, 99.5% pure nitrogen

# Organic Wastes



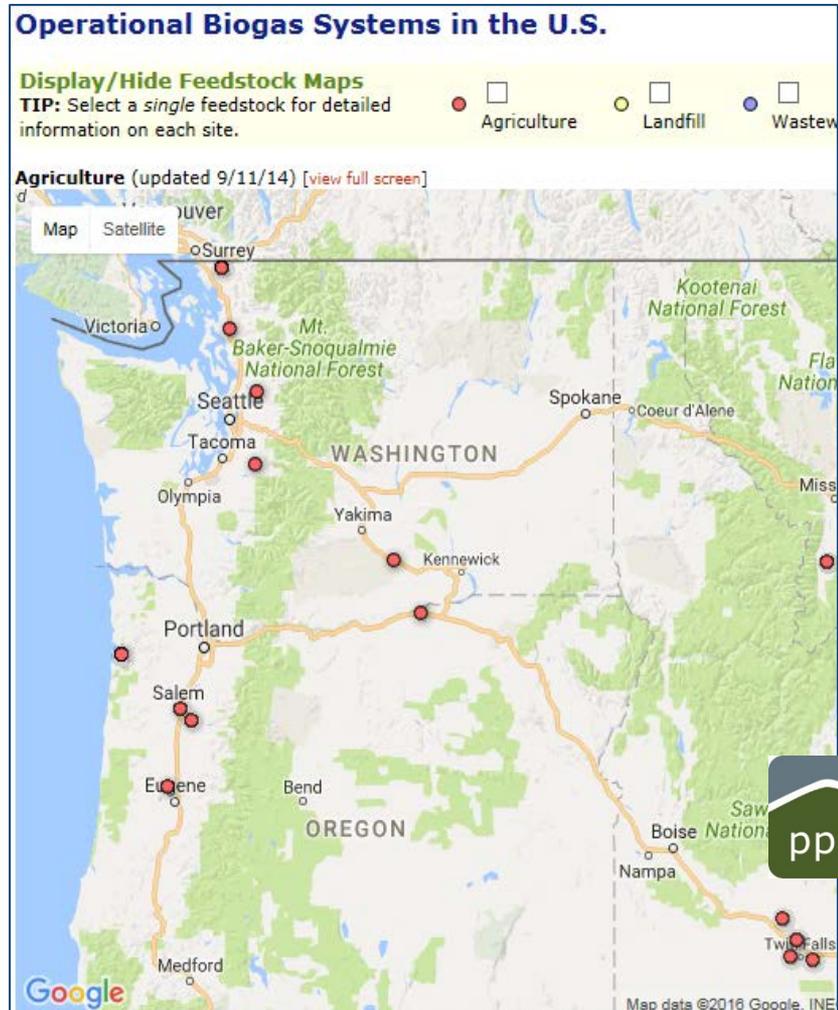
- Pub food scrap collection (prep/waste) to compost or feed @Fort George
- Anaerobic farm/livestock digesters
- WiserG (used by Fremont Brewing)
  - expanding to Vancouver, WA



WISERG's Harvester, which processes food waste at Pike Place Market. (WISERG)

The Redmond startup, with an added \$16.4 million in financing, is expanding its business of processing and analyzing food waste and making fertilizer out of it.

By Seattle Times staff  
The Seattle Times



# Solid Wastes

SIGNAGE IS PROVEN TO INCREASE DIVERSION



Multi-layer hops storage bags, Crosby is testing a PP bag which would be recyclable



# Stormwater



Galvanized HVAC and roof & siding → ZINC in stormwater.

- Coatings (zinc free)
- Filtration at downspouts from roof
- Rain garden/bioretention



Parking lot filtration pond at HUB.



DIY filtration box at downspout

Source: Washington Stormwater Center/Port of Vancouver

<https://www.youtube.com/watch?v=COib6WLxTNE>

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Brewers Association  
2015 Sustainability  
Benchmarking Report



# Additional Resources

## Sustainable Craft Brew Listserv

Send email to [craftbrewenvirolistserv-subscribe@yahoogroups.com](mailto:craftbrewenvirolistserv-subscribe@yahoogroups.com)

## Brewer's Association

John Stier - [sustainabilitymentor@brewersassociation.org](mailto:sustainabilitymentor@brewersassociation.org)

New Wastewater BMP Manual (Release ~Nov)

[2015 Sustainability Benchmarking Report](#)

## [PPRC Craft Brew Topic Hub](#)

## Energy Trust of Oregon

### [Energy Savings Guide](#)

[Case Studies](#) (*Deschutes, Worthy, Widmer, Ninkasi, Gilgamesh*)

