

Digest This.

PROFITING FROM BREWING BYPRODUCTS

APRIL 15, 2015





There's Value in Those Byproducts!



Yeast, Trub



CIP Water



Out of Spec Product

- Your organic load, water & nutrients have value
- Treating the high COD streams is key - Yeast, Hops, Trub,
- Options include Aerobic and Anaerobic treatment
- *Anaerobic Digestion* is well suited to breweries;
 - It can eliminate BOD surcharges
 - Produces valuable renewable power & heat from biogas
 - Contributes to your Bottom Line
- Done right, Anaerobic treatment can return 12 – 25% ROI
- It's not complicated – think fermentation

Should I Consider Anaerobic Pretreatment?



- Yes, if you are on a path to;
 - Production restrictions caused by hydraulic or organic limits
 - Exceeding 100,000 bbl/year
 - A 150 bbl or larger brewhouse
 - Spend over \$400,000/year on surcharges and/or byproduct disposal and trucking costs
- Yes, if you simply want greater control over growth and profitability
- The economics are very site dependent – Growing brewers in high cost areas may benefit now

Tribrid-Bioreactor™ for Brewing Byproducts



Prefabricated
Pump Skids
or Modules

No internal
moving parts

Best of breed
pumps,
controls,
filtration, CHP



Robust, 3 phase design separates SRT
and HRT & protects against overloading

Low OPEX:
No Chemicals,
only 2
continuous duty
pumps

Water
reclaim
options for
up to 80% of
flow

PURPOSE ENERGY™

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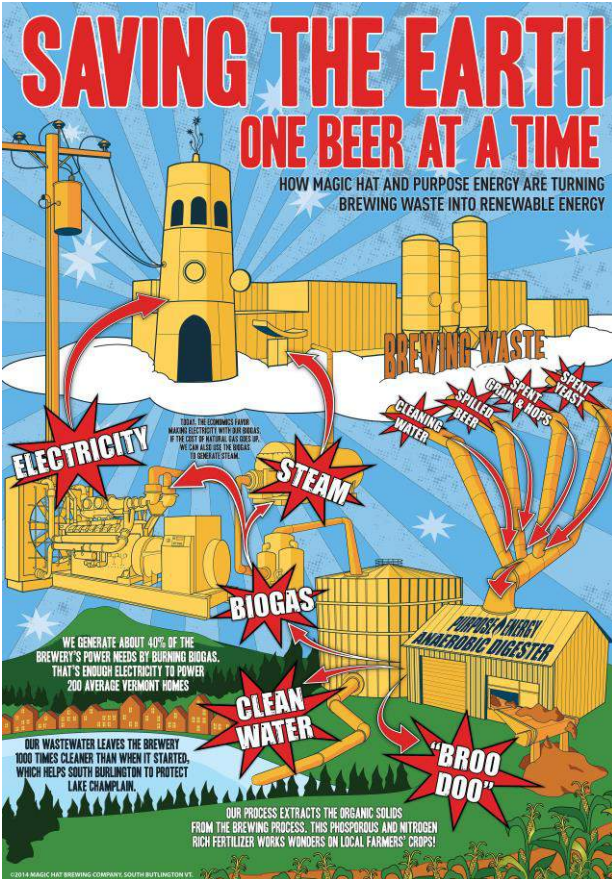
Case Study: Magic Hat, Burlington, Vermont



Anaerobic Digestion of High Solids Brewing Wastes

- Eliminated WW discharge constraints which allowed *Doubling of Brewery Capacity*
- Reduced byproduct handling costs by 60%. From \$1M/year to under \$400,000
- Zero Capital Investment - PurposeEnergy Built, Owns, Operates, Maintains the facility – Shared Savings
- Produces over 1/3 the Brewery's electricity needs - enough to power 200+ homes

Magic Hat Brewery



DIGESTION OF HIGH SOLIDS BREWING WASTE

- 100% of Yeast, Hops, Trub, & CIP flows are converted to biogas, clean water & a bit of natural fertilizer aka “Brew Doo”
- No pretreatment, separation or screening
- Influent averages 20,000 mg/L COD
- Cleaned Effluent averages 20 – 40 mg/L BOD
- Tribid-Bioreactor™ removes 99% of the organic load
- Robust design absorbs inevitable shocks, surges and accidents
- Powers 200 kW CoGen Unit - More than 2 GWh Produced!

Case Study: Dogfish Head - Milton, Delaware



Anaerobic Digestion Paired with Water Reuse

- Digesting all brewing byproducts except BSG
- Will eliminate hundreds of waste truck trips
- System will repurpose 80% of the daily flow for CIP, boiler makeup, process use...and deliver it at 98°F!
- Projected to save 55 MGY of water at full production
- Biogas created powers a 1.2 MW CHP system

Dogfish Head Craft Brewery - Digestion Paired with Water Reuse

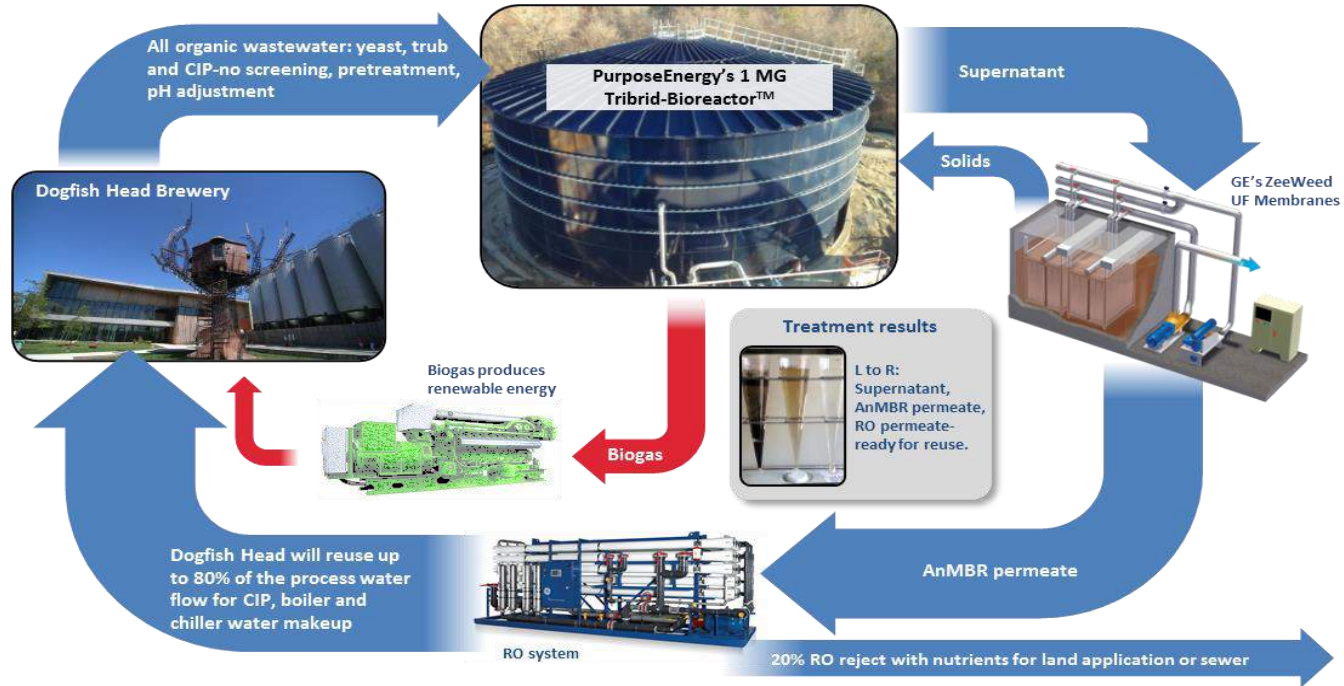


Challenge

- Rapid growth swamped town's POTW
- Field application led to production constraints & climbing costs

Solution

- Digest organic waste in Tribrid-Bioreactor™
- Treat effluent via UF/RO



Lessons Learned



- Caution! - Byproducts can limit your growth if not well managed
- There are economies of scale - growing Craft Brewers take note
- Location Matters
- On-site treatment gives you control
- The right design is *absolutely robust*, never compromises production, and is worry free
- It's not complicated – think fermentation!



Thanks for digesting this.





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