Brewery Wastewater Basics - What you need to know

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Potential Limiting Factors:

It is common to be regulated for these parameters:

- pH
- BOD (Biochemical Oxygen Demand)
- COD (Chemical Oxygen Demand)
- TSS (Total Suspended Solids)
Potential Limiting Factors

Less common, but it happens:

- Nitrogen, measured as
  - TKN *(Total Kjeldahl Nitrogen)*
  - NH4 *(Ammonia)*
- Phosphorus
- Temperature
- Volume- per second, minute, hour, or day
A few definitions

POTW

- Publicly Owned Treatment Works
- The wastewater treatment plant

Load

- A factor of wastewater concentration and volume
- The language of the wastewater treatment plant operator
An example of a situation to be aware of:
Educate yourself:

What is the installed and current capacity of the POTW?

Are there any lift stations between the brewery and the POTW?

Is the sewer main near the brewery gravity or pressure?
Educate yourself:

How are sewer fees calculated?

Does the City apply surcharges for high BOD wastewaters? Or TSS, Total P, TKN?

● Can sewer charges to be based on actual discharge (via flowmeter) instead of incoming water?

● Or a percentage of incoming water?
Educate yourself:

What will the testing requirements be?

Is it possible to be regulated for COD instead of BOD?

Does the City have a wastewater lab? Can that lab test our wastewater samples for us?

Is it OK if we do some of our own testing in house?
Will there be limits?

- Will there be discharge limits?
  - pH, pounds of BOD, COD, or TSS per day

- Will there be any volume limits per day, hour, or minute?

- Are any other capacity constraints seen at this point?
Take aways:

- Answers to these types of questions vary widely from town to town all across the country.
- There is no one size fits all solution, and town size is independent of these answers.
- Want to minimize headaches? Find a town where a factory closed down. The local POTW is probably over sized and under fed. *I'm only half joking here.*
Avoiding Pretreatment

The main concern is economics

Which option makes the most sense for your brewery?

- The least cost (capital & operating)
- The easiest to operate, and
- Satisfies discharge requirements.
- Green considerations are cool, but they have to justify themselves financially.
Avoiding Pretreatment:

Side streaming!

Collect your high strength material before it hits the floor

- Trub, spent yeast, waste beer

Put it into it's own tank and truck it off site.

- Fertilizer, compost wetting agent

Side streaming works; it's simple, cheap, and buys you time.
Avoiding Pretreatment

● Have you exhausted all options?
  ● Equalization
  ● Diurnal loading
  ● Expansion at local POTW
On Site Disposal

I get asked all of the time:

“I'm looking at property for a brewery with no sewer connection. What do I need to know?”

- Listen to Eppa, you don't want fermentation in a septic tank
- A simple septic system won't work
- Don't plan to irrigate food crops with untreated wastewater...
Thank you!

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There’s Value in Those Byproducts!

- 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

Low OPEX:
- No Chemicals, only 2 continuous duty pumps
- Water reclaim options for up to 80% of flow

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

Craft Brewers Conference - Portland, Oregon - April 2015
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

Tribrid-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

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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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Lagunitas, Wastewater, Water Re-use and other Mumblings

Eppa Rixey
Strategery Guy

Lagunitas Brewing Co.
Wastewater has been a defining aspect of Lagunitas’ existence from day one.

The town of Lagunitas (pop. ~390)

Our first brewery (’93)
On to Petaluma and outgrowing the City’s capacity

Petaluma’s Ellis Creek Facility (built July 2009)

Lagunitas brewery as seen from our farm

Lagunitas Brewing Co.
Shackled to growth and paying for water twice

Lagunitas Brewing Company
21 Years of Growth 1993-2014
in 000's Barrels

Incoming water: ~$26k / month
Wastewater: ~$180k / month
87% of water cost was wastewater

Brewery moves to current facility
Wastewater trucking begins…
Start looking for alternatives

Brewery moves to Petaluma
Taking the wastewater trucks off the road

- Cambrian system selected for our high strength waste (anaerobic digestion)
  - Modular / scalable
  - High reliability / remote monitoring
  - Greater energy output
  - Outsourced operation
  - Clean energy / ITC

- Also incorporating re-use into the design via MBR and RO
  - Water use ratio 4:1 → 2.5:1
  - ~40% reduction in water usage
  - ~70% reduction in wastewater volume
Wastewater can be a real thorn in the side of a growing brewery

• Technologies exist that can reduce this burden significantly
  • Choose the right option given your specific requirements (one size does not fit all)

• Understanding your wastewater and options for dealing with it will enable you to grow your brewery while avoiding:
  • Significant fines
  • Fees
  • Even the possibility of getting shut down

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