

Brewery Wastewater

Basics-

What you need to know

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Brewery Wastewater Design

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Potential Limiting Factors:

It is common to be regulated for these parameters:

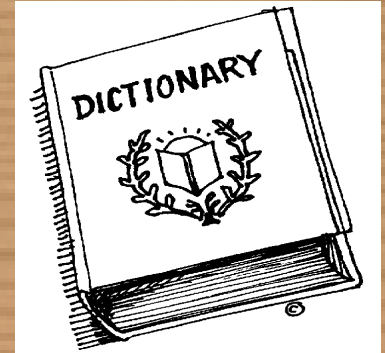
- pH
- BOD (***B**iochemical **O**xygen **D**emand*)
- COD (***C**hemical **O**xygen **D**emand*)
- TSS (***T**otal **S**uspended **S**olids*)

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



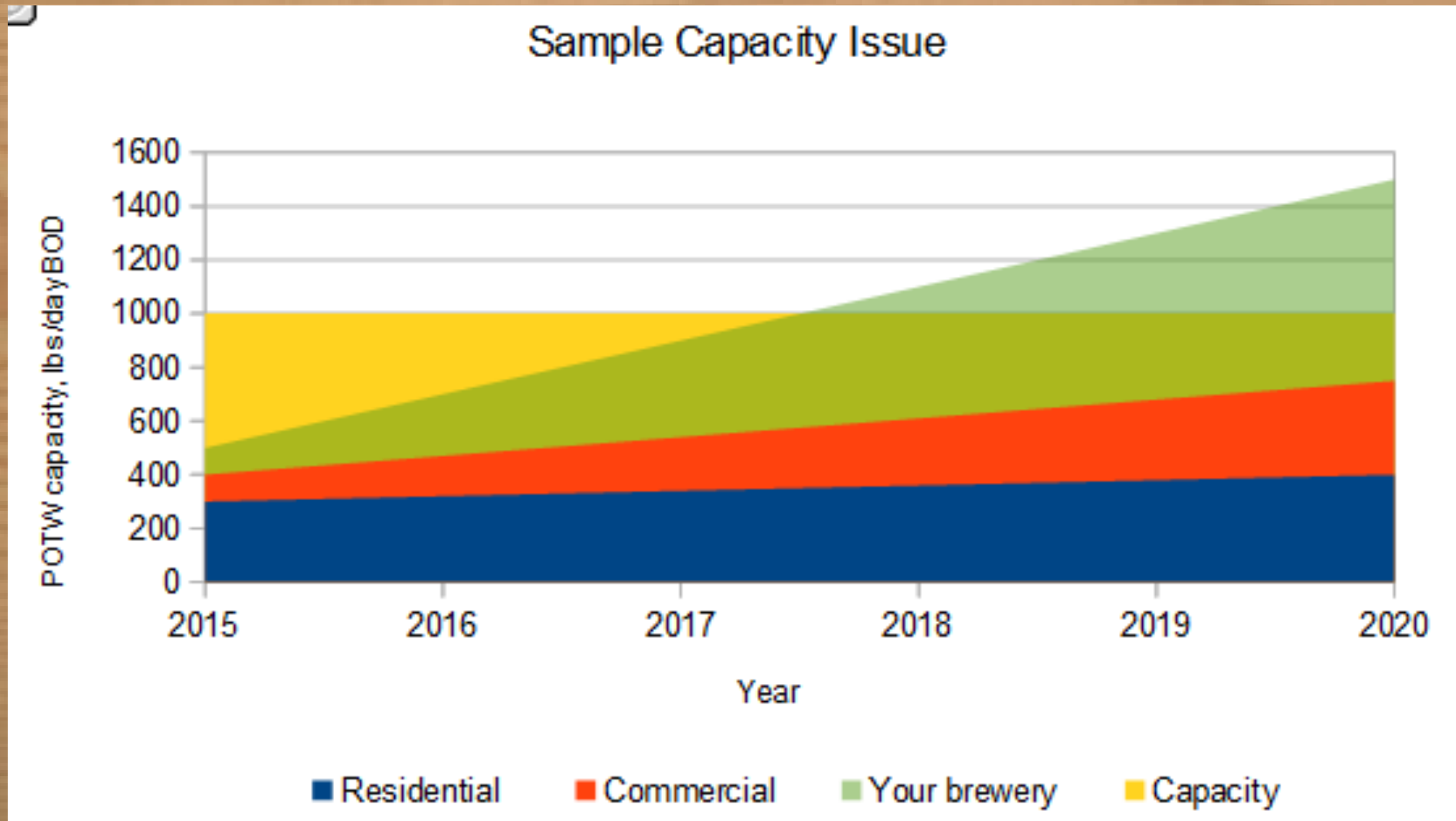
POTW

- *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?

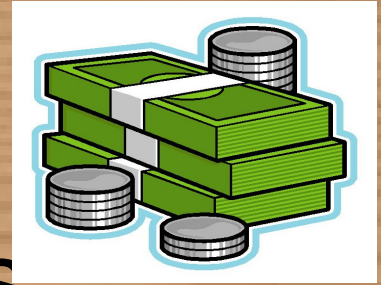
- Will there be discharge limits?
 - pH, pounds of BOD, COD, or TSS per day
- Will there be any volume limits per day, hour, or minute?
- Are any other capacity constraints seen at this point?

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!

John Mercer

Brewery Wastewater Design

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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



Digest this.

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™

Digest this.

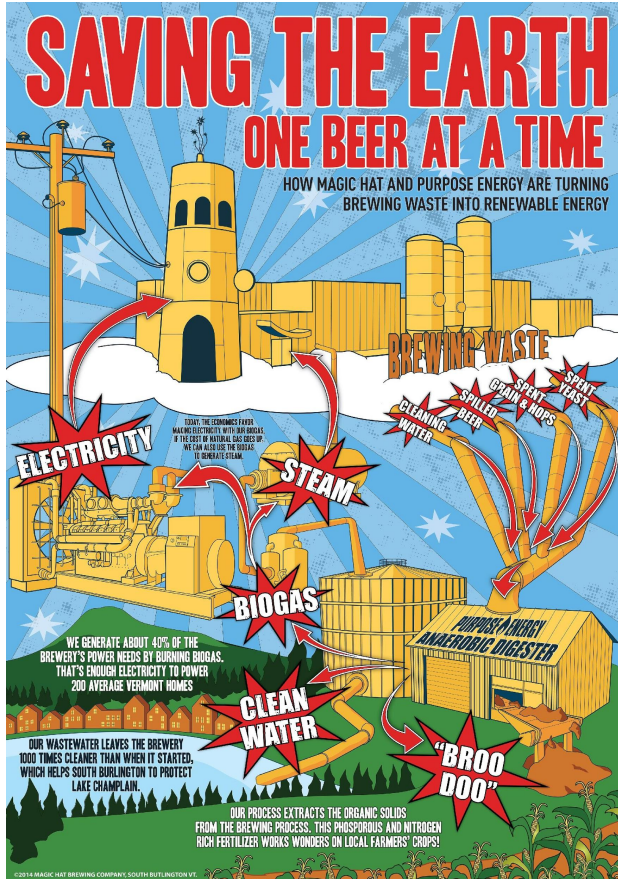
Case Study: Magic Hat, Burlington, Vermont



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
- 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

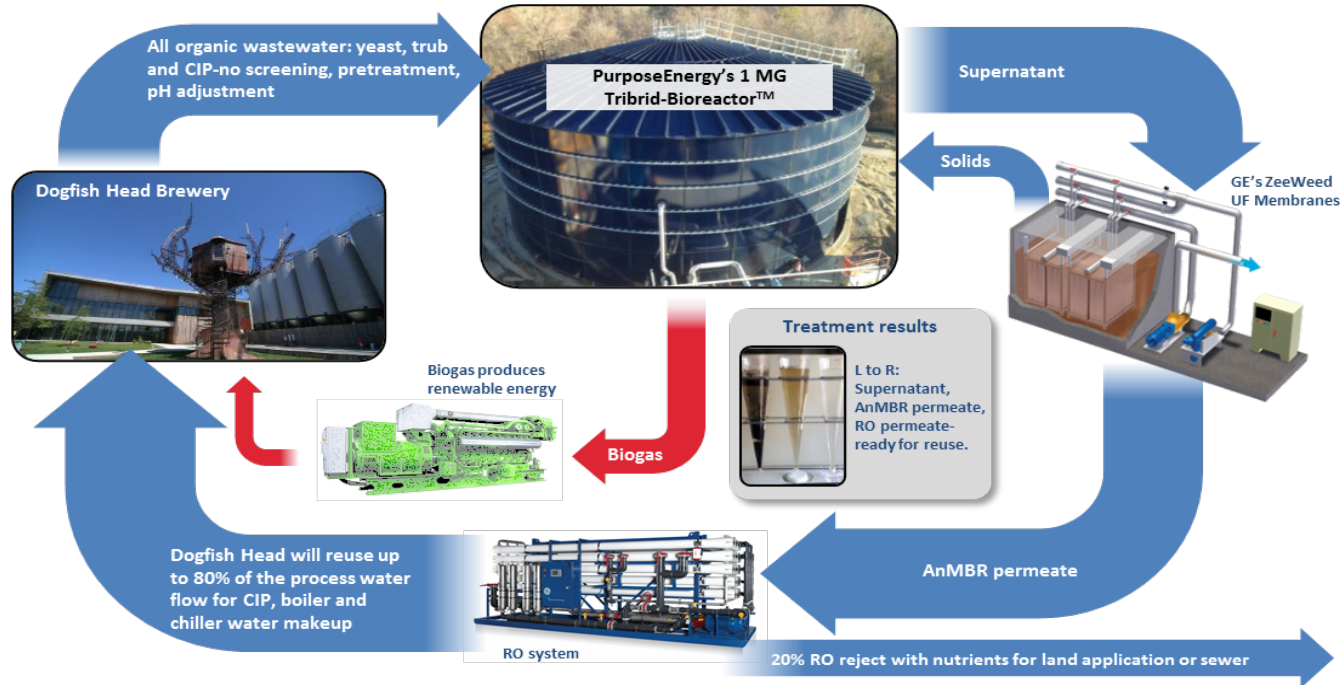


Challenge

- 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



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
Strategy 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)



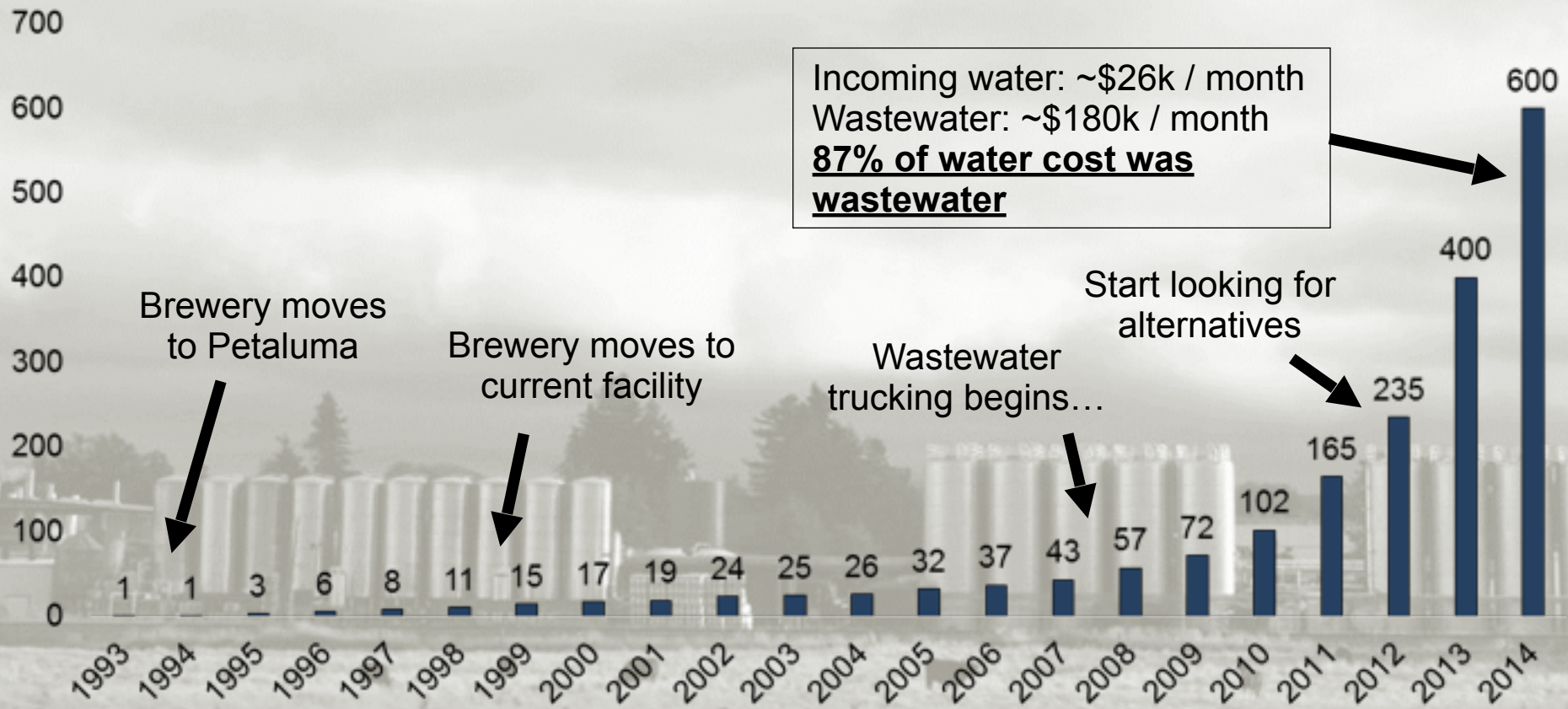
Lagunitas brewery as seen from our farm



Shackled to growth and paying for water twice

Lagunitas Brewing Company 21 Years of Growth 1993-2014

in 000's Barrels



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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The background of the slide is a grayscale photograph of a brewery. In the foreground, there is a grassy field with several cows grazing. In the middle ground, there are several large, cylindrical metal storage tanks or fermentation vessels. In the background, there are trees and a cloudy sky. At the bottom of the slide, the text "LAGUNITAS BREWING CO." is written in a large, bold, blue, serif font.

LAGUNITAS BREWING CO.