



~~Wastewater~~ “*Brewery Byproduct*” & Why it is Relevant to You

Panelists:

- **Tyler Glaze**, Quality Manager, Short’s Brewing Company
- **Cody Green**, Environment, Health & Safety Specialist, Founders Brewing Company
- **Peter Manthei**, Co-owner, Beards Brewery
- **Steven M. Rochow**, Senior Environmental Services Supervisor, City of Kalamazoo

Moderator:

- **Walker Modic**, Sustainability Manager, Bell’s Brewery

Alphabet Soup & General Info...

- **BOD – Biochemical Oxygen Demand.** The amount of oxygen required for aerobic microorganisms to break down organic materials.
 - Essentially a measure of strength. The degree Plato of water treatment.
- **COD – Chemical Oxygen Demand.** The amount of oxygen required for an oxidizing agent (Dichromate) to break down all organic materials.
 - A different (easier) way to measure Strength.
- **Brewery BOD to COD ratio** ~ 0.6 to 0.75
- **TSS – Total Suspended Solids**
- **Cubic Meter (m3)** = 264.3 gallons
- **POTW – Publicly Owned Treatment Works.** Your local water reclamation plant.
 - aka – the guys who keep your process from resulting in detrimental environmental outcomes
 - aka – the guys who send you the bill.
- **NPDES – National Pollutant Discharge Elimination System.** The permit issued to a POTW by the US EPA that dictates quality of water returned to natural bodies of water.



Brewery Effluent Profile

Parameter	Average	Max
Water Use Ratio (bbl/bbl)	6.94	12.60
Wastewater to Water Ratio (bbl/bbl)	0.78	0.93
Wastewater to Beer Ratio (bbl/bbl)	5.39	10.20
BOD Concentration (mg/L)	10,563	16,000
TSS Concentration (mg/L)	2,330	5,960

Source: Brewers Association, Wastewater Management Guidance Manual:

https://www.brewersassociation.org/wp-content/uploads/2016/12/BA_Wastewater-Management-Guidance-Manual_2016.pdf



Federal Regulation 40 CFR 403.5

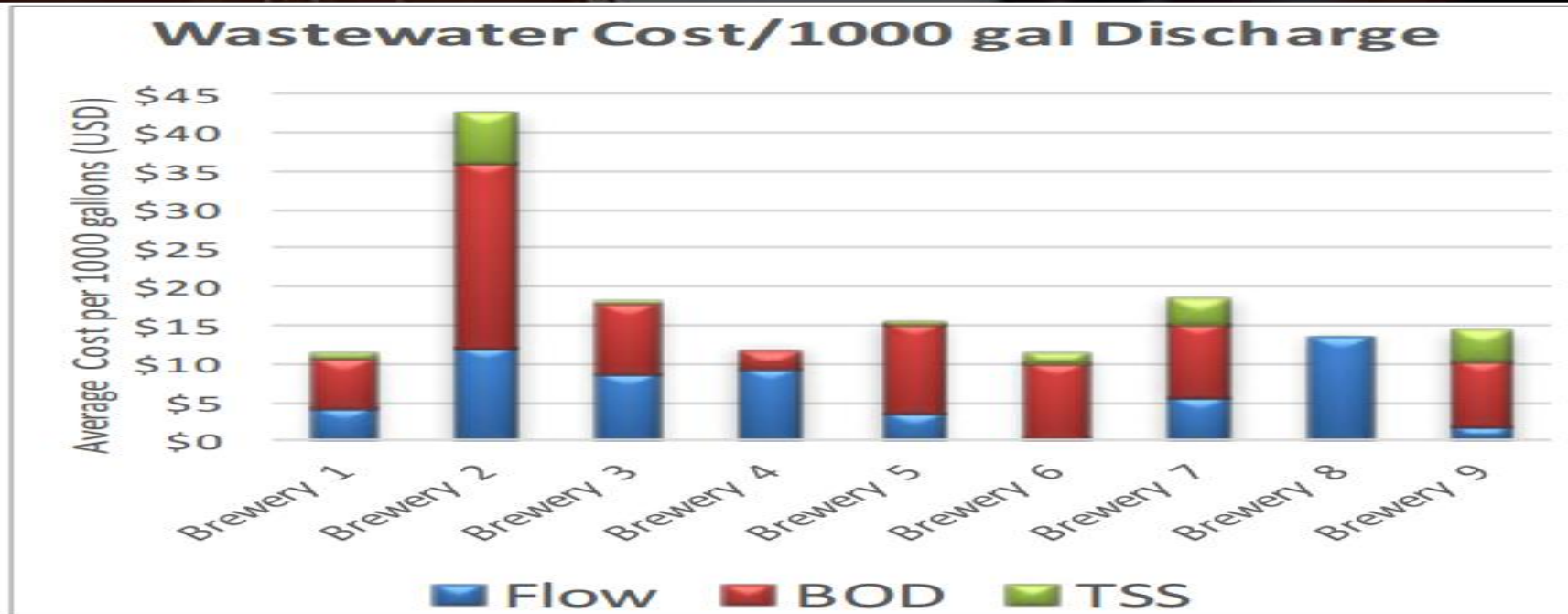
An industrial user may not introduce to a POTW

1. Pollutants that create a fire or explosion hazard in the POTW
2. Pollutants that will cause corrosive structural damage to the POTW, but in no case discharges with pH lower than 5.0
3. Solids or viscous pollutants in amounts that will cause obstruction to the flow in the POTW
4. Any pollutant including oxygen-demanding pollutants (BOD) released in a discharge at a flow rate and/or pollutant concentration that will cause interference with the POTW
5. Heat in amounts that will inhibit biological activity in the POTW, but in no case heat in quantities that the temperature at the POTW exceeds 40 C.
6. Petroleum oil, non-biodegradable cutting oil or products of mineral oil origin.
7. Pollutants that result in the presence of toxic gases, vapors, or fumes within the POTW that may have adverse health effects
8. Any trucked or hauled pollutants

Kalamazoo POTW Operation KPIs

	Influent	Effluent	Effluent ppm	% removal	Surcharge (In City)	Surcharge (Outside City)
Volume	26M GPD	26MGPD			\$0.13/m3	\$0.43/m3
BOD	41,086 kg/d	239 kg/d	2.42	99.4%	\$0.468/kg	\$0.531/kg
TSS	30,899 kg/d	370 kg/d	3.76	98.8%	\$0.506/kg	\$0.576/kg
NH3	1,955 kg/d	16 kg/d	0.16	99.2%	\$2.518/kg	\$2.715
Phos	711 kg/d	19 kg/d	0.19	97.3%	\$0	\$0

Surcharge Costs at Different Breweries



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Treatment System KPI's

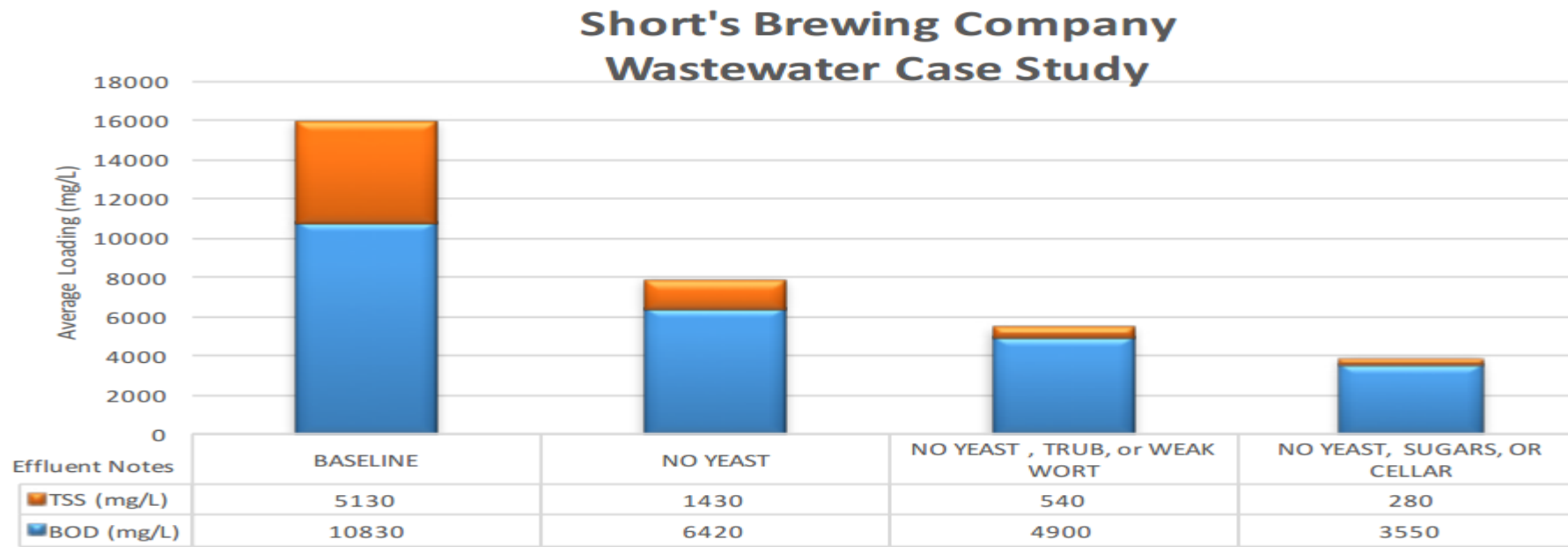
	Volume Brewed	System	KG COD Removed/M3-d	Sqft/kg COD	CapEx/kg COD removed	OpEx/kg COD-d	% COD removal	Solids separation
Beards	600	Communication						
Founders	348k	Side-Streaming	14.3	0.12	\$167.90	(\$0.09)	70%	No
Shorts	52k	Aerobic MBR	14.5	1.39	\$1,620 (\$798)	\$0.54	99.2%	Yes
Clear Cove	200 to 3k	Chemical Treatment->UF-> RO	26.4	2.66	\$1,387.65	\$1.14	99.9%	Yes
Bell's	417k	Anaerobic	10.4	1.25	\$1,473 (\$2,009)	\$0.07	86%	Yes
Dow Biotower	3k to 7k	Aerobic	1.2	5.5	\$3,400	\$0.08	98.4%	Yes
EcoVolt	10k to 30k	Anaerobic & Aerobic MBR	11.4	1.2	NDA	NDA	99.9%	Yes

* - Actual cost inflated by design for expansion & EOM closure. \$798 is estimated CapEx without duplicate cost and full system capacity.

^ - \$2,009 is the CapEx/kg-d of system without Federal Renewable Energy Investment Tax Credit

NDA – Information not available without execution of Nondisclosure Agreement.

Hierarchy of High Strength Byproduct Side-streaming



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