LAGOONS & HIGH STRENGTH WASTE: DID SOMEONE SAY CRAFT BEER?
Proposed Agenda

▪ The Michigan Craft Brew Scene
▪ Potential Impacts to WWTPs
▪ Considerations & Tips
▪ Case Study: Tripelroot
▪ Case Study: Dexter
▪ Questions
Michigan's Craft Beer Scene
So they want to open a brewery…

- Size matters:
  - Brewpub
  - Microbrewery
  - Craft brewery
BOD ranges from 2,000 to 16,000 mg/L

Prevent overloading
So they want to open a brewery...

- Sewer Use Ordinance/Requirements:
  - Check local limits for BOD, phosphorus
  - Sampling manhole / metering manhole
  - Oil/grease interceptor (esp. for brewpubs serving food!)
  - Equalization tanks
  - Secondary containment
  - Spill prevention / slug control plans
  - Consider pretreatment
  - Proportional user charges for loading, surcharges
So they want to open a brewery...

- Best Brewery Management Practices:
  - Separate sanitary and process wastewaters
  - Separate spent grain / yeast
  - Reduce water use
  - Optimize cleaning procedures
  - Neutralize acidic wastewater from cleaning processes before discharge
CASE STUDY: TRIPPELROOT
Tripelroot - Zeeland

- Small brewpub in Zeeland
- Zeeland used to be a dry town
- Law changed in 2006
- Now there’s a thriving brewpub
Tripelroot - Zeeland

- Small brewpub
  1 barrel system
  10 barrels per month
Served onsite
Food service
But no fried foods

- Facility has a 3 compartment interceptor to meet City SUO because it is a restaurant

- Small amount of wastewater, it hasn’t really effected the City of Zeeland WWTP
Tripelroot / Zeeland Brewing Company

- Larger brewing facility in Holland Township
- 15 barrel system, 10 batches per month = 150 barrels/month
- Brews Tripelroot beer for use in its brewpub
- Just opened 4 weeks ago, may expand to brewing other brands
- Owners worked closely with Holland BPW to determine monitoring requirements
- Decided to take a “watch & see” approach regarding monitoring requirements
Tripelroot / Zeeland Brewing Company
Holland Charter Township
CASE STUDY: DEXTER
Introduction

City of Dexter (formerly Village of Dexter)

- Small to midsize community located near Ann Arbor
- Small brewery located in the Village
- Activated sludge wastewater treatment plant discharges to Mill Creek (Huron Watershed)
Village of Dexter (2012)

- Average WWTP flow was ~0.3 MGD
- MAHL hadn’t been updated since 1980s
- Surcharge rates not updated since 1980s
- WWTP operating fine with small brewery downtown
Smaller Brewery

- Opened in 2004

- Smaller brewery downtown Dexter maxed out at just shy of 2500 bbls of production before moving to industrial park

- Belgian style ales

- Small ale producer joined forces with other breweries in 2009

- Larger facility, making many types of beer
Initial Situation – Original Smaller Brewery

- Original brewery location – downtown Dexter, MI
- Artisan ales only
- Approximately 3000 barrels per year
- Downtown facility wasn’t originally designated as an SIU
- Wastewater from smaller brewery was not real noticeable at the WWTP
Then…
Craft Beer became REALLY Popular
Small Brewery 2010
Broad Street Location in Dexter, MI
Expansion (cont.)

- Brewery approached Dexter Community Development in 2010-2011
- Village meetings & correspondence with brewery regarding wastewater service 2010-13
- Existing brewery and proposed brewery to be designated as SIUs
New Facility, Expanded Operations

- More kinds of beer

- Higher production volume:
  - Plan to brew 10,000 barrels in 2014
  - Increase to 20,000 barrels per year in near future
Action Plan for Handling Brewery Expansion

▪ “The Question”
  ▪ How much beer (byproducts) can the plant drink?!

▪ Outline the Needs/Challenges
  ▪ City/brewery Meetings … jobs! (and beer)
  ▪ Challenges identified
Action Plan for Handling Brewery Expansion

- **Challenges:**
  - Need MAHL, SUO updates
  - Larger brewery is SIU (by loading)
  - Slug loading = batch process
  - Start-up funds were very limited
  - Brewery expansion leading WWT plan

- **Options**
  - Pretreatment, Discharge to POTW, Liquid Haul
Initial Action Plan for Expanded Facility

- Sampling & Monitoring
- Maximum Allowable Headworks Loading (MAHL) Evaluation
- Industrial Discharge Permit Application
- Industrial Discharge Permit issued with Interim Limits
Initial Action Plan for Expanded Facility

Sampling manhole and flow monitoring
SiU Discharge Permit Application Jan. 2013

- Brewery submitted completed permit application
- Slug loading and spill prevention plan
- Meeting with Village, engineer, and brewery to discuss anticipated flows, concentrations, loadings
- No data (production or WW characterization) was available
Maximum Allowable Headworks Loading

- Non-compatible pollutants based on:
  - Chronic & acute toxicity water quality impacts
  - Treatment & digestion inhibition
  - Biosolids contamination (for land application)

\[
L_{\text{Chronic}} = Q_{\text{POTW}} \cdot 8.34 \cdot \frac{WQBEL_c}{1000} \cdot \frac{1}{1 - R_{\text{Avg}}}
\]

\[
L_{\text{INHIB,Sec}} = \frac{Q_{\text{POTW}} \cdot 8.34 \cdot C_{\text{INHIB,Sec}}}{1 - R_{\text{PRIM}}}
\]

\[
L_{\text{INHIB, Dig}} = \frac{Q_{\text{Sludge}} \cdot 8.34 \cdot C_{\text{INHIB, Dig}}}{R_{\text{Avg}}}
\]

\[
L_{\text{Sludge}} = \frac{Q_{\text{Sludge}} \cdot TSS_{\text{Sludge}}}{100} \cdot 8.34 \cdot \frac{C_{\text{Sludge}}}{R_{\text{avg}} \cdot F_{\text{Sorp}}}
\]
Maximum Allowable Headworks Loading

- Compatible pollutants (BOD, TSS, phosphorus) – most important for breweries, based on:
  - NPDES discharge permit limits
  - Treatment design/capacity
  - Process modeling in GPSx

\[
L_{NPDES} = \frac{8.34 \times C_{NPDES} \times Q_{POTW}}{(1 - R_{Avg})}
\]
BOD MAHL

- Review MORs
- Design Basis
- Process Modeling
- Estimate the expanded brewery’s higher flow & loading
BOD – Most important for brewery wastewater

- WWTP monthly average BOD capacity is 1495 lb/D
- Allocate mass for Village domestic users, reserve, & SIUs (brewery, metal finisher)
- $1495 - 1344 = 151$ lb/D
  Remainder for SIU(s) including brewery
Interim Permit for Brewery

- An interim permit was issued Jan. 2013
- Covering the brewery start up period
- 90 days = initial permit cycle
- 150 lbs BOD/day limit
Start Up Operations & Interim Permit

- Brewery wastewater had higher loading than anticipated when MAHL & interim permit developed

- Brewery was not able to reach these limits
  Avg. BOD 300-450 lbs/day
  (in 2 to 3 hours!)

- Slug loading was causing issues at WWTP

  Equalization was necessary
Issues at the WWTP

- Slugs overloaded primaries
- Aeration system slug loaded; D.O. challenges
  - Extra blower required, power consumption, mlss, sludge
  - ‘Babysitting’ by WWTP staff
- Digester was under construction
- Increased operational requirements throughout
Higher Loading than Anticipated

- Average BOD frequently higher than permit limit of 150 lbs/day

**Brewery Discharge**

![Average BOD graph showing monthly discharge from Jun-13 to Jul-14](image-url)
Equalization: Mitigate Issues at the WWTP

- 20,000 gal ‘Frac Tank’ was rented

- Provided Flow EQ + Load EQ
  - Septic tank & grinder pumps
  - Throttled discharge from EQ tank

- Smoothed out the WWTP operations over the day
  - Targeting avg 10-14 gpm discharge from brewery
Action Plan for Handling Brewery Expansion

▪ Education, Development & Consensus
  ▪ Surcharges are required
  ▪ How to calculate surcharges
  ▪ Surcharges totaling $25,000/month were assessed

▪ Start-up Surprises
  ▪ Higher BOD than expected

▪ Letter from Brewery to Dexter:
  ▪ looking at options to reduce BOD by separating yeast and spent grain.

▪ Permit: 150 lb/day BOD limit

▪ City: “Need to make progress; issue progress report every 90 days”
Interim Steps to Reduce BOD

- Additional Steps to reduce BOD
  - Installed permanent, underground equalization tank
  - Separated spent yeast from wastewater discharge stream
  - Separated spent grain from wastewater discharge stream
Interim Steps to Reduce BOD
Site Plan for Brewery Wastewater Improvements – Add EQ and Separate Yeast/Grain
Current Operations & Next Steps

Proposed Site Plan for Brewery Wastewater Improvements
Continued Expansion, Continued High Loads

- Avg BOD 250-350 lbs/day
- Exceeding 150 lb/day limit
- City and brewery agreed that pretreatment would be necessary to meet limit
- Brewery installed anaerobic biological pretreatment system
Continued Expansion, Continued High Loads

- Avg BOD 250-350 lbs/day
- Exceeding 150 lb/day limit
Pretreatment

- Cambrian EcoVolt system was chosen
- Installed Fall 2016 – Spring 2017
- Start-up operations began in March 2017
- 80% reduction in BOD
- Expecting pretreatment for full flow by end of May 2017
Pretreatment Construction

October 2016
Next Steps

▪ Continued monitoring of pretreatment system

▪ Compliance schedule for BOD to comply with 150 lb/day limit by June 30, 2017

▪ With phosphorus TMDL decision for the Huron River watershed pending, expecting to implement phosphorus permit limit of 1.85 lb/day

▪ Brewery to submit a plan to bring phosphorus in discharge to 1.85 lbs/day (monthly avg) by June 30, 2017

▪ Brewery’s wishes to expand its tasting room to a full service restaurant – additional work needed to allow for restaurant
SUMMARY
Summary

▪ WWTP Staff should be part of site plan review process
▪ Size of brewery/brewpub matters
▪ Gather information – fill out industrial user survey
▪ Consider Sewer Use Ordinance
▪ Consider MAHL evaluation
▪ Consider BMPs
▪ Bring in an expert if needed
References

▪ Michigan Brewers Guild – www.mibeer.com


▪ US EPA Local Limits Development Guidance Manual

Special thanks to:

▪ Tripelroot / Zeeland Brewing Company

▪ City of Dexter