Waste Not, Want Not: Maximizing High Strength Waste Addition

CSWEA MN Conference on the Environment
November 4, 2015
Presentation Outline

➤ Background
  ▪ Plant Details
  ▪ Co-digestion Experimentation
  ▪ Biogas Utilization
  ▪ Brewery Operations

➤ Solution
  ▪ Design Goals and Preferences
  ▪ Operations Present - Future
Background: Operations
Stevens Point WWTP

- Plant Details
  - 4.55 mgd (3 mgd)
  - EBPR
    - A/O with RAS Denite
  - Anaerobic Digestion
  - Service Area
    - 27,000 Population
    - BOD Population Equivalent of 54,000
Co-digestion Experimentation

- Possible HSW sources?
- How to handle the material properly?
- How much biogas can be produced?
How Much is too Much?

- Normal Feed Rate 125 lbs VSS/1000 cuft digestion
- Over fed at 286 lbs VSS/1000 cuft digestion
Biogas Utilization

- 180 KW CHP
- Sustainable Results
- Utilization of excess engine heat
23.5% decrease in annual net electricity consumed 2002 – 2011

98% decrease in annual net electricity consumed 2002-2014
Brewery Loadings

![Graph showing Brewery Loadings from 2008 to 2015 with BOD (lbs/d) on the y-axis and years on the x-axis. The graph includes two lines: one labeled 'Annual Average' and another labeled 'Peaking Factor'. The 'Peaking Factor' shows a peak in 2014.]
Recent Expansion

Currently producing 130,000 bbls per year

Plan to double production in the future

Operational Issues

- Slug loading
- Nutrient Deficiencies
- Blower Demand
Solution:
Design
Solution

- Design Goals and Preferences
  - Tank Size
  - Tank Shape
  - Tank Material of Construction
  - Tank Placement
  - Tank Mixing
  - Digester Feed Pump
  - HSW Receiving
  - Coatings
  - Odors
  - Brewery separation/handling
Solution

- Design Goals and Preferences
  - Tank Size: 40,000 gal
  - Tank Design: Circular/Concrete/Below Grade
  - Tank Mixing/Pumping: Pump&Nozzle/Rotary Lobe
  - HSW Receiving: Basic
  - Coatings: Fiber-Reinf. Polyamine Epoxy
  - Odors: Smells like Beer
  - Brewery source separation/handling: Contracting/tools
Operations Present – Future

- Brewery to pump “the good stuff” through forcemain
- Transfer ASAP, or risk concrete-like deposits
- Buffer slug loads at WWTP receiving tank and mix
- Blend other HSW or sludge
- Hold volume, store for weekend/holiday
  - Redirect 25 man-hrs/wk running old setup
- Passive overflow to headworks
Waste Segregation

Brewery Waste

Thin

WWTP Aerobic Treatment

Energy Required

WWTP Anaerobic Treatment

New Force Main to EQ Tank

To Digester and Engine Generator

Hauled in Waste

Energy Produced

Energy Required

Hauled in Waste

Energy Produced
New System

- 1800 gal 316L SST
- Multiple Suctions
- Flushing Water
- Air Diaphragm Pumps
- Cleanouts
Brewery Operational Change

Before

After
New System

- Drive-on Lid for Vac-Truck
- Flushing Water
- Rock Trap
- Access Road and Fence
- Sanitary Drain
New System

- Ball Check Valve = OK
- Digested Sludge Transfer
- Brewery Line
- Chopper Pump
- Cleanouts
Before (Biowin Simulation)

- **Influent**
- **Zone #1**
- **Zone #2**
- **WAS Thickener**
- **Brewery**
- **Sludge**

**Treating Aerobically**
- 2 d SRT (MLSS = 1200 mg/L)
- Aeration = 4211 lb/d Oxygen
- PSD and DAFT = 4% TS
- Biosolids = 4425 lb/d TS
- HRT = 25 d
- Gas Production = 70,000 cf/d
After (Biowin Simulation)

- **Influent Zone #1**
  - Aerobic
  - Secondary Clarifier
  - Secondary Effluent

- **Anaerobic digester**
  - Treatment: Anaerobically
  - 2 d SRT (MLSS = 650 mg/L) **DECREASE**
  - Aeration = 2444 lb/d Oxygen **DECREASE**
  - PSD and DAFT = 4% TS
  - Biosolids = 3950 lb/d TS **SIMILAR**

- **Sludge Zone #2**
  - Treating Anaerobically
  - HRT = 33 d (less PSD and TWAS) **SIMILAR**
  - Gas Production = 112,000 cf/d **INCREASE**

- **Brewery Forcemain**

- **Sludge**
Peaking Factor Reduction

Brewery Loadings

Average to Max Peaking Factor (before) = 2.6

Average to Max Peaking Factor (after) = 1.8
Model Data - Results

➢ After (Biowin Simulation)

- Influent
- Zone #1
- Aerobic
- Sec. Clarifier
- Secondary Effluent
- Anaerobic digester
- WAS Thickener
- Zone #2
- Sludge
- Brewery
- Forcemain
- Sludge

Treating Anaerobically

- 2 d SRT (MLSS = 650 mg/L) **DECREASE**
- Aeration = 2444 lb/d Oxygen **DECREASE**
- PSD and DAFT = 4% TS
- Biosolids = 3950 lb/d TS **SIMILAR**
- HRT = 33 d (less PSD and TWAS) **SIMILAR**
- Gas Production = 112,000 cf/d **INCREASE**

CONTINUE HSW PROGRAM
Operational Data - Results

After

Treating Anaerobically

- 2 d SRT (MLSS = 1000 mg/L)
  - 14% DECREASE in WAS
- Inf/PE BOD consistent
  - Negligible decrease (new loads)
- No slug loading
  - From (2) 150HP blowers to (1) 150HP Blower
- Biosolids = 3950 lb/d TS
  - SIMILAR
- Gas Production = (metering limitations)
  - 16% INCREASE

Consistent digester feed with better sampling of feed stock
- Less foaming
- Higher capacity
- Better destruction (%VS and by observation)
- More gas
- Less gas burping around cover
- Increased hauler preference
Operational Data - Results

Digester Feed Stock

Sample (mg/L TSS) vs. Date

- Dairy
- Intev.
- SPB
- CHX
- Grease
- Groc.
- Goldn
- Dist.
- PSD
- TWAS
- EQ Tank

Date:
- 06/03/15
- 06/04/15
- 06/05/15
- 06/06/15
- 06/07/15
- 06/08/15
- 06/09/15
- 06/10/15
- 06/11/15
- 06/12/15
- 06/13/15
- 06/14/15
- 06/15/15
- 06/16/15
- 06/17/15
- 06/18/15
- 06/19/15
- 06/20/15
- 06/21/15
- 06/22/15

Values on the graph represent the concentration of various feed stocks over time.
Grease/Food Waste
Questions

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