Sheboygan Regional WWTF’s Waste to Energy
The Good, the Bad, and the Ugly

2016 Spring Biosolids Symposium
March 22, 2016
• 7 Communities, Western Shore of Lake Michigan
• Population 68,000
• 18.4 MGD Average, 56.8 MGD Max
• 10 MGD Average Daily Flow
• Activated Sludge with Biological P Removal and Backup Ferric Chloride Addition
• Anaerobic Co-Digestion, Biogas Recovery for Combined Heat & Power
• Liquid Storage of AD Biosolids and Biosolids Drying & Storage
• $4.7 Million O&M Budget
• 2013 ACEC Engineering Excellence Grand Award - Net Zero Energy
2005
Energy conservation initiatives & Co-digestion implemented

2006
Co-digestion program increased biogas

2006
Partnered with Alliant Energy - installed biogas conditioning and turbines; 300 kW, 1MMBtu/hour heat

2010
Installed additional biogas conditioning and turbines; 400 kW, 1.4MMBtu/hour heat

2012
Purchased biogas conditioning equipment and turbines from Alliant Energy - City recoups all cost savings from biogas to energy systems

Biogas to Energy
Initial CHP Generation Project

- 10—30 kW Capstone Turbines
- 2 Cain Heat Exchangers
- Unison Gas Conditioning
- 300 kW Electrical Power
- 1 MMBtu per hour heat recovery

Alliant Energy-Wisconsin Power & Light funded the turbine project and recovered costs through the sale of generated electricity to the WWTF
Co-Digestion Program Implemented

- Used Excess Capacity
- Dairy, Food Additives, FOG Waste
- Tanker Trucks
  - 24/7 Access
- 6000 gal/load
HSW Receiving & Feeding

In-line Strainer

HSW Unloading

HSW Feed Pump
Second CHP Generation Project

- Allowed Beneficial Use of Excess Biogas
- 2—200 kW Capstone Turbines
- 2 Cain Heat Exchangers
- Unison Gas Conditioning
- 400 kW Electrical Power
- 1.4 MMBtu/h Heat Recovery
Biosolids Storage Requirements

- NR 204 Requires 180 Day Biosolids Storage
- Increase in Biosolids Production Attributable to HSW
- 10.08 MG Required; 5.96 MG Available
- Alternatives Considered to Expand Biosolids Storage Capacity
  - Minimal Additional Liquid Storage & Eliminate HSW Receiving Program
  - Large Scale Liquid Storage
  - Liquid Storage & Drying
Biosolids Process Improvements

- Dewatering & Drying: Huber Screw Press & Huber Medium Temperature Belt Dryer
- Dryer Utilizes Excess Biogas & Waste Heat from CHP
- Class A, EQ Product
- Significant Cost Savings (Drying vs Hauling Liquid)
Biosolids Process Improvements
10 Years of HSW Program

- Process 60,000 gpd High Strength Waste
- Biogas Produced: 500,000 cu ft/day
- Biogas Quality: 53-63% Methane
- Equipment Installed: 700kW Electrical Generation
- Electrical Energy Produced: 5,000,000 kWh Annually
- Thermal Energy Produced: >100,000 Therms Annually
- Energy Savings: >$450,000 Annually
- CHP Program Produces: ~80% Electrical Needs & Heating Requirements
- Existing Facilities Deteriorated
- Significant Capital Improvements Required
HSW Challenges
Evolution of HSW Program

2005
• Sheboygan Only Regional HSW Program
• Increasing Revenue from Tipping Fees
• Significant Grant Money Available
• Utilized Existing Tank Capacity

2015
• Multiple Co-digestion Programs
• 90% HSW from One Supplier
• Decreasing Revenue from Tipping Fees
• Minimal Grant Money Available
• Significant Capital Improvements to Continue HSW and Co-digestion
Annual Operating Costs
Energy + Biosolids

- **End HSW**: $978,541
- **Continue HSW**: $517,307
Capital Improvements — Phased Approach

- Sustain the Current HSW Program - $1.4 Million
  - Receiving & Storage Tank: Rehab & Line Existing Tank
  - Enhance HSW Receiving & Debris Removal
  - New Truck Unloading Area
- Evaluate HSW Types
  - Diversify and/or Expand HSW Program
- Evaluate Biogas Utilization Alternatives
- Expand and Enhance Biogas Storage
- Anaerobic Digestion Improvements
Future of Co-Digestion Program

Cumulative Present Worth, $

End HSW: Energy, Biosolids Costs
Continue HSW: Energy, Biosolids, Capital Improvement Costs

Years

$0,000,000
$2,000,000
$4,000,000
$6,000,000
$8,000,000
$10,000,000
$12,000,000
$14,000,000
$16,000,000
$18,000,000

0 2 4 6 8 10 12 14 16 18 20
Resource Recovery Facility

- Team Effort
- Evaluate Energy Consumption
- Keep User Rates Low
- Continue Path to Sustainability & Being a RESOURCE RECOVERY FACILITY

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