Grease Trap Waste Acceptance and Codigestion at the Derry Township Municipal Authority Clearwater Road WWTP, Hershey, PA

PRESENTED TO THE NATIONAL ASSOCIATION OF WASTEWATER TRANSPORTERS, Inc.

Wayne A. Schutz
Derry Township Municipal Authority
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• Operating Authority – Staff of 32
• Two Wastewater Treatment Facilities
  – Clearwater Road WWTP
    • 5.02 MGD
  – Southwest WWTP
    • 0.6 MGD
    • Unmanned Satellite WWTP
• Thirteen Pumping Stations
• 150+ Miles of Sanitary Sewer
  – 6” to 48”
• **5.02 MGD Activated Sludge**
  – Wastewater Pumping
  – Preliminary Treatment
    – Screening & Grit Removal
  – **Septage Receiving Station**
  – **Primary Clarification**
  – Activated Sludge Mechanical Aeration
  – Biological Nitrogen Removal (Chesapeake Bay compliant)
    – (anoxic ~ oxic ~ anoxic ~ re-aeration)
  – Ferric Chloride (FeCl$_3$) Addition for “P” Removal
  – Enhanced Final Clarification
  – UV Disinfection
Major Components
Solids Processing

- Sludge / Biosolids Processing Facilities
  - Gravity Thickening - Primary Sludge
  - DAF – WAS
  - Hershey IPF Sludge
  - Anaerobic Sludge Digestion (two stage)
  - Centrifuge
  - Indirect Paddle Dryer
  - Biosolids Storage Pad
  - SteadiGro™, Class A – “EQ” Product Beneficial Reuse
• **9.1 DT/D Raw**
  - 5.7 DT/D (63 %) Primary Sludge
    - 1 DT/D (12%) Septage/Grease Pretreatment Solids
  - 2.2 DT/D (24%) WAS
  - 1 DT/D (11%) IPF Sludge (anaerobic raw)
  - 0.2 DT/D (2.2%) DTMA SW WWTP WAS

• **4.1 DT/D Digested**
  - 55% Reduction
• Septage Receiving
  – Illegal Dumping in late ’80’s
  – First Receiving Station Started in August 1991

• Current Receiving Station
  – Two Lane
  – Hauler Kiosk & DTMA Operator Station
  – Lime addition to settle solids (& organic load) in primary clarifier
  – Screening & Grit Removal via WWTP Headworks

• 2009 Totals – 20.6 MG
  • Septage - 13.85 MG  [~48,400 GPD]
  • Grease Trap Wastes - 5.89 MG  [~20,600 GPD]
  • Misc. Sludges - 0.81 MG  [~2,800 GPD]
Septage Receiving Facility Layout

- Headworks Building
- Lime Silo
- Septage Valve Vault
- Grinder & Grease Unloading Connection
- SEPTAGE RECEIVING PADS
- HAULED WASTE RECEIVING STATION

Key Features:
- Grease Digester
- Grease Digester Control Building
- Chemical Building for MgOH
- Kiosk
• Originally Refused Grease Trap Wastes (GTW)
  – Grease was loosely defined as 750 mg/l FOG

• “Evolution” of GTW Acceptance
  – Started Grease Trap inspections to prevent sewer clogs & issues at pump stations & required proof of pump-out
  – Restaurant documentation of pump out was “weak”

• Accepted GTW from Derry Twp Restaurants
  – Requested GTW be diluted
Problems, Problems, & PROBLEMS

- Build up of Grease on Primary Clarifier baffles, weirs, beaches, in the PC center wells & scum pits
- 30 – 40 CY removed from each PC every 3 months
- Plugging Primary Sludge Line
- Tear down & flush line every month
- Visible grease “specks” in digested BFP cake
GTW Pretreatment

Genesis

• Accumulation in Primary Clarifier Scum Pits
  – Genesis of pretreatment idea
  – Pilot “Digestion” in Scum Pits
  – Bugs, soda ash, & mixing/aeration

• Design Concept for Aerobic Grease Pretreatment (AGP)
  – KISS
  – Incorporate into existing septage receiving station
  – Provide 48-72 Hours of detention (40,000 gal tank)
  – Computer controlled fill & draw
    • Draw off mixed, tank liquor to WWTP Headworks
• Design Concept (continued)
  – Chopper Pumps
    • Venturi Aeration
    • Rotomix Mixing Nozzles
  – pH Adjustment (original)
    • Manual control
    • Lime Addition
  – pH Adjustment (current)
    • Automatic control via pH probe
    • Magnesium Hydroxide
  – Addition of Bacteria
    • ECOBIONICS™ Biogenerator bacteria delivery system
GTW Pretreatment
Process Flow Diagram

Aerobic Grease Trap Pretreatment
Process Schematic
• Immediate & Dramatic Results throughout WWTP
  – Within a few weeks grease buildup throughout the WWTP was gone.
  – Within a few months grease “specks” in BFP cake disappeared.

• Change in delivery philosophy
  – Requested concentrated and if possible dedicated grease trap loads.
  – “Adjusted” rates to enhance cooperation
• Improvements
  – Grinder/macerator on truck discharge to AGP
  – Addition of rock trap in front of macerator
  – Addition of pH control for magnesium hydroxide feed
  – Scum / Foam Control
    • Cannot operate system at optimal conditions of pH 7 and D.O. 1 or the foam/scum problem becomes uncontrollable
    • Mission impossible
GTW Pretreatment
Impact on Codigestion

- GTW Mixed Liquor is discharged into headworks with Plant Influent
- Screening & Grit Removal
- Settles out as Primary Sludge
- Anaerobic digester feed stock
  - High Volatiles
  - Very good alkalinity

- Impact of Biogas Production
  - Because of all the variables involved in the digestion of sludge and the subsequent generation of methane, it is very difficult, to establish a quantitative relationship between the amount of grease wastes received and the volume of methane produce, but clearly a relationship exists.
Impact on Codigestion
Before GTW Pretreatment

BIOGAS PRODUCTION vs. GREASETRAP WASTE VOLUME ACCEPTED

SCALE AS NOTED

MONTH

2003
2004
2005
1,000 GALLONS / MONTH
10,000 CF / MONTH
Impact on Codigestion
After GTW Pretreatment

**BIOGAS PRODUCTION vs. GREASETRAP WASTE VOLUME ACCEPTED**

- **METHANE PRODUCED**
- **GREASE ACCEPTED**

UNIT STARTED:

- 1,000 GALLONS/MONTH

2005 - 2009

MONTH

10,000 CF/MONTH
Biogas Utilization

History

• 2000 - ES Anaerobic Digester On-line
• 2001 - Biogas utilization study
  – No favorable PPL rate structure
  – Green Energy not yet in vogue
  – Phase aligned induction generator not yet common
• 2003 – Plan B
  – Use biogas to produce steam and dry biosolids into STEADIGRO™ Class A, EQ Product for sale
  – Some biogas wasted
• 2007 – Install Centrifuge
  – 50% reduction in dryer biogas use due to increased cake solids
  – Increased biogas production from grease acceptance
• 2008 - Biogas utilization for CHP
  – PPL rate caps off – 20-30% rate increase
  – Green Energy / REC’s
  – Recovered waste heat for building heat
  – Payback ~ 8½ years

• 2009 – Cogen & Gas Conditioning Design & Bid
  – Award Contract ($2,200,000) & Notice to Proceed - July
  – $500,000 PA Green Energy Works (ARRA/DOE) Grant – December

• 2010
  – Unit start-up June 8th
• Annual CHP Forecast
  – Electric Power
    • 1,500,000 kWh / Yr Power Production
    • Approximately 20% of WWTP consumption
    • $150,000 savings @ $0.10 / kWh
  – Recovered Heat (winter)
    • 20,000 gallons of #2 fuel oil saved
    • $47,000 savings (@ $2.365/G)
  – System O & M
    • Two year bumper to bumper including PMs for Gas Skid & Engine
  – Payback with Grant
    • ~6.5 years
Cogeneration Engine

Aligned 3 PH Power to Distribution Ctr

Hot Water to Boilers Biogas Supply
Cogeneration Engine
Inside the “Box”
Cogeneration Engine Connections

Heat Recovery Connections

Waste Heat Radiator
CONVERTING WASTE BIOGAS INTO POWER & HEAT

THE FINAL OBJECTIVE
QUESTIONS?

DOGBERT THE GREEN CONSULTANT

YOUR COWORKERS HAVE IDENTIFIED YOU AS A SOURCE OF METHANE.

IF WE CAPTURE THIS FREE SOURCE OF ENERGY WE CAN POWER A SMALL OFFICE BUILDING.

I GIVE AND I GIVE.