Reducing the costs for WWTP digester clean-outs
What is Anaerobic Digestion?

• Widely used sludge treatment method in municipal wastewater treatment plants (WWTP)
• Fueled by organic materials in sewage
Sludge Break Down During Anaerobic Digestion

- 50% of organic matter → Gas carbon dioxide (CO2) and methane (CH4)
  - Methane (CH4) = Power generator!
  - Remaining 50% → Dried and becomes a residual soil-like material (biosolids)
    - Classified as Class A or Class B Biosolids
    - Chemically stable
    - Nearly odorless
- Significantly reduced levels of pathogens
Organic Materials Fueling Anaerobic Digestion Often Have... Organic Material

But, inorganic debris is often mixed in.....

- Plastic
- Grit
- Rags
- Accumulated sand
- Other debris
  - Steady increase of disposable wipes and other non-dispersible products
Inorganic debris robs anaerobic digester capacity

Why do we care?

Increase in Population +
Increase in Manufacturing and Industrial Production +
Increase Environmental Regulations and Green Initiatives = More sludge being processed through existing wastewater infrastructure
Loss of Digester Capacity

Debris Build-up = Poor performance

- Increases the need for maintenance
- Increases the need for repairs
- Difficult to meet stabilization requirements
- High-odor biosolids
Protect Your WWTP at the Headworks

Screens
Filter out inorganic material

Monster Grinders
Grinder within sludge systems
shred large debris into smaller suspended solids
Poor headworks screening allows more inorganic debris into wastewater plants

- No screens
- Manual racks with large openings
- Mechanical screen with large openings
- Step screens, smaller openings
- Perforated plate fine screens (> 6mm)
Keeping Anaerobic Digesters Performance On Par

- Dewatered and the sludge cleaned out
  - Approximately every 3-10 years to maintain best operability
- Perform inspection and repairs
  - Pumps
  - Valving and Piping
  - Temperature Control
  - Power Generation Equipment
Digester Sludge Clean Out

- Costly
  - Up to $100,000 to dewater and remove the sludge
- Disruptive
  - Takes a portion of digester capacity offline
  - Can take more than a month to complete
About South Orange County Wastewater Authority’s Regional Treatment Plant (SOCWA)

- Location: Orange County, California
- Built: 1983
- Sludge Treatment Compacity: 950,000 gallons of anaerobic digesters
  - 4 Digesters Total
- SOCWA’s Regional Treatment Plant
  - Liquid handling capacity of 12 MGD
  - Solid Handling capacity of 24.6 MGD
SOCWA’s Regional Treatment Plant

Operations and processes include

• Screening
• Grit removal
• Primary clarification
• Secondary treatment (activated sludge)
• Secondary clarification
• Dissolved air flotation thickening
• Anaerobic digestion and solids dewatering
SOCWA’s Anaerobic Digestion Process

1. Collects methane gas from the anaerobic digesters
2. Powers its cogeneration facility
   1. 3 engines equipped with a heat recovery system and 400 KW generators
3. Cogeneration system utilizes
   1. 75 percent digester gas
   2. 25 percent natural gas as fuel
4. Waste heat is circulated to provide hot water to heat the anaerobic digesters
5. Electrical power is generated by the cogeneration system and used entirely by the wastewater treatment plant

* Approximately two-thirds of the treatment plant’s electrical power needs are supplied by the cogeneration facility
Traditional Process for Digester Cleaning

- Emptying
- Hydroblasting
- Hydro Excavation
- Chemical Cleaning
- Sludge Waste Disposed in Landfill

*Digester Cleaning Is Very Challenging to Achieve SAFETY, TIME, $$$$*
Situation at SOCWA

SOCWA waited 17 years to clean digester!

Effects of neglected digester:
- 20% of digester space leading to lower retention times or getting an upset due to overloading of digester
- Rags would reform in the digester and form large rag balls
- Odor control was a big concern during cleaning – especially with neighborhoods nearby
Problem

- Digest #1 Cleaning Costs: $120,000
- Hired Contractor
- Dewatered 50%
- Needed cheaper solution
A Unique Solution to Cut Costs – The Trial

Digester #2 Cleaning

- Cleaning costs: $40,000
- Drained the 950,000 gallon anaerobic digester themselves
- Invested in rotary drum screen
- Used drum screen to process sludge
How Rotary Drum Screen Works

1. Influent sludge enters headbox
2. Flow is evenly distributed onto the sidewalls of the drum
3. Plastics and debris are retained on the screen surface
4. Slurried sludge flows radially through the openings
5. Debris is transported axially, by flights, to the open end of the drum
6. Rotation of the drum allows entire screening surface to be continuously or intermittently washed
7. Fixed external spray bar fitted with a bank of fan jet spray nozzles
A Unique Solution to Cut Costs – A few more upgrades

Digester # 3 Cleaning

- Changes from six-inch pumps to eight-inch pumps
  - Fed the rotary drum screen
- Elevated the drum so that a collection bin could be positioned underneath to collect the plastics and debris as it was exiting the auger
- Adjustable-nozzles were installed to the fire hoses
  - Permitted the fire hose nozzles to move vertically and horizontally while maintaining a fixed location
  - Hydro blast the sludge slurry into the rotary drum screen
- Cleaning Costs: $20,000
A Unique Solution to Cut Costs – Perfecting the Process

Digester # 4 Cleaning

- A few more modifications
- Adjustable-nozzles were installed to the fire hoses
- Hose stands were put into place
- SOCWA cleaned 90% of digester themselves
- Cleaning Costs: $10,000
Benefits to Plant for New Digester Cleaning

• Save $$$
  – Cost on digester #1 was $120,000
  – Cost of digester #4 $10,000
• Safety of Workers
• Less Downtime
• Decrease Maintenance
“This screen is a workhorse – it uses very little electricity and requires virtually no maintenance. We have now been trucking it around to other SOCWA facilities to clean their digesters too.”

- Bob Waters, Chief of Operations at the Regional Treatment Plant
Question Time
JWC Environmental is headquartered in Santa Ana, California, and has a global network of representatives, distributors and regional service centers to provide customer support. For more information, visit us at www.jwce.com.

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