

# Anaerobic Digester Foaming – Case Studies

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Anaerobic Digester  
Foaming Workshop



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# Healthy Digester Parameters

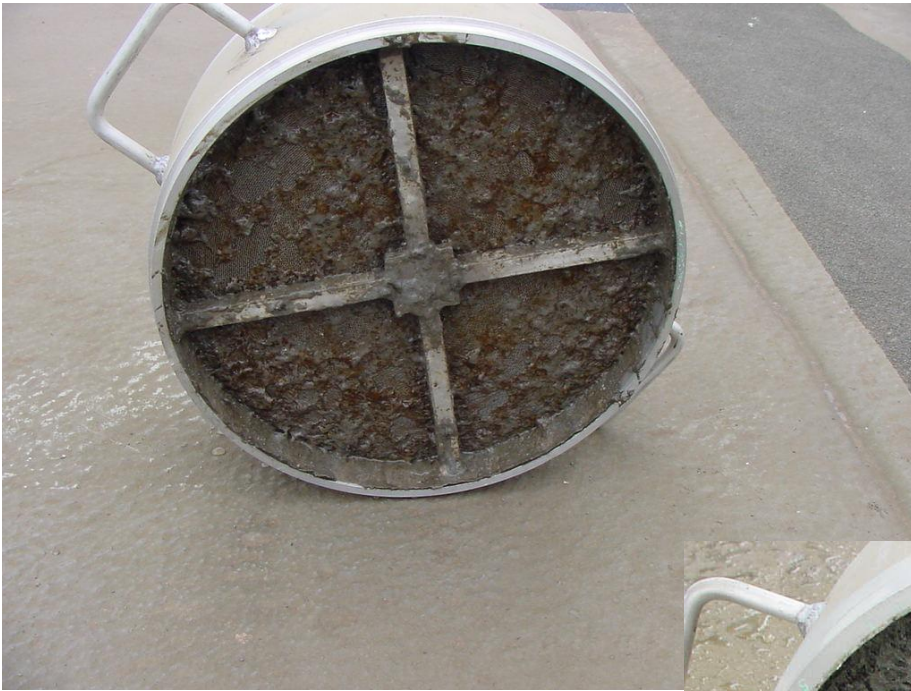
- Temperature (mesophilic)
  - 93-98°F
  - Change less than 2 to 3°F over several days
- Volatile Acids to Alkalinity Ratio
  - 0.10 target
  - <0.25 operable
- Gas Production -12 to 18 cu.ft./lb. VS destroyed
- Gas Composition
  - 35-45% Carbon Dioxide
  - 55-65% Methane
- Sludge Loadings
  - 0.1 to 0.2 lbs VS/cu.ft./day (high rate)
  - 80 lbs VS/1000 cu.ft./day (10 States Standard)

# Typical Causes of Excessive Foaming

- Varying Sludge Loadings
  - Total Sludge Quantity
  - Ratio of Primary Sludge to WAS
- High Ratio of WAS
- Inadequate Mixing
- *Nocardia* and *Microthrix Parvecella*
- Inconsistent or High VFAs
- Low Influent Solids Concentration
- Excessive or Fine Bubble Mixing

## What Problems Can Digester Foaming Cause?

- Upset the Anaerobic Digester
- Impact Gas Piping and Handling Equipment
- Make a Mess
- Damage Tanks and Equipment





# Digester No. 1 Case Study

## Plant Description:

This is a 60 mgd plant that has preliminary, primary, and secondary treatment. Solids handling facilities includes DAFT's, anaerobic digestion, dewatering and incineration.



# Digester No. 1 Case Study

## Problems:

- Feed rate
- Mixing
- Temperature
- Weight on cover



## **Solution:**

- Improve feeding
- Improve mixing
- Improve temperature control

# Digester No. 2 Case Study

## Plant Description:

This is an 8 mgd plant consists of preliminary, secondary, and tertiary treatment. The solids handling facilities consists of scum thickening, DAFT's, anaerobic digestion and dewatering.



# Digester No. 2 Case Study

## Problems:

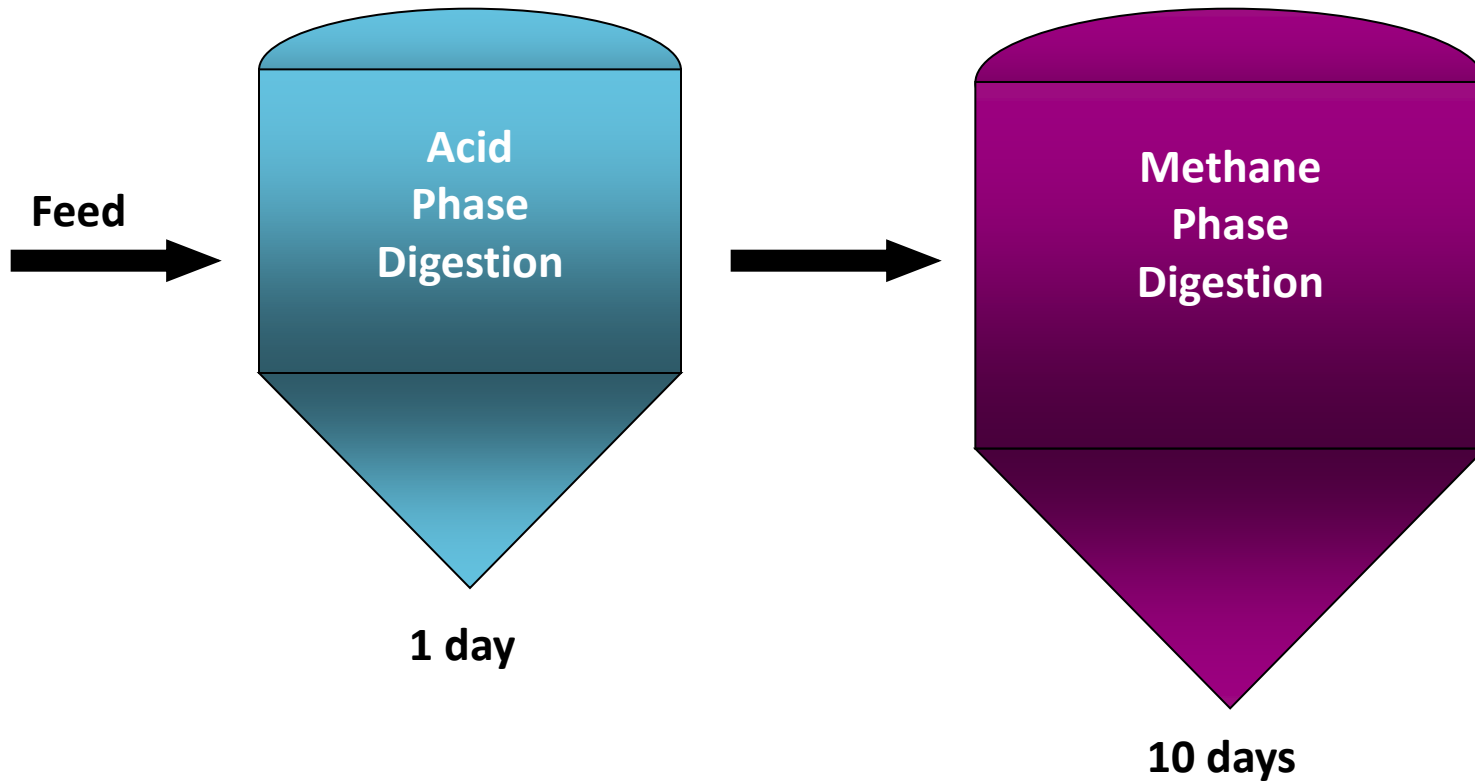
- Type of process
- Nocardia

## Solution:

- Phased digestion



# Phased Digestion



# Digester No. 3 Case Study

## Plant Description:

This facility serves two WWTP's. One plant is a 37 mgd and the second plant is 112 mgd. Both plants have preliminary, primary, and second treatment. The solids handling facility consists of DAFT's, anaerobic digestion, dewatering, and drum dryers.



# Digester No. 3 Case Study

## Problems:

- Feeding methods
- Foam adaptation

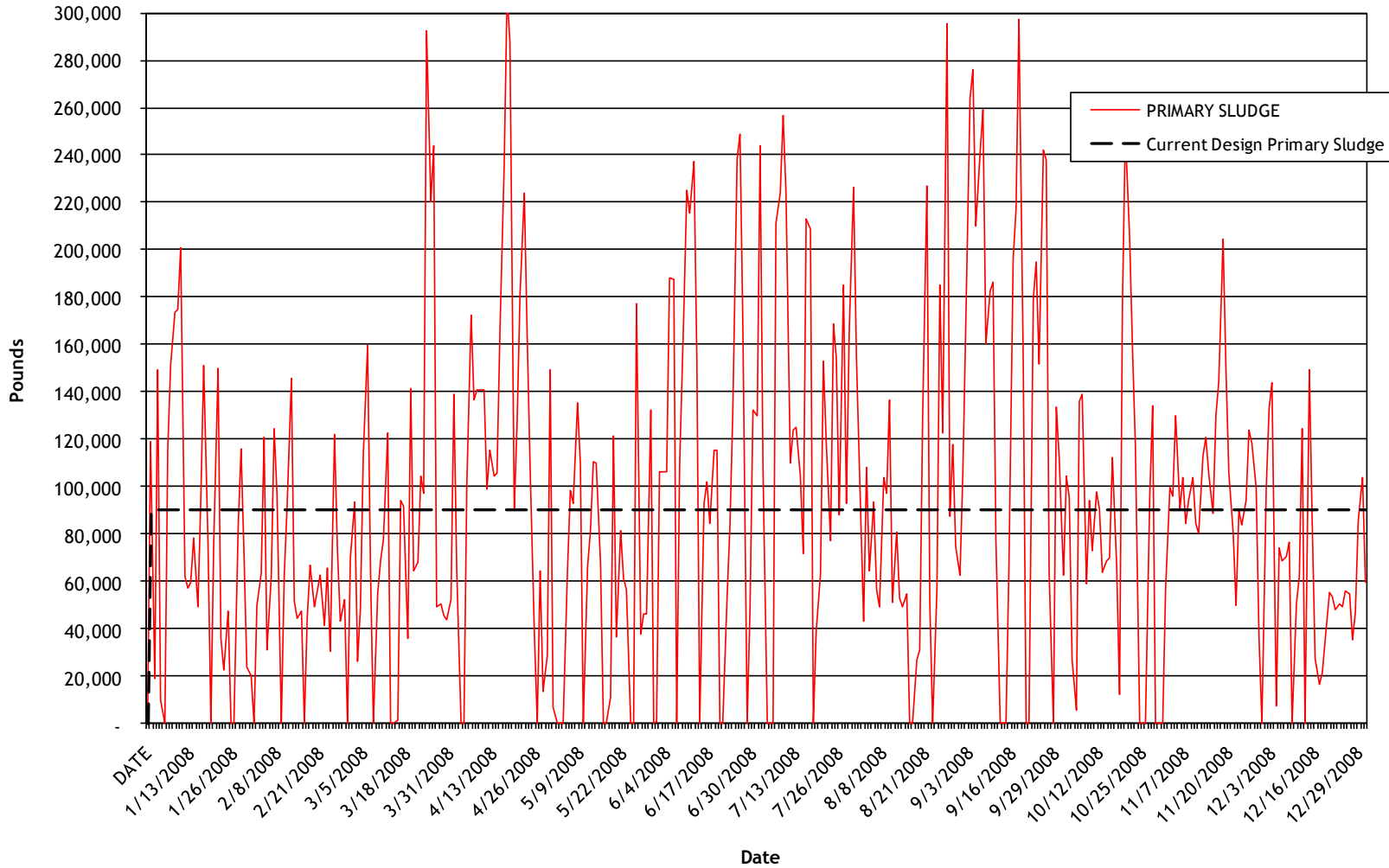
## Solution:

- Improved feeding methods
- Improved mixing methods
- Digester modifications

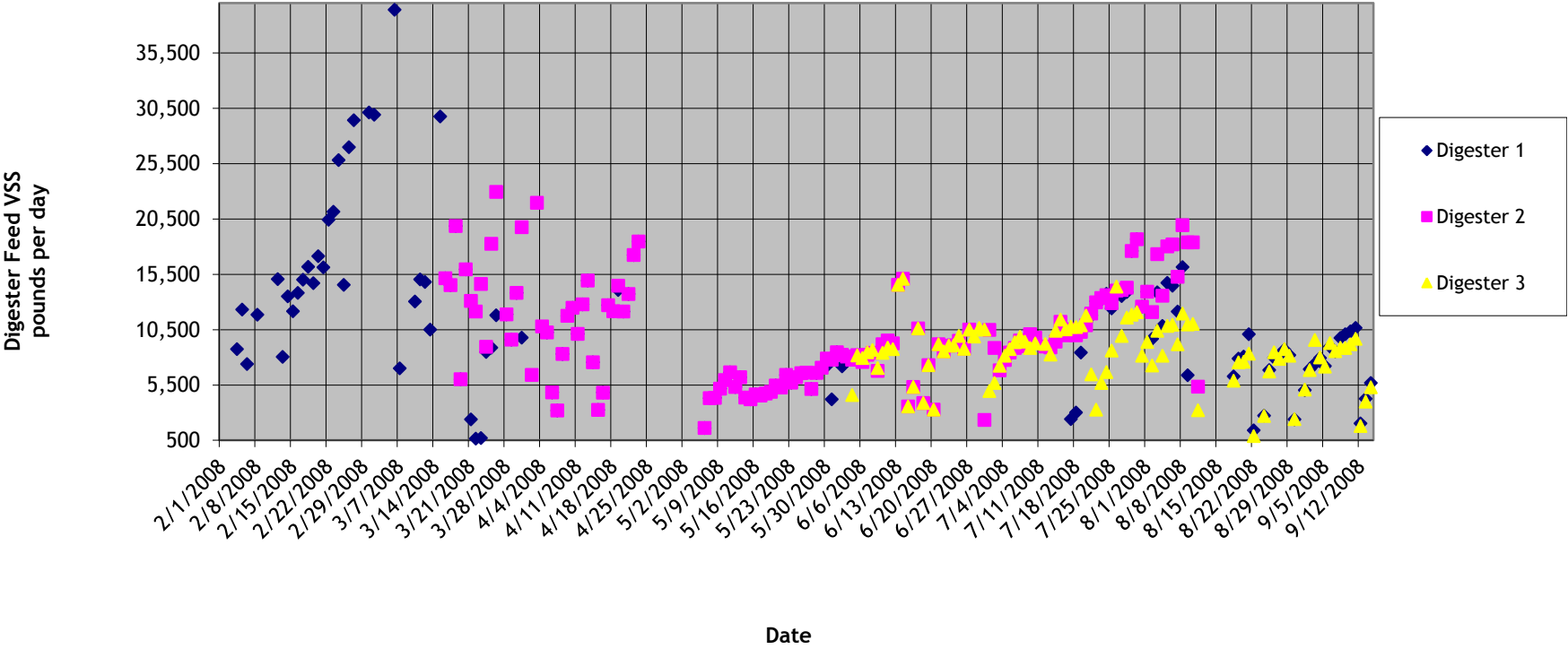


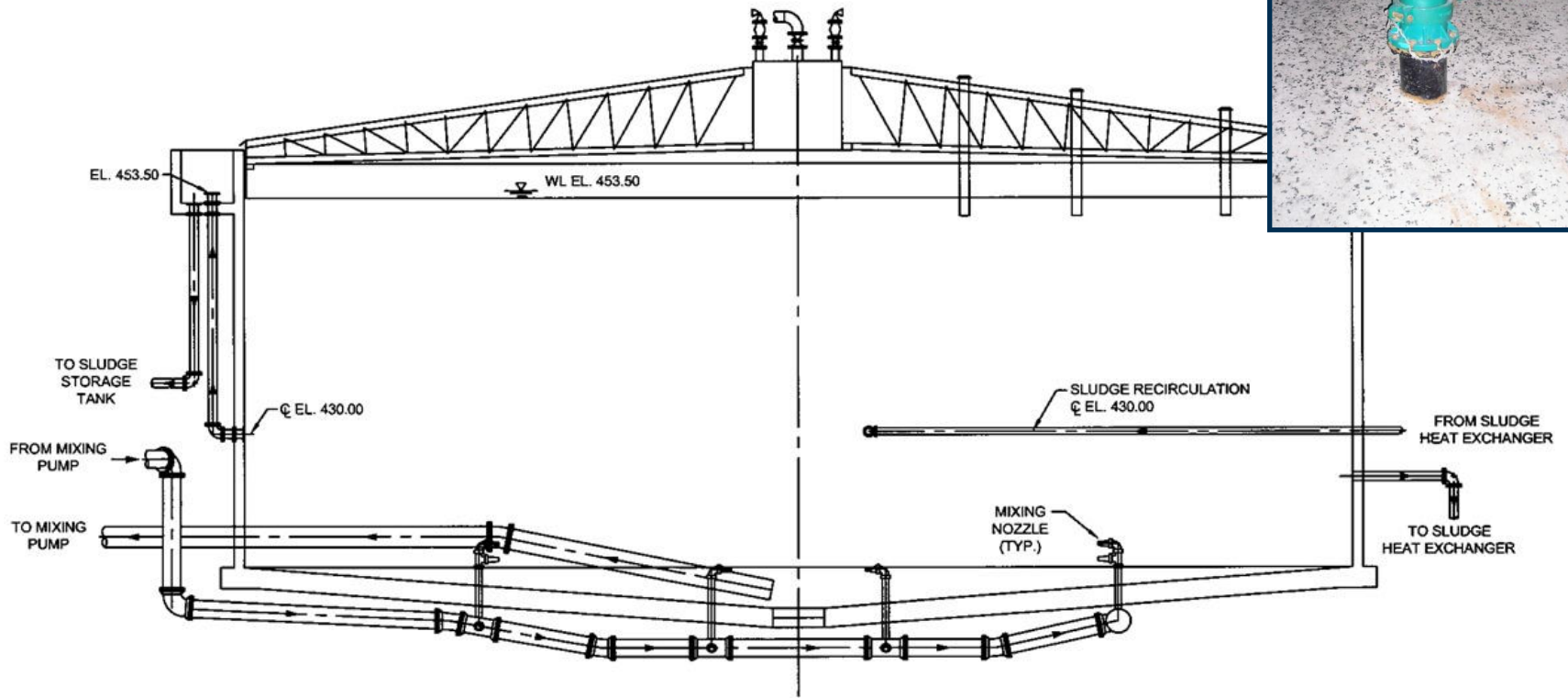
# Actual Versus Design Loadings

Primary Sludge

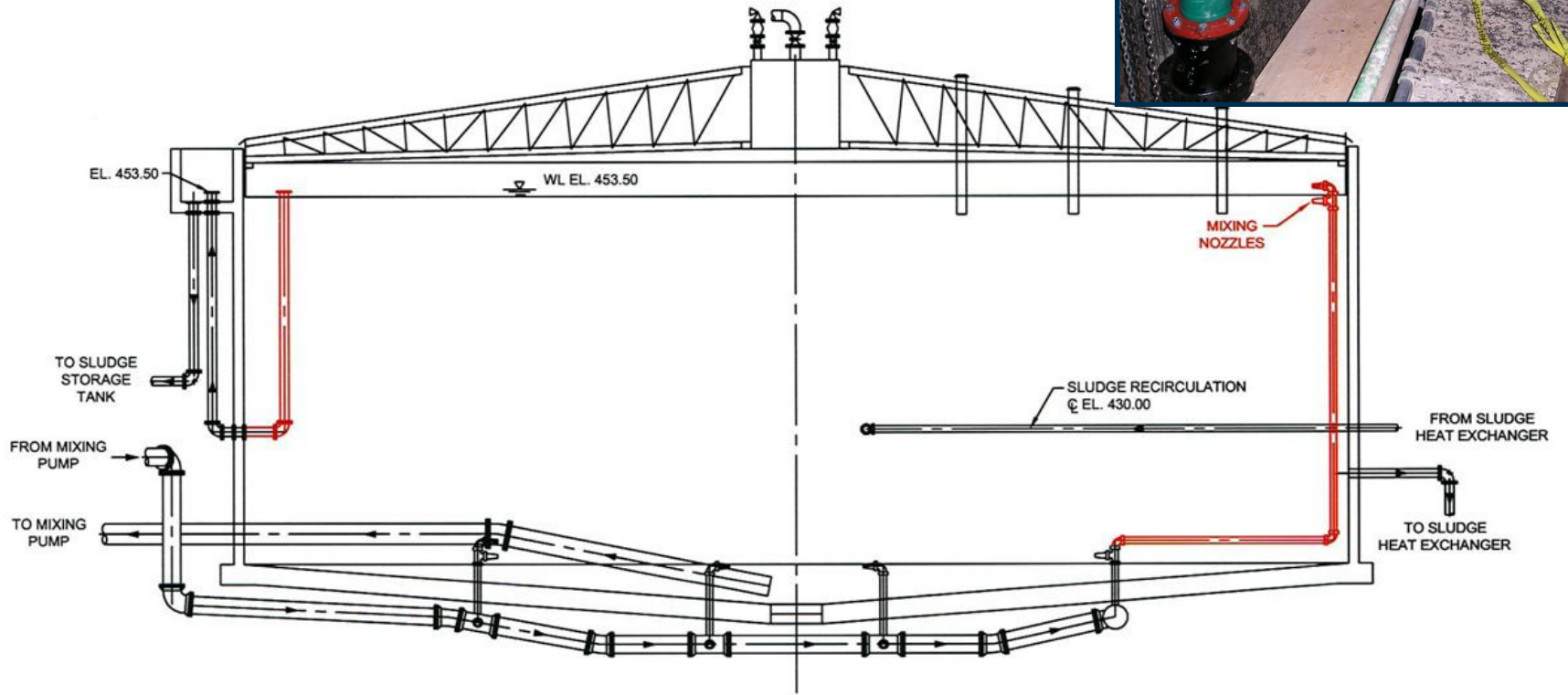


### Digester Feed VSS pounds per day





EXISTING DIGESTER



MODIFIED DIGESTER

# Lessons Learned

## Operator Controls

- Control Feeding
- Monitor Feed
  - Volatile acids (Below 4,000 mg/L)
  - VS loading rate
  - Consistent feed
- Maintain Temperature
- Provide Good Mixing

# Process Monitoring

- Digester Feed
  - Loading rate
  - Types of feed
  - Feeding times
- Temperature
- Digester Gas Production and Consistency
- VA and Alkalinity

# VA/AK Forms – Digester Daily Data Sheet

## Digesters

parameters	Dig. 1	Dig. 2	Dig. 3	Dig. 4
ID - number	4888	4889	4890	
pH	7.3	7.2	7.3	
<b>vol. acid</b>	<b>176</b>	<b>128</b>	<b>168</b>	
alk. - 5.8	3540	3430	3330	
alk. - 4.3	4690	4560	4670	

## Feed Sludge

ID Number	4891
pH	6.2
<b>vol. acids</b>	<b>969</b>

## Recycle Flow

ID Number	
Ammonia	180.1
Susp. Solids	356
V.Susp. Solids	272

## Splitter Box Feed

vol. acids	
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# Mitigation and Adaptation

- Mitigation
  - Minimize Feed of Foaming Organisms
  - Proper Feed Control – quantity, frequency, mixture consistency
  - Good Mixing
  - Consistent Temperature
- Adaptation
  - Surface Discharge
  - Surface Removal
  - Foam Suppressant Chemical Feed
  - Foam Trap on Gas Lines
  - Foam Sensor
  - Protection of Pressure/Vacuum Release Valves
  - Cover Design

# Thank You

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