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# Kankakee River Metropolitan Agency Digester Improvements

October 8, 2015

Wisconsin Wastewater Operators' Association:  
49<sup>th</sup> Annual Conference



Presented By:  
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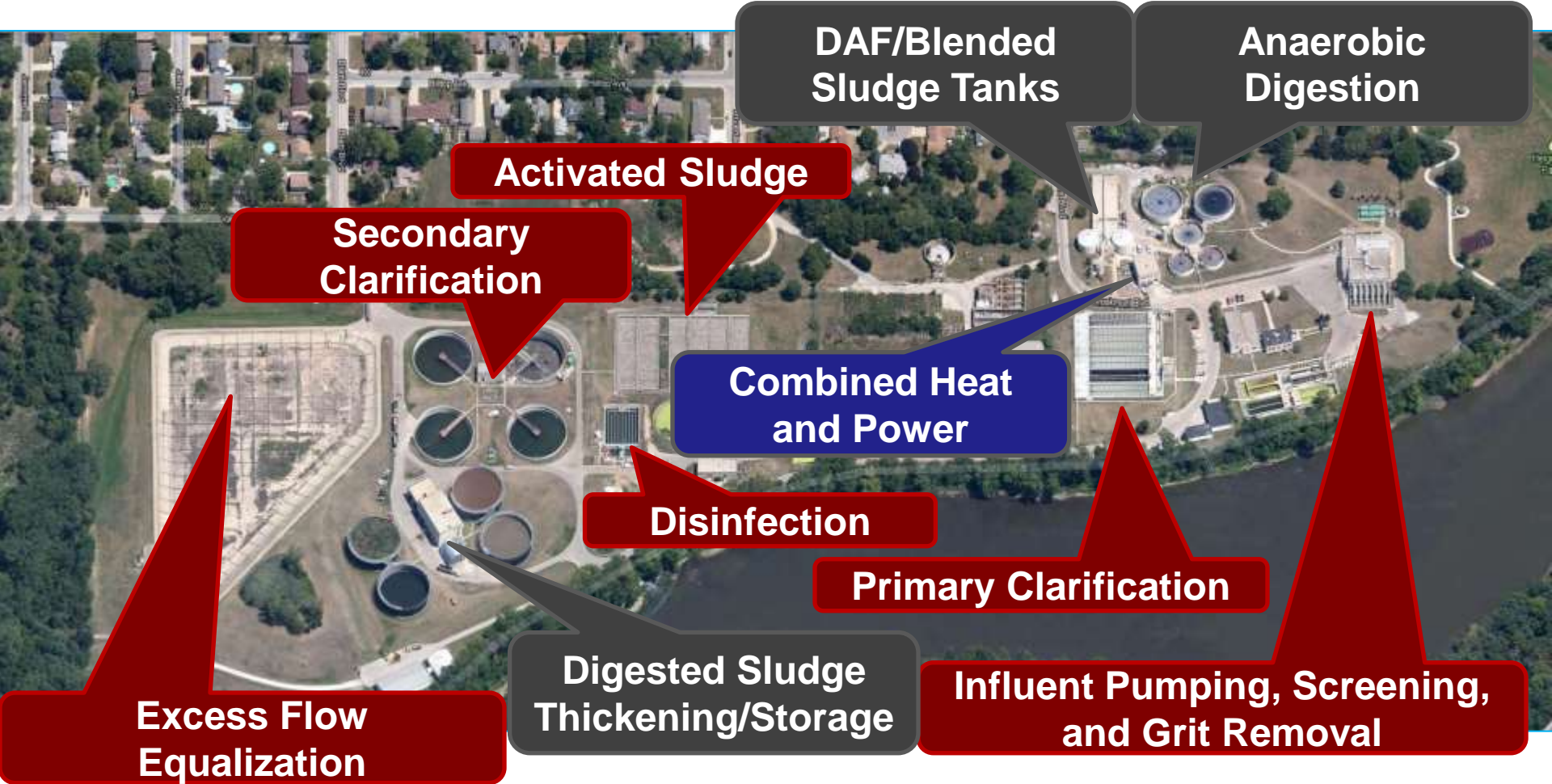


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Art Strother, KRMA

# ■ Today's Outline

- Operations and Planning
- Incident
- Planning/Design
- Construction
- Commissioning
- Operation

# Plant Aerial



# ■ Digester Foaming a Persistent Issue

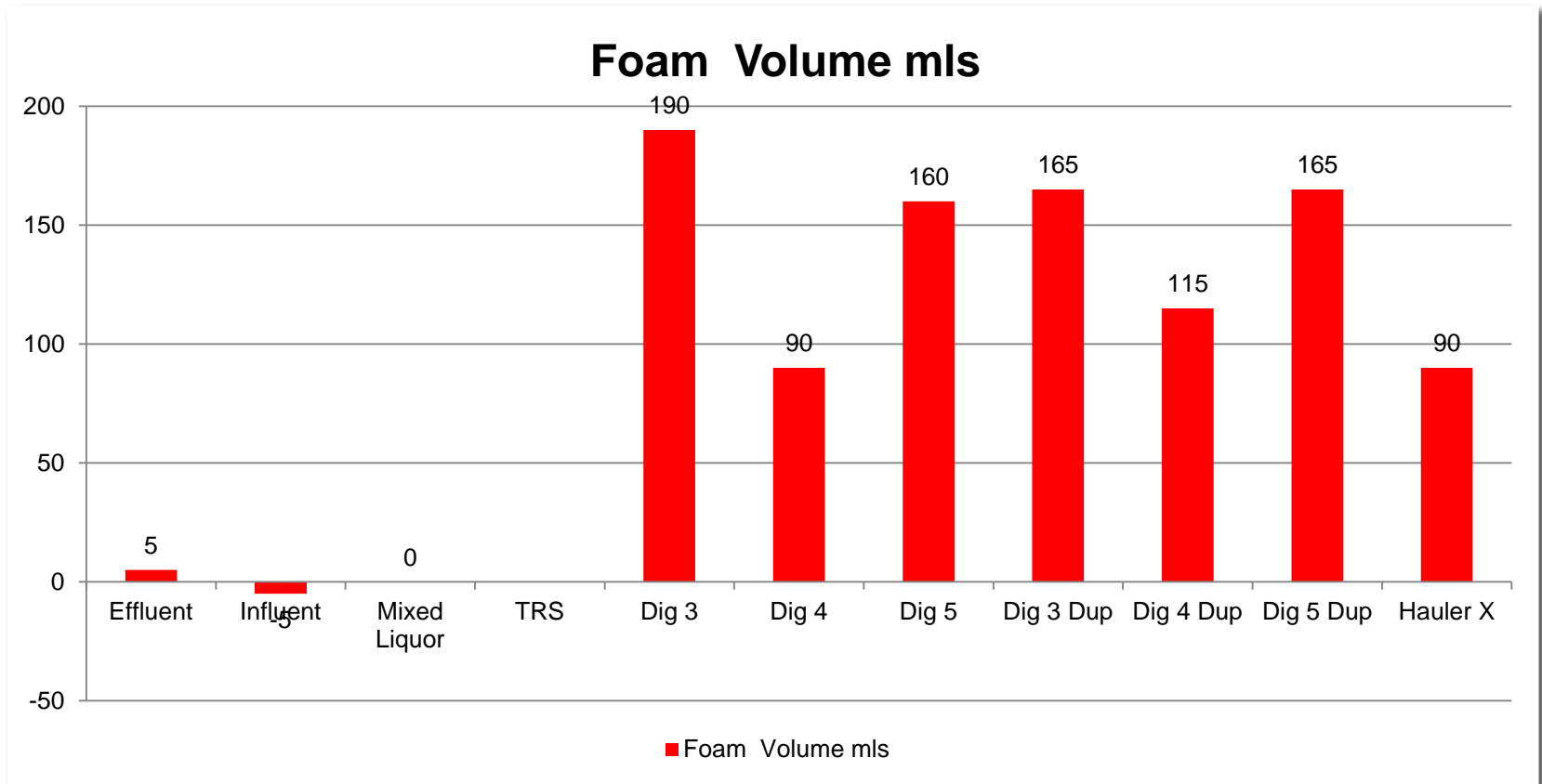


# ■ Foam Troubleshooting

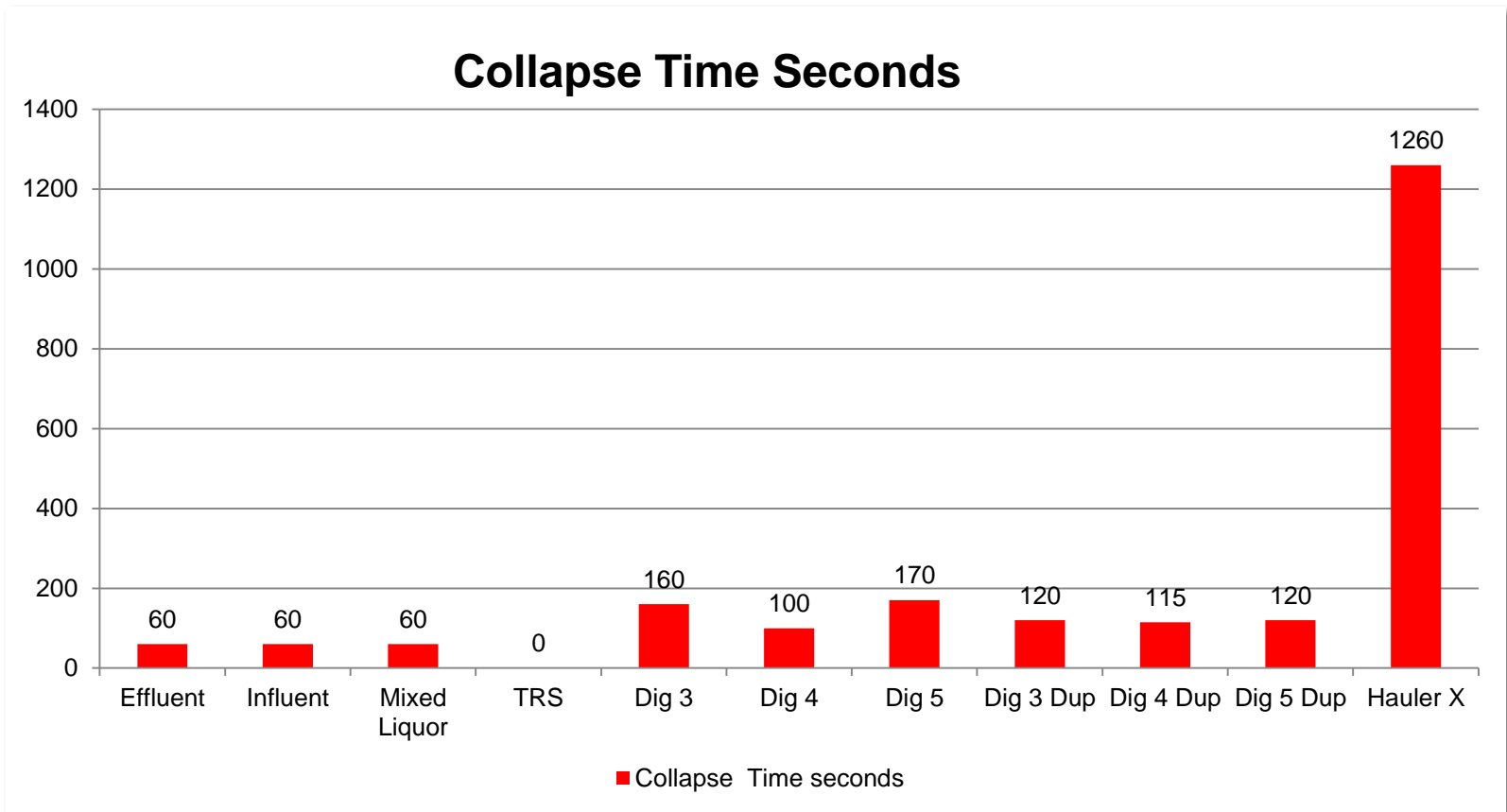
- Temperature Control
- Feed Strategies
- Mixing Time/Energy
- Hauled/Industrial Wastes
- Diagnostics – e.g. Foam Potential (pictured)



# Foam Troubleshooting



# Foam Troubleshooting



# Operations Impacted By Age and Condition of Equipment



# Operations Impacted By Age and Condition of Equipment



# ■ Old System: Pumped Mixing



# Improvements Planned – Status Prior to December 27, 2010

- Projects that were shovel ready included
  - Gas conditioning and cogeneration
  - Dissolved air flotation thickening
  - SCADA Improvements
- Gas piping and conveyance improvements were being considered in house.
- Foam and treatment considerations were being further evaluated, however all considerations were operational at this time.

# ■ Turning Point – December 27, 2010

## Explosion destroys Kankakee water treatment building

Tweet

Sun-Times Media wire December 27, 2010 2:03PM

No one was injured when an explosion demolished a water treatment building Monday morning in far south Kankakee.

Emergency crews were notified of the explosion at 8:49 a.m. at the Kankakee River Metropolitan Agency treatment facility, Kankakee Fire Department Chief Ron Young said. The building is just west of Bradley between Bradley and the Kankakee River.

The digester building — which produces methane gas for use as energy — was demolished in the explosion, although no employees were inside at the time and no injuries have been reported, Young said.

The scene was secured Monday morning and the plant is considered operational, Young said.

Nicor, ComEd and the Illinois Environmental Protection Agency were notified and were responding to the scene, Young said.

The cause of the explosion remained under investigation Monday afternoon.



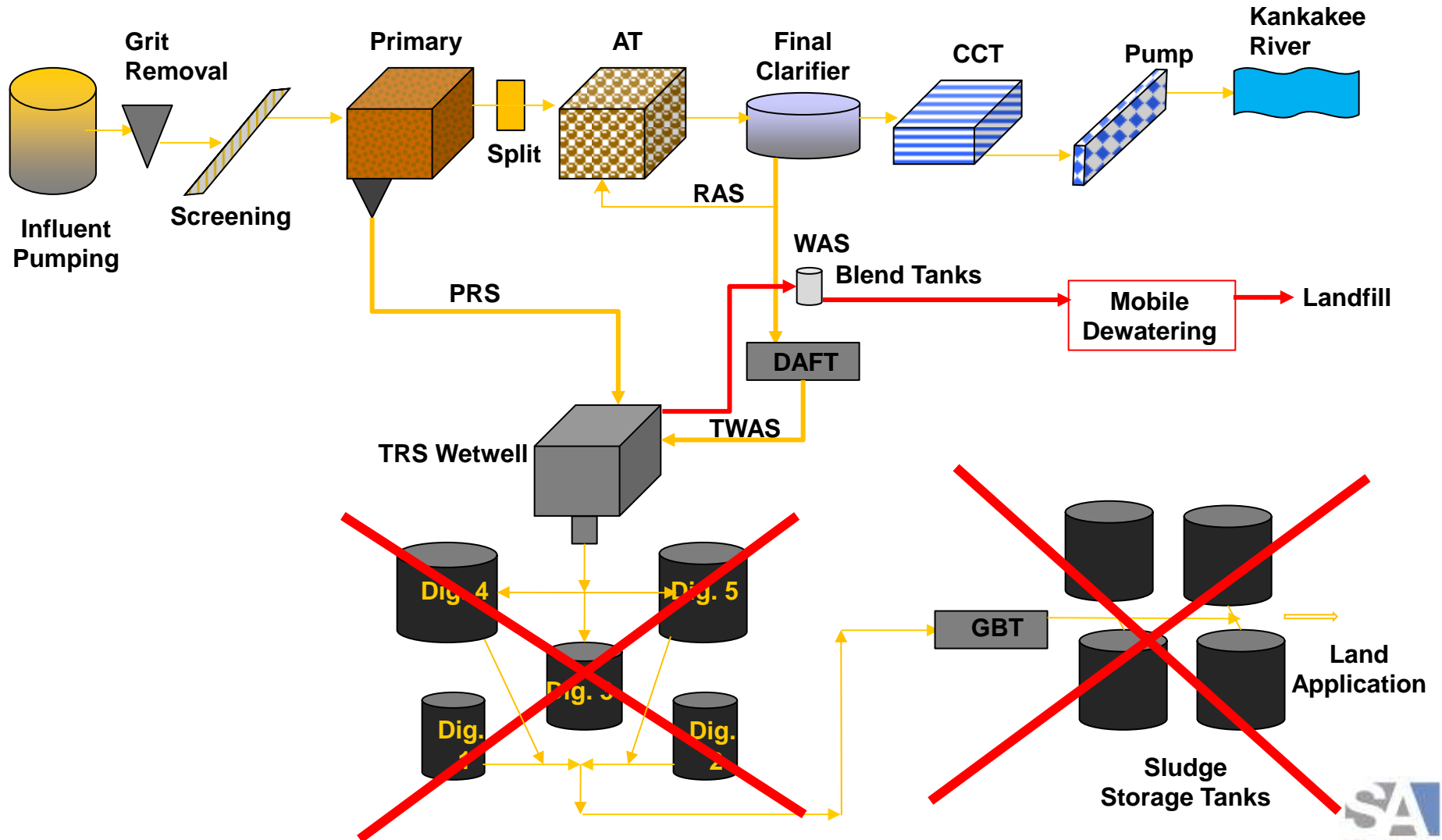
# ■ Short Term Response

- Emergency Response/Site Security
- Develop Operational Strategies To Minimize Forward Flow Disruptions
  - Blended Sludge Tank Storage
  - Mobile Dewatering
  - Landfill Disposal

**Net Impact on Operating Budget ~ \$1,500,000**  
**or \$125,000 per month**



# KRMA Post-Incident Schematic



# ■ Many Factors Influence the Evaluation of the “Best” Solution

- Capital Costs
  - Use existing digester structures? Equipment needs?
- Operating Costs
  - Appropriate evaluation timeframe – 20 yrs? 40 yrs?
  - Availability of land for disposal
  - Landfill tipping fees and trucking costs
  - Electrical costs
  - Degree of solids reduction
  - Labor
- Non-monetary Issues
  - Reliability
  - Foaming mitigation
  - Class “A” movement in US
  - Carbon footprint
  - Future flexibility

# ■ Planning- Cost Evaluations (20-Year Basis)

		Opinion of Costs	
		Opinion of Capital Costs	
Alt. B-1	Conventional Mesophilic Anaerobic Digestion	\$15,080,000	
Alt. B-2	Acid-Gas Mesophilic Anaerobic Digestion	\$19,575,000	
Alt. B-3	Class A Solids Acid-Gas Anaerobic Digestion	\$22,623,000	
Alt. B-4	Class A TPAD	\$21,262,000	
Alt. B-5	Class A TPAD-Second Configuration	\$23,278,000	
Alt. B-6	ATAD	\$20,501,000	
Alt. B-7	Raw Sludge Dewatering and Landfilling	\$8,788,000	

# ■ Planning- Cost Evaluations (40-Year Basis)

		Opinion of Costs			
		Opinion of Capital Costs	Opinion of Annual O&M	Opinion of Present Worth (40-Year)	% of Lowest (40-Year Present Worth)
Alt. B-1	Conventional Mesophilic Anaerobic Digestion	\$15,080,000	\$484,000	\$24,160,000	100%
Alt. B-2	Acid-Gas Mesophilic Anaerobic Digestion	\$19,575,000	\$448,000	\$28,114,000	116%
Alt. B-3	Class A Solids Acid-Gas Anaerobic Digestion	\$22,623,000	\$450,000	\$31,074,000	129%
Alt. B-4	Class A TPAD	\$21,262,000	\$457,000	\$30,716,000	127%
Alt. B-5	Class A TPAD-Second Configuration	\$23,278,000	\$471,000	\$32,991,000	137%
Alt. B-6	ATAD	\$20,501,000	\$996,000	\$40,147,000	166%
Alt. B-7	Raw Sludge Dewatering and Landfilling	\$8,788,000	\$1,767,000	\$37,313,000	154%

# ■ Planning– Non-Cost Issues

		Criteria			
		Opinion of Capital Costs	Present Worth Rank	Class A or B Biosolids	Foaming Issues
Alt. B-1	Conventional Mesophilic Anaerobic Digestion	\$15,080,000	1		
Alt. B-2	Acid-Gas Mesophilic Anaerobic Digestion	\$19,575,000	2		
Alt. B-3	Class A Solids Acid-Gas Anaerobic Digestion	\$22,623,000	4		
Alt. B-4	Class A TPAD	\$21,262,000	3		
Alt. B-5	Class A TPAD-Second Configuration	\$23,278,000	5		
Alt. B-6	ATAD	\$20,501,000	7		
Alt. B-7	Raw Sludge Dewatering and Landfilling	\$8,788,000	6		

# ■ Design Considerations

- Meet Current Code
- Deal with Multiple Funding Sources (IEPA, Owner, Insurance Co.)
- Minimize Foam Impact
- Maximize Gas Production and Utilization



# ■ Gas System



Create Gas  
(Primary  
Digester)



Store Gas  
(Secondary  
Digester)



Sulfide  
Removal



Chilling



Compression  
and Moisture  
Removal



Beneficial  
Use

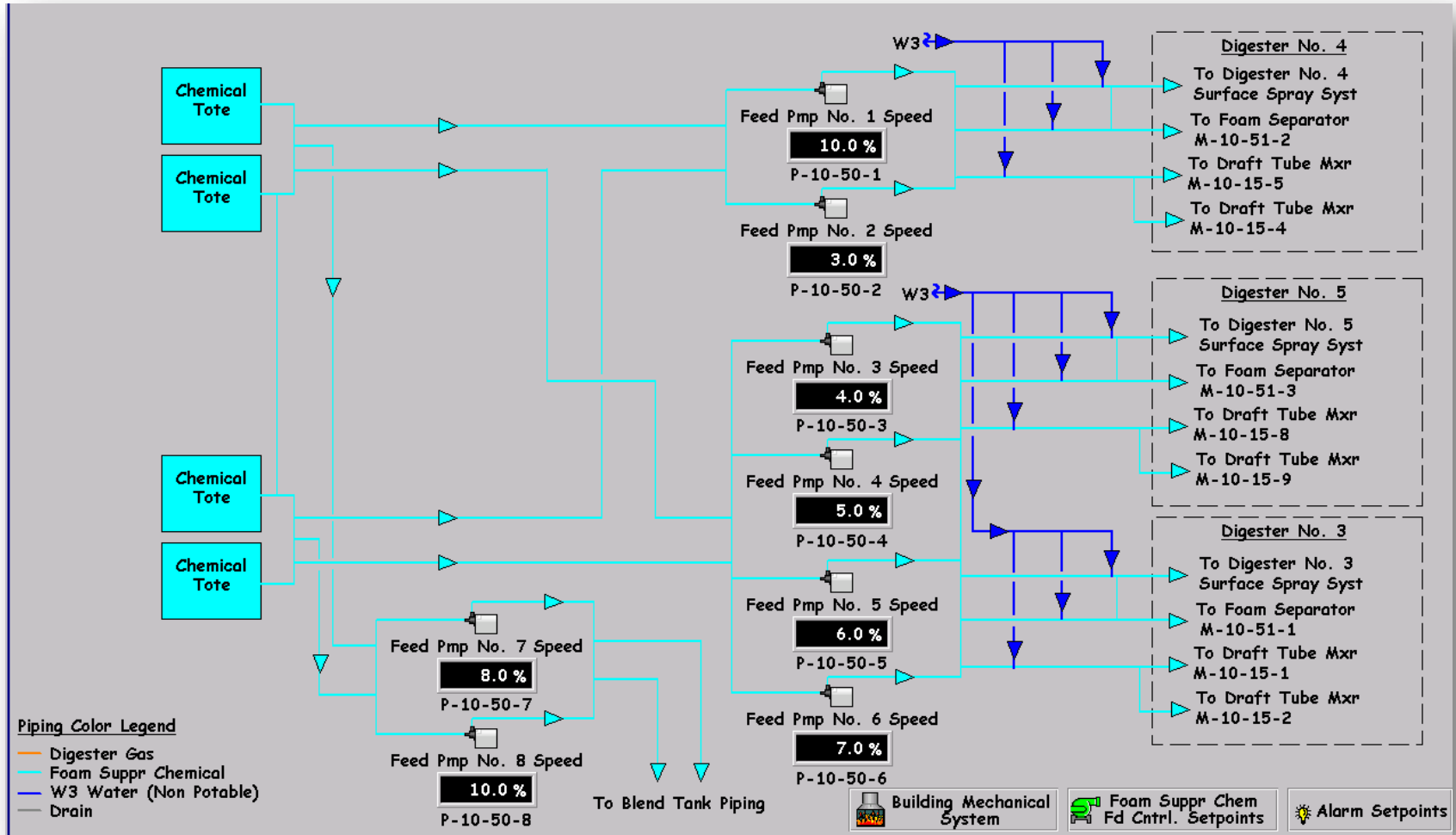
# ■ Foam Detection



# ■ Chemical Foam Control



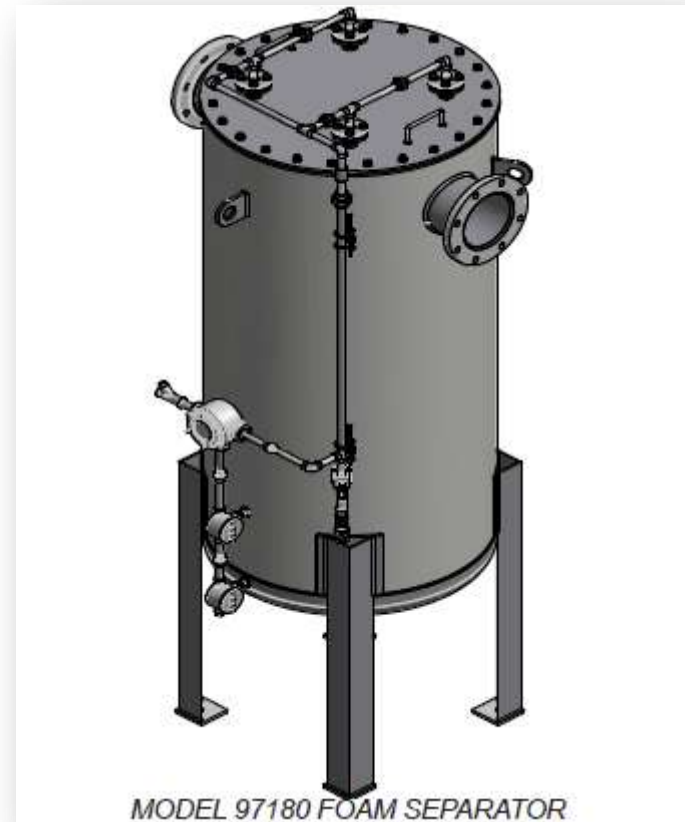
# Chemical Foam Control – Multiple Options Provide System Flexibility



Foam control includes 8 pumps capable of treating 14 different locations.

# ■ Foam Control

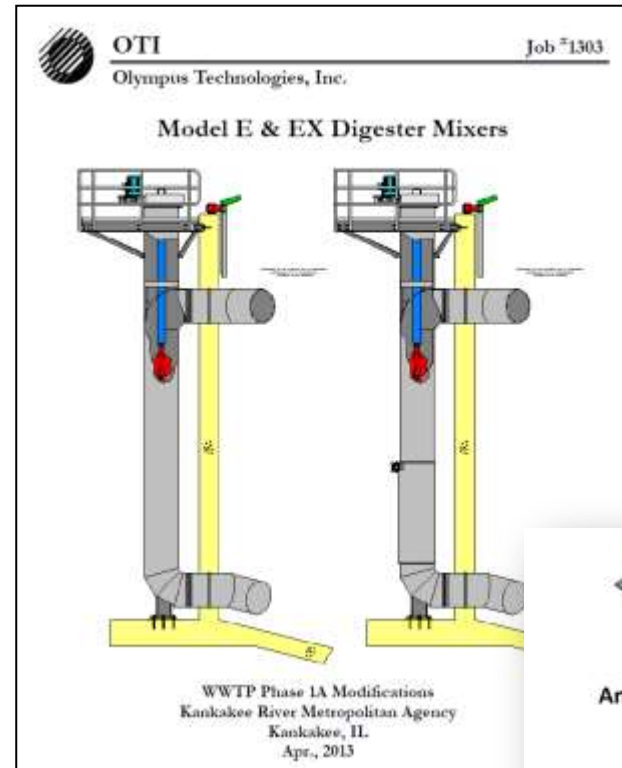
- Gas piping equipped with foam separators and large drip traps to encourage uninhibited gas flow.



# Draft Tube Mixing Chosen; Reduced Foam Creation Anticipated

## • Draft Tube Mixers

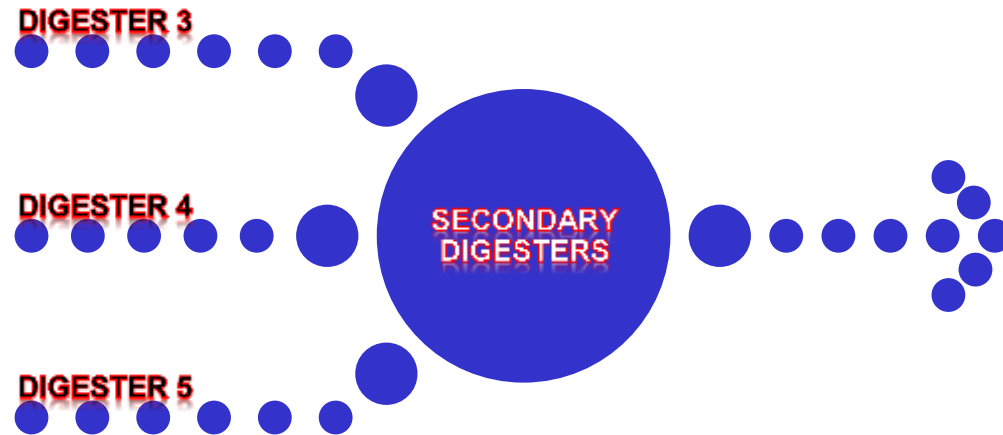
- Digester 3
  - 3 Draft tub mixers
  - 7,600 gpm each
  - 5 Hp
  - Maintenance Heat (at 2)
    - 200,000 BTU/hr
- Digesters 4 and 5
  - 4 Draft tub mixers/Digester
  - 9,000 gpm each
  - 7.5 Hp
  - Maintenance Heat (at 2 each)
    - 400,000 BTU/hr



VFD drives and SCADA control adds to mixing control.

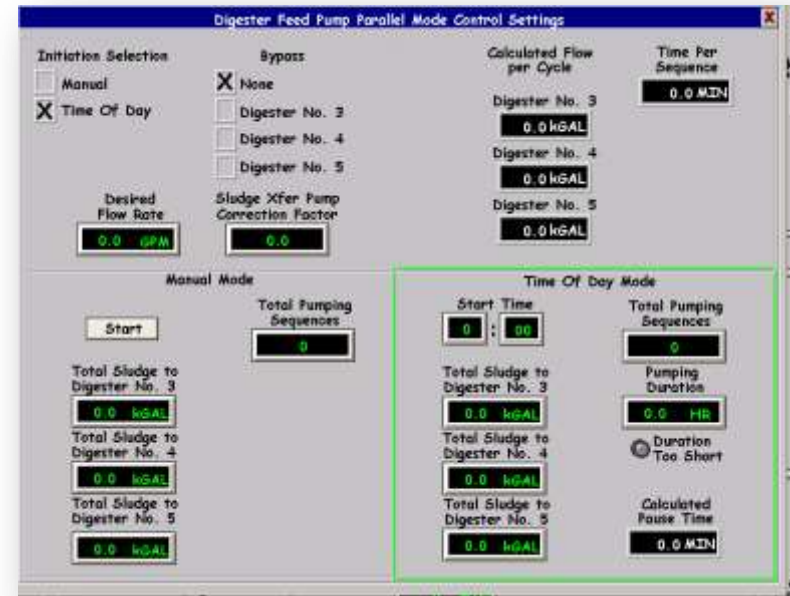
# ■ Operational Flexibility Added

- Parallel Mode (Shown)
- Series Mode
- Split Series Mode



# ■ SCADA Feed Control Offers Improved Control

- Improved Control Including:
  - TS Concentration
  - Timing
  - Duration

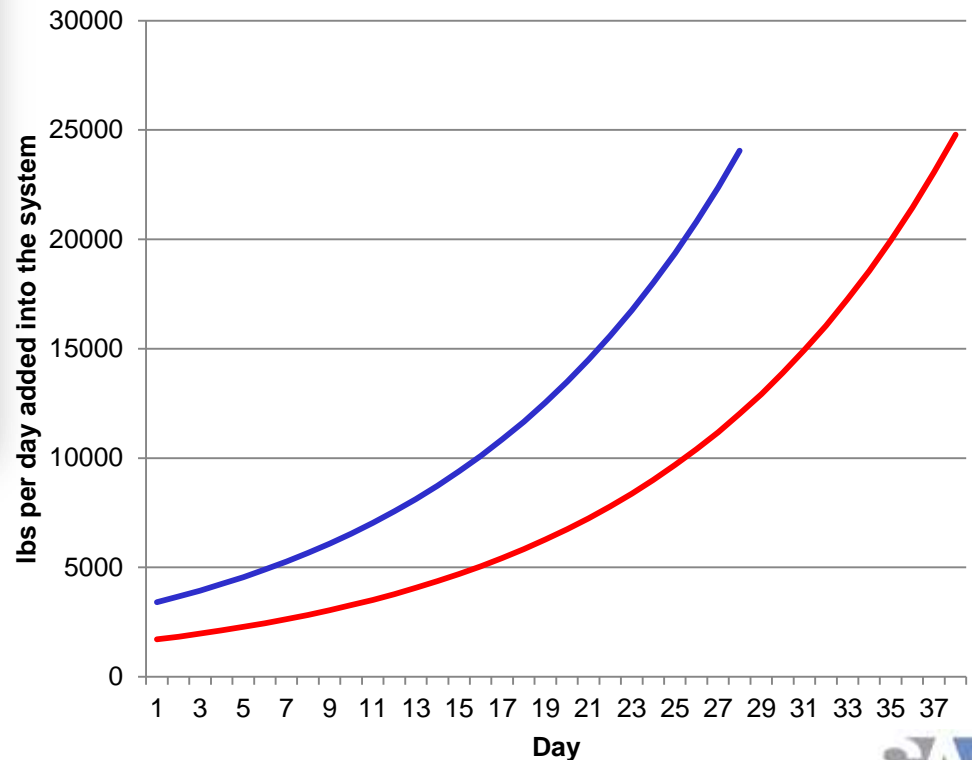


# Operations Workshops Resulted in Start-up Plan

Workshop Discussion  
Regarding Seeding and  
Starting KRMA Digesters –  
Milestone 1 of Contract 1A

Acclimation schedules were simulated considering plausible seeding and feeding scenarios.

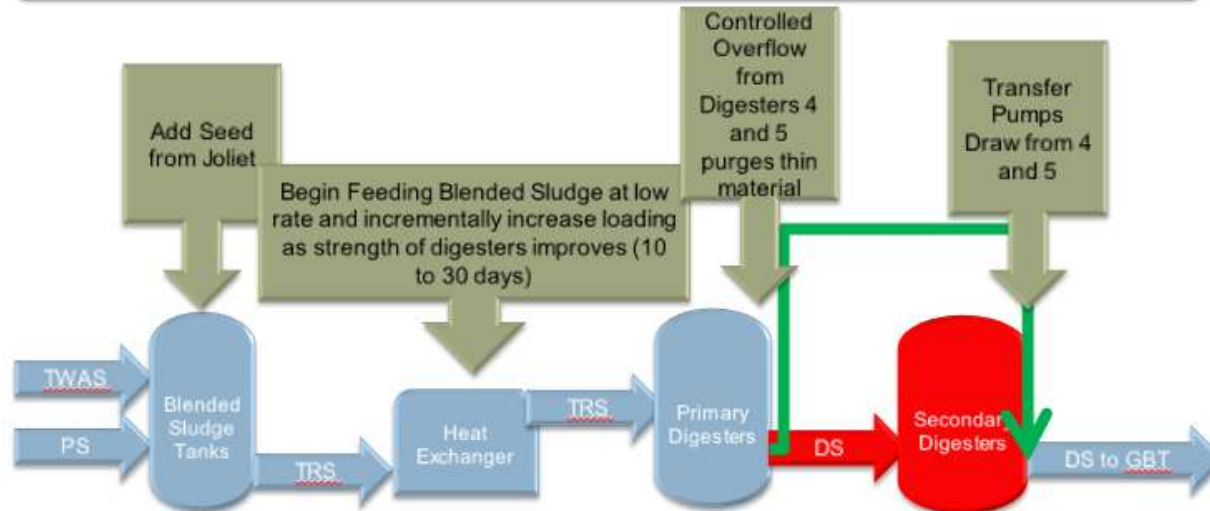
Operator training, construction sequencing and temporary controls were discussed.



# Startup Condition Planning and Communication Critical

## Start-up Initial Activities

- Boiler System on Natural Gas and In Auto
- One Blend Tank Available for Seed and then Blended Sludge
- Digesters 4 and 5 Filled with PRE
- Temporary Piping In Place to “leap frog” Secondary Digesters



Training targeted communication regarding construction activities, briefings regarding design intent and information related to process understanding.

## ■ Start-up Highlights

- Construction Activities “Phase In” Available Tanks
- Winter Impacted Seed Transport
- Surfactant Load Impacts Secondary Treatment...and Then Digestion
- Digesters Healthy – Producing Class B Biosolids

# ■ Foam Receding Following Surfactant Record Load



**System bent but did not break when recent record surfactant load was imposed on the KRMA facility.**

# ■ Summary

- Surfactants likely contribute significantly to foaming.
- Problems associated with foaming can vary from aesthetic to impactful.
- Multiple design attributes can keep foaming issues in check.
- Strong leadership from the Owner kept long term interests in focus.



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