CSWEA Member WEF
Central States Water Environment Association

2nd Annual Anaerobic Digester Foaming Workshop

April 20, 2011

History of the CSWEA Digester Foaming Committee's Efforts

- Committee established after 2009 annual conference
- Initial groundwork in late 2009
- Survey sent out in early 2010
- 1st Seminar – April 2010

2010 Survey Goals

Correlate Digester Foaming With:

1. Size of WWTP
2. Type of Liquid Biological Treatment
3. Foaming in Activated Sludge?
4. Nutrient Removal
5. Type of Anaerobic Digestion
6. Digester Detention Time
7. Digester Mixing System

2011 Survey Focus

<u>Attempted to Dig a Little Deeper</u>:

1. **Many of the same questions as 2010**
2. **Mixing times, sequence, etc.**
3. **Heating equipment and methods**
4. **Feed sludge type, blending, etc.**
5. **Feeding times, sequence, etc.**
6. **Hauled waste acceptance**
7. **VS loading rates**

Anaerobic Digestion in CSWEA

- About 216 WWTPs have anaerobic digestion:
  - Illinois: 64
  - Minnesota: 56
  - Wisconsin: 96

Survey Response Summary

2010: 94 responses (44% success rate)

2011: 41 responses (19% success rate)

2011 Survey Concerns

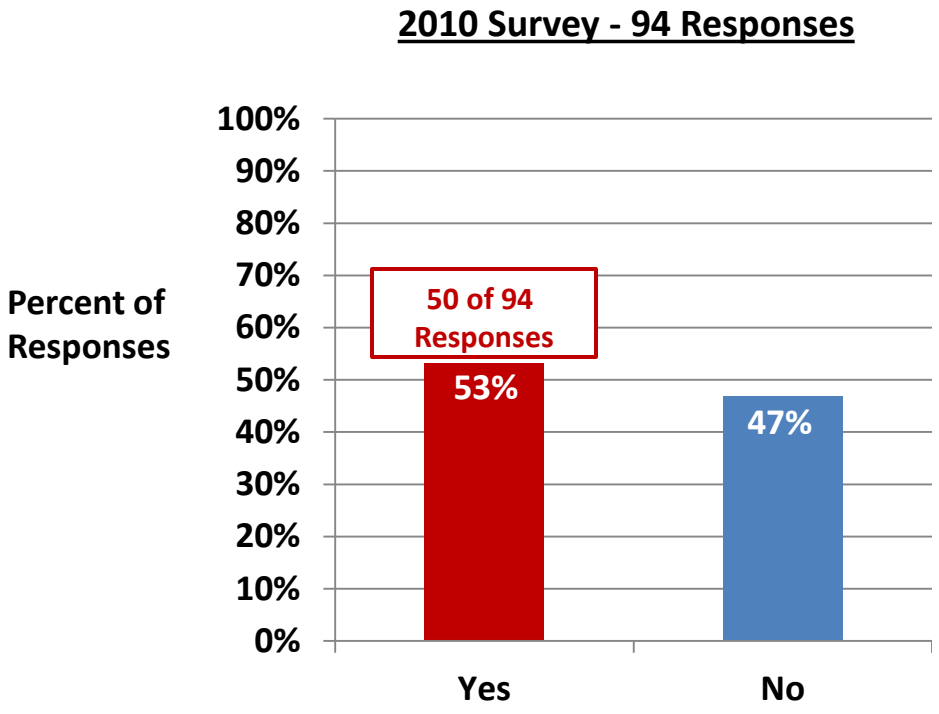
1. **Significantly smaller sample size**

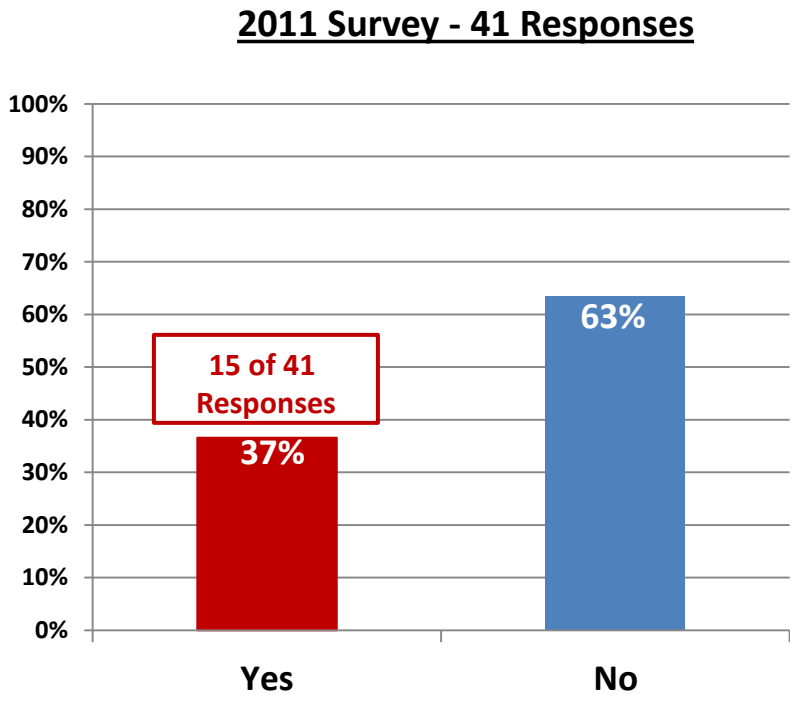
2. **Attempted to collect more complex data; resulted in confusion with several questions**

3. **Confusion with accessing the survey tool delayed/reduced responses**

Survey Responses

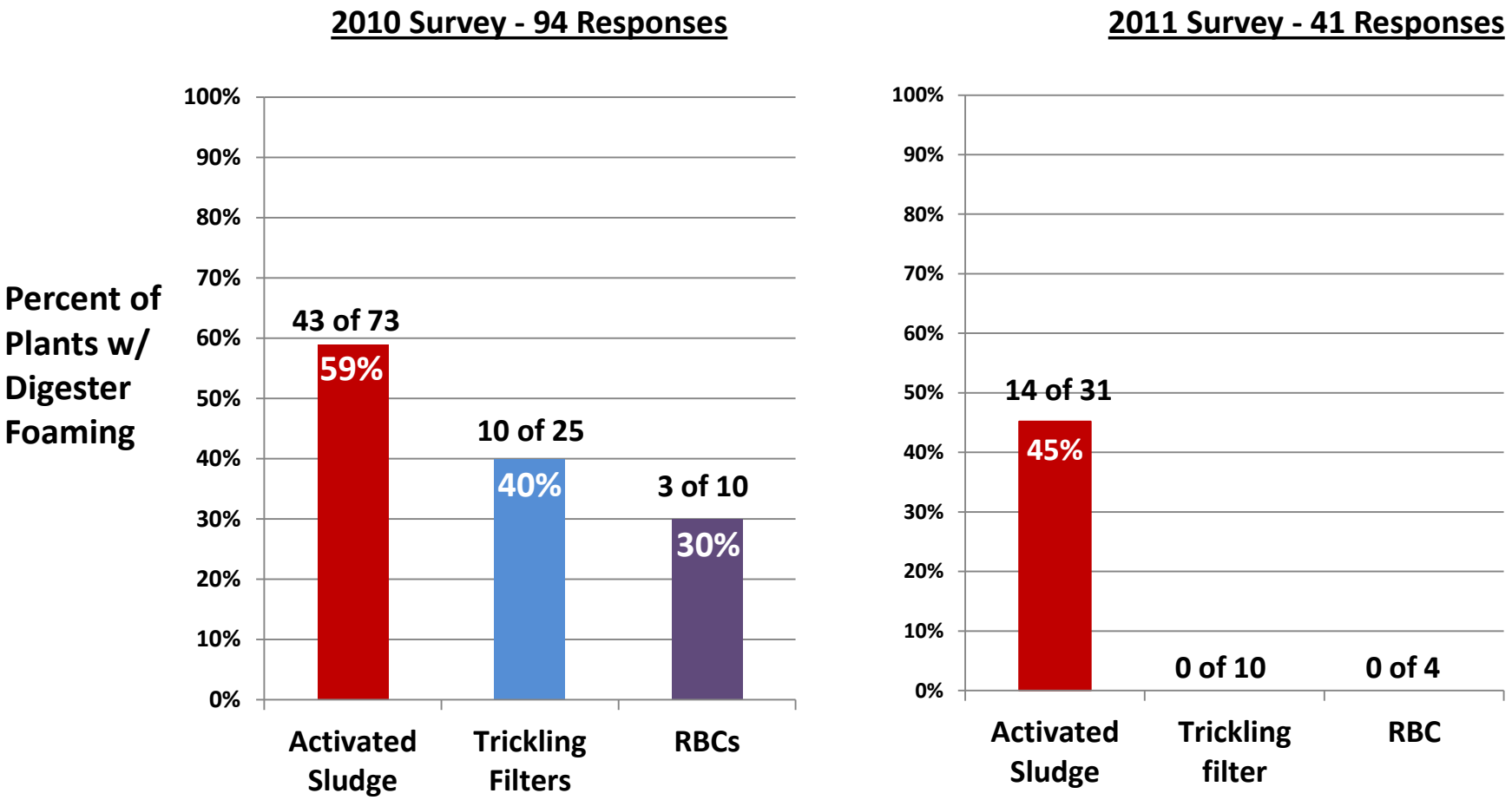
Significant Digester Foaming in Last 10 Years?





Survey Responses

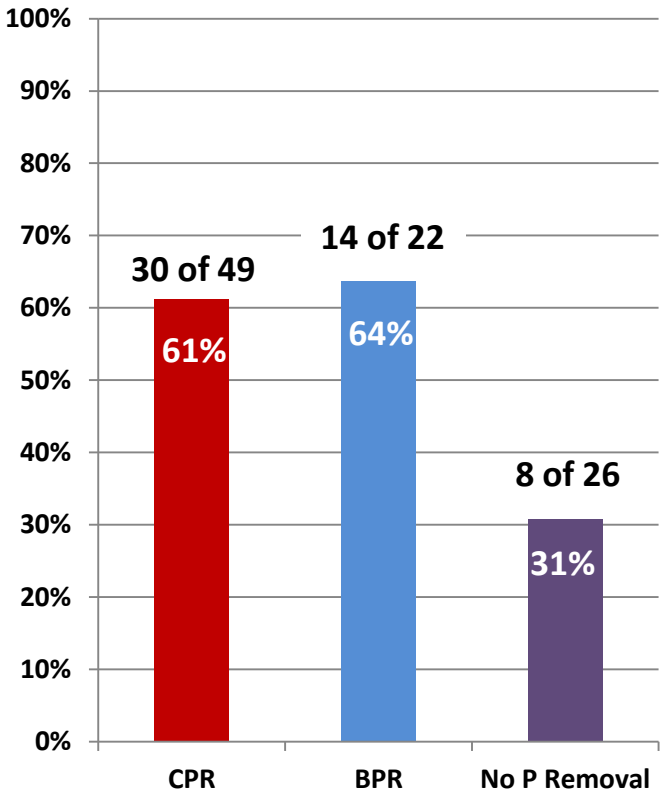
Type of Biological Treatment

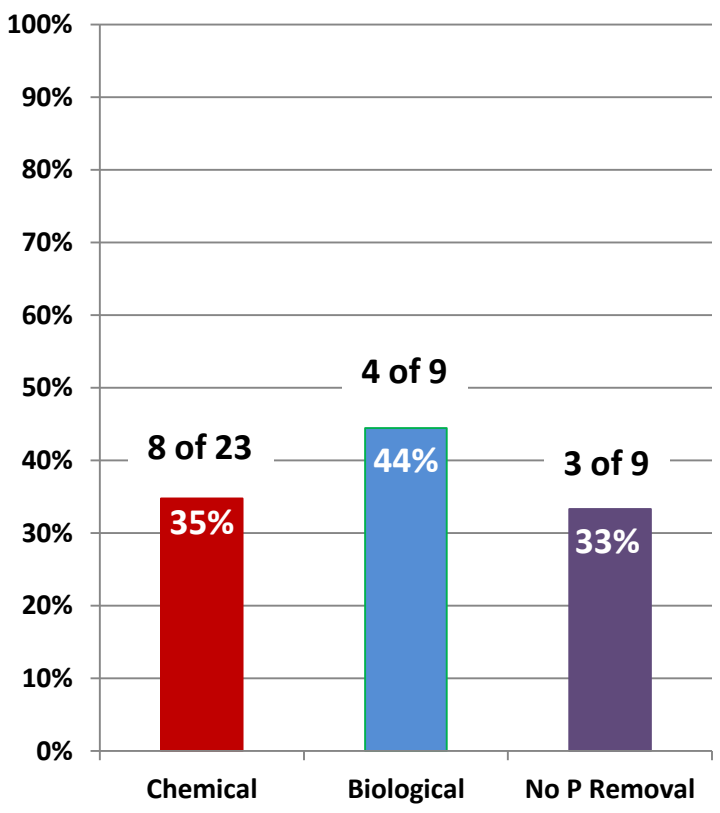


Survey Responses

Phosphorus Removal

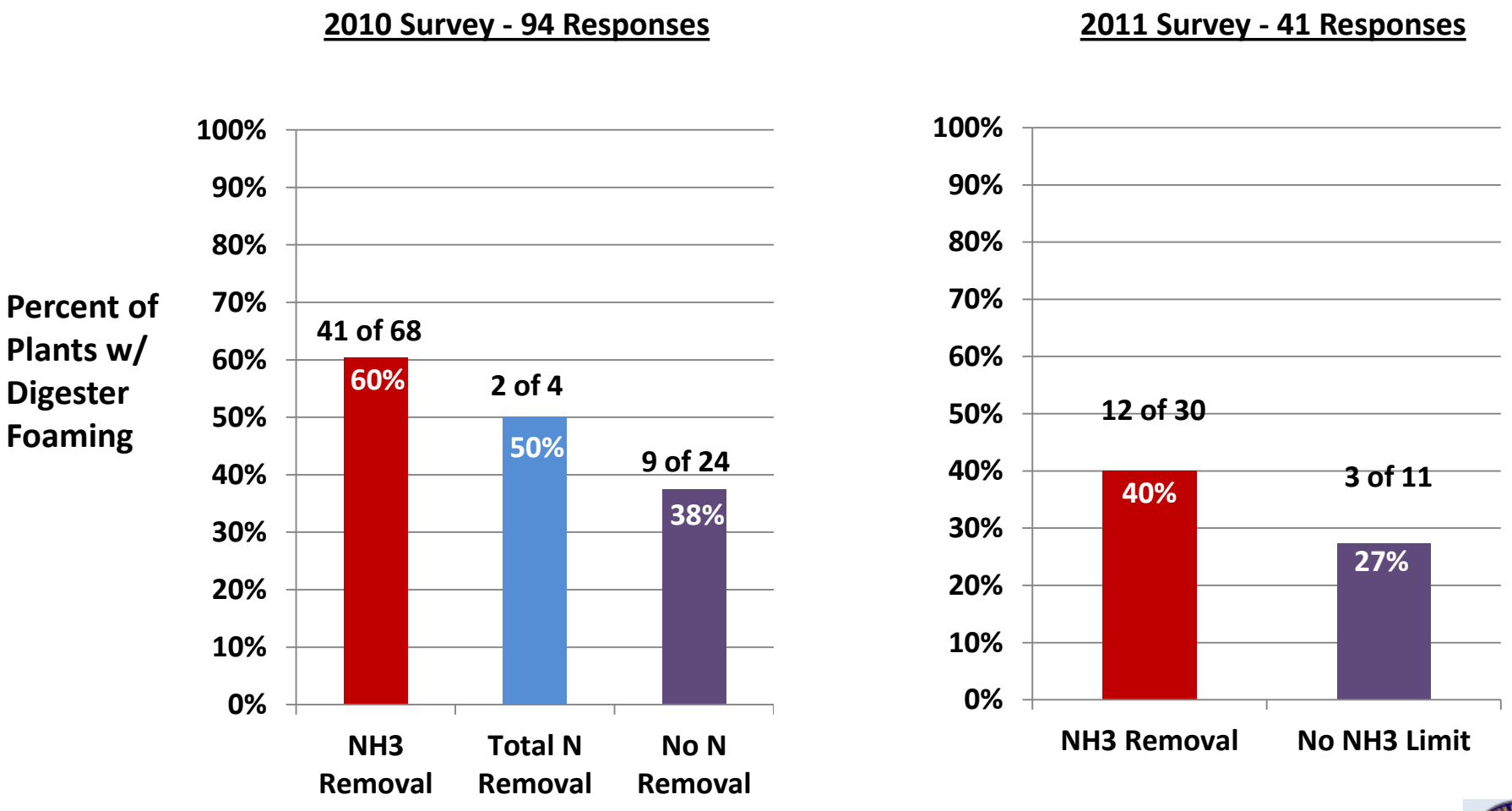
Percent of Plants w/ Digester Foaming





Survey Responses

Nitrogen Removal



Survey Responses

Comments – Dealing with Foam

- Lowered our operating level
- Reduced feed rates when digester indicates that it has foam
- Increase Volatile Acid and Alkalinity testing
- H2S / CO2 testing
- Change mixing intervals
- Reduced feed
- Adjust duration of feed
- Adjust removal rates
- Reduced grease pumping

Survey Responses

Comments – Dealing with Foam

- Cease recirculation, water spray when applicable, shovel frozen material
- Requires ~ 10 manhours/week to manage foam

- Maintain low digesters temps (85-95)
- Rotate feeding/heating/recir between 4 digesters very frequently
- Reduce gas pressure (from 6.7 to 6.0 in WC)
- Only minor foaming problems now

- Intermittent mixing
- Bypassing 20-40% of the WAS around the digesters and going directly to winter biosolids storage for long term digestion
- Trying a new feed scheme: separate digestion of WAS and primary sludge
- Trialing defoamant chemicals

Survey Responses

Comments – Dealing with Foam

- Pump to storage; turn off mixing

- We had major foaming after we put the new activated sludge plant on line. The first 5 years we tried many approaches and nothing seemed to work well. We finally stopped pumping grease into the digester and since then we have had no foaming issues for about 2 years now

- Spray down the covers and keep a lower sludge level in tanks.

- Gas mixing Perth units contribute to foaming issues, units are turned off most of day.
- Primary scum is not pumped to digester, hauled off site.
- Reduce sludge age to keep filamentous growth minimal

- Reduced the pump mixers frequency and duration

Survey Responses

Comments – Dealing with Foam

- It's rarely a serious problem. Usually mixing and heating along with feed rate reduction will correct the problem in a few days or so.

- If foaming gets excessive, we generally first turn off gas mixing and hose down foam.

- Foaming is not a problem for us. When we have some foam it is right after we feed the digester and the foam only comes up on the floating lids about 2 feet.

- Timed operation of Perth (gas mixing) led to development of solid layer on top of liquid; this forced biogas to tank periphery & onto cover.
- Operate Perth system constantly now.
- Pumped somewhat thinner sludge to primary digester *(to help with Perth mixing?)*
- Installed stainless steel baffle around digester periphery

Other Research

WERF INFR1SG10
Anaerobic Digester Foaming – Prevention and Control
Project Definition

February 2, 2011

WERF Project Objectives

Objectives

1. To determine gaps in the understanding of causes/impacts of AD foaming and fill them.
2. Identify successful methods for prevention and control.
3. Develop a guidance document for WWTP to use for AD foaming prevention and control.

WERF Project Team

WERF

Dr. Amit Pramanik

Technical Advisory Committee

Dr. David Jenkins &

Dr. Andre van Niekerk

Universities

- **Illinois Institute of Technology, Chicago,**
  Dr. Krishna Pagilla, P.E.
- **UC Berkeley, CA**
  Dr. Slav Hermanowicz
- **Manhattan College, NY**
  Dr. Robert Sharp
- **ICRA**
  Dr. Ignasi Rodriguez-Roda

Municipal Utilities

- **San Francisco**
- **MWRD of Chicago**
- **City of Elmhurst, IL**
- **New York City DEP**
-
-
-

Companies

- **Hazen & Sawyer**
- **OpenCEL**
- **Baxter & Woodman**

WERF Project Schedule

Project Task	Year 1				Year 2			
	Q_1	Q_2	Q_3	Q_4	Q_1	Q_2	Q_3	Q_4
Project Contracts and Startup	■							
Task 1: Literature and Data Collection and Processing	■	■	■	■	■	■	■	■	
Task 2: Plant Survey – Data Collection	■	■	■					
Task 3: Full Scale Plant Demonstrations and Investigations			■	■	■	■	■	■	
Task 4: Synthesis of Information and Results		■	■			■	■	■	
Task 5: Project Reporting and Guidance Document		■	■		■		■	■	■

CSWEA Member WEF
Central States Water Environment Association

2nd Annual Anaerobic Digester Foaming Workshop

April 20, 2011