

The Madison Metropolitan Sewerage District Foam Experience

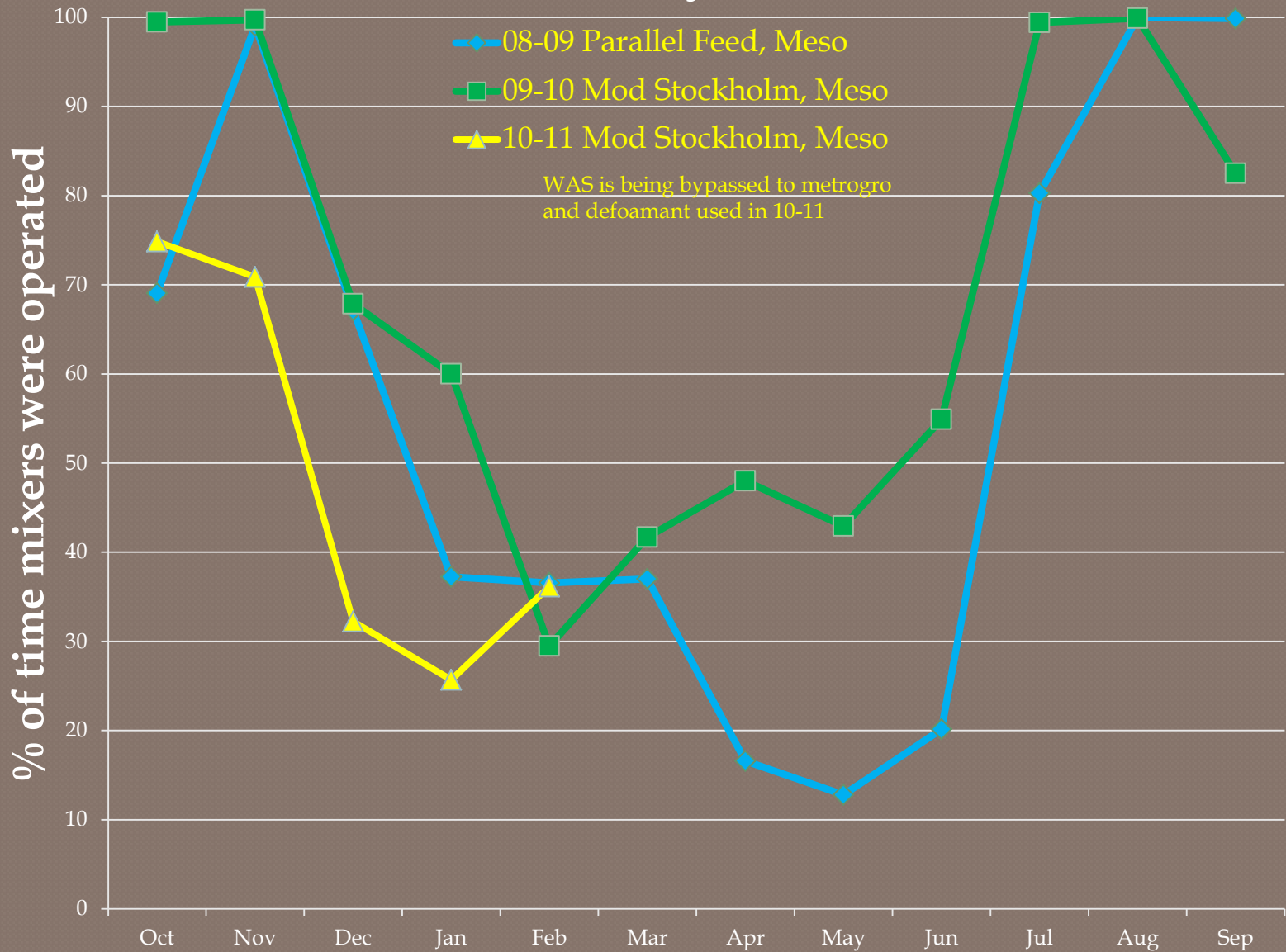


**2nd Annual CSWEA Anaerobic
Digester Foaming Workshop
April 20, 2011**

A brief history of foam

- ◉ Regular digester foaming coincided with implementation of EBPR in 1996.
- ◉ Very predictable – effluent crossing 16°C threshold apparently triggers transition.
- ◉ Seasonal – foaming season is approximately mid-Nov through mid-May.
- ◉ Forces reduction in mixing and SRT for digestion.
- ◉ Microthrix is believed to be the culprit.

Dig 4-7 % mixer run by month for the last three years



Attempted solutions

- ◉ TPAD
- ◉ Acid-Phase Digestion
- ◉ Reduction of WAS loading
- ◉ “Split” digestion of WAS and primary
- ◉ Chemical defoamants
- ◉ Attacking symptoms

Attempted solution - TPAD

- 10th addition project implemented temperature-phased anaerobic digestion, better known as TPAD.
- Bench scale pre-design research suggested TPAD as effective in addressing foam.
- Research was not conducted with MMSD sludge.
- Our full scale experience did not agree with the bench scale results.

Attempted solution – Acid-Phase Digestion

- Modified TPAD system to run a designated digester as an acid-phase digester.
- Appeared effective for periods, but eventually process crashed due to establishment of methanogens.
- The acid-phase digester was adapted from TPAD batch sizing and was not designed for acid digestion – test not conclusive.

Attempted solution-WAS load reduction

- ◉ Reduction of WAS load to digesters has been a regular – and effective – solution for every foam season except 2009-10.
- ◉ A portion of the WAS is thickened and directed to storage without digestion.
- ◉ By hauling season it is suitable for land application.
- ◉ Not a designed solution, nor a long-term solution to the issue.

Attempted solution-Split Digestion

- ◉ Informally dubbed “Stockholm Process”.
- ◉ 100% thickened primary and 40% thickened WAS digested in east complex where higher gas production occurs.
- ◉ 45% of this digested flow is combined with remaining 60% of thickened WAS and digested in west complex, where there is more Microthrix but lower gas production.
- ◉ The east complex still foams, the west has been relatively foam free – jury still out.

Attempted solution-Chemicals

- ◉ Spot use of a defoamant during 2009-10 foaming season.
- ◉ 2010-11 foaming season significant use of defoamant chemical -- \$35,000 so far.
- ◉ Chemical defoamant has an effect, but dosage is higher than anticipated and overall cost is high.
- ◉ Foam is present even with chemical defoamant, simply holding in check.

Attempted solution-symptom mitigation measures

- ◉ Reducing mixing time – four digesters with “bubble guns” are mixed less frequently when foaming is nearing a critical point.
- ◉ Reduction of sludge level – creates more head space to house foam; only effective in containing foam.
- ◉ **Not effective in eliminating, only in surviving the foam season.**

Moving forward

- ◎ 11th Addition is being designed
 - Implementing acid-phase digestion by adding two *designed* acid-phase digesters.
 - Will utilize steam injection into WAS for process heating.
 - Possible option for split digestion.
 - Removing gas mixers and converting to internal draft tube mixers.
 - Adding digester #8.
 - Improve gas draw-off and foam separation.
 - Adding provisions for defoamant addition.

Questions?

