Municipal Water-Wastewater Breakout Session: High Speed “Turbo” Blowers

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June 3, 2009
Boston, MA

Agenda

- Introduction to Water-Wastewater Initiative
- Overview of Turbo Blower Technology
- Member Experiences with Turbo Blowers
  - George Lawrence, Efficiency Vermont
  - Jim Conlan, Snohomish PUD
- Discussion: Where do we go from here?

CEE Municipal Water and Wastewater Facility Initiative - 2005

- **Objective:** increase awareness of and demand for energy efficiency within the municipal water and wastewater sector

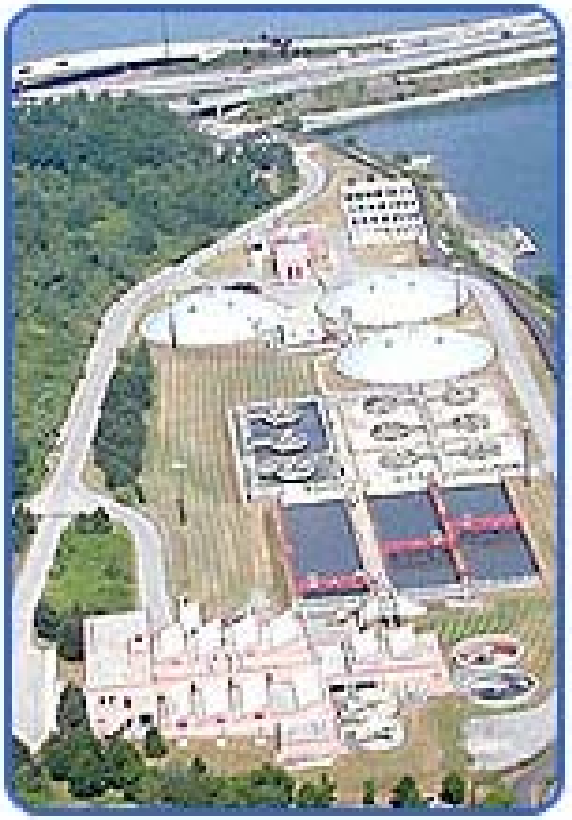
- **Strategy:** To build a template of nationally consistent tools and messages for members to incorporate into their programs and to deliver nationally

Challenges

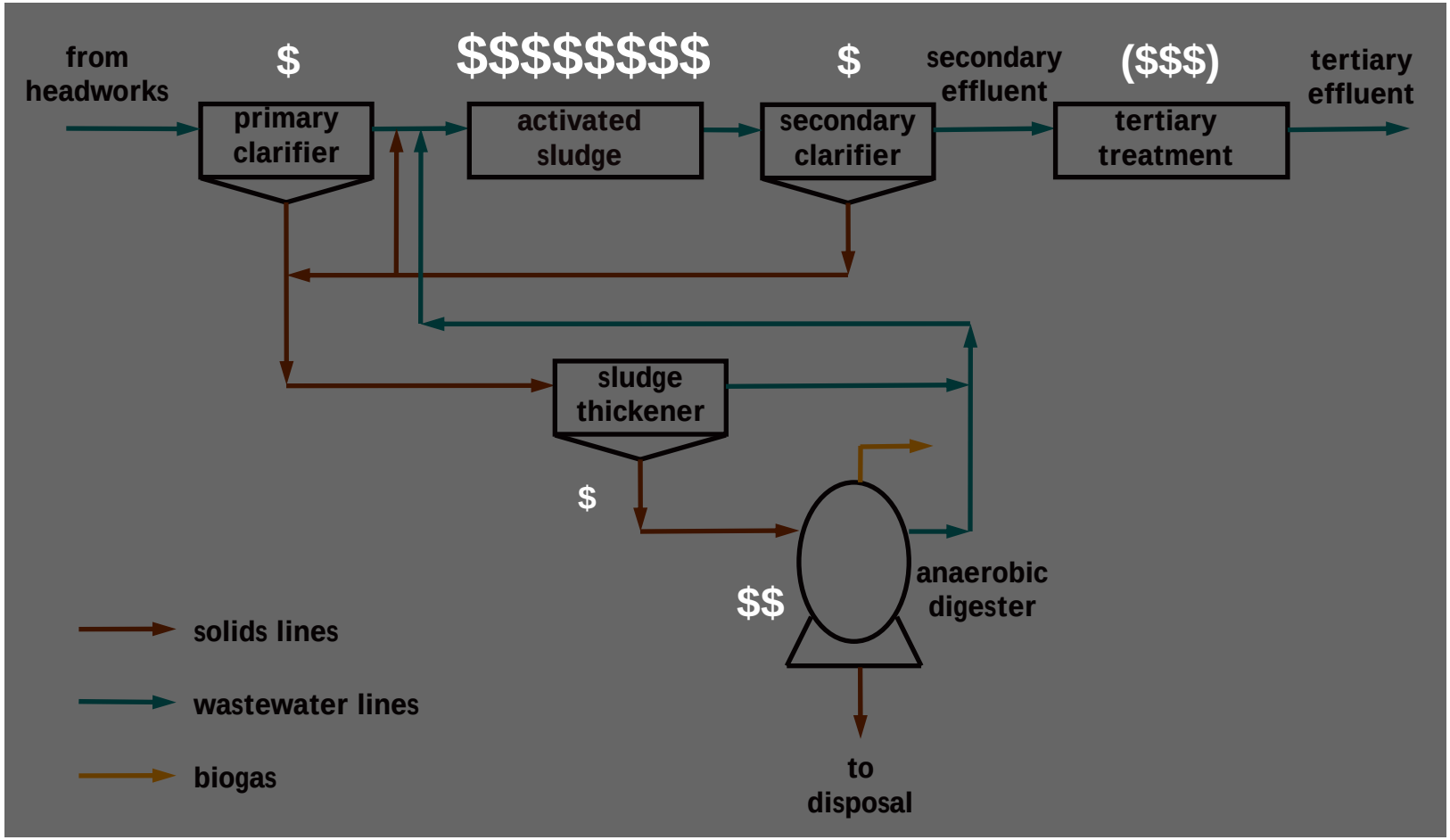
- Understanding the market
  - How energy is used
  - Energy saving opportunities
  - Decision-making process
- Identifying best practices for energy-efficiency
- Promoting awareness in the market
- Gaining support for enhanced energy performance

Energy Consumption in the Wastewater Treatment Sector

- Wastewater treatment consumed 21b kWh in 2000 (EPRI, 2000)
- Energy occupies on average 7% of WWTF operating budgets (AWWARF, 2003)
- On average 1,800 kWh per million gallons treated



WHERE IS THIS ENERGY SPENT?



Aeration cost = 45-75% of plant energy cost

Rosso and Stenstrom (2005) *Wat. Res.* 39: **3773-3780**

Aeration & Blowers

- Aeration is provided through subsurface (blowers) or mechanical means, for mixing and support of aerobic bacteria
- 70% of medium & large facilities (>2.5 MGD) employ blowers in activated sludge treatment (Jones et. al.)
- Turbo blower manufacturers claim to offer significant energy savings over conventional blower equipment

Types of Aeration Systems

Mechanical Aeration

- Low Efficiency
- High Maintenance
- 1.5 – 3 lb O_2/BHPxHr

Jet Aeration

- High SOTE
- Low to Moderate SAE
- Moderate Maintenance
- 4 - 6 lb O_2/BHPxHr

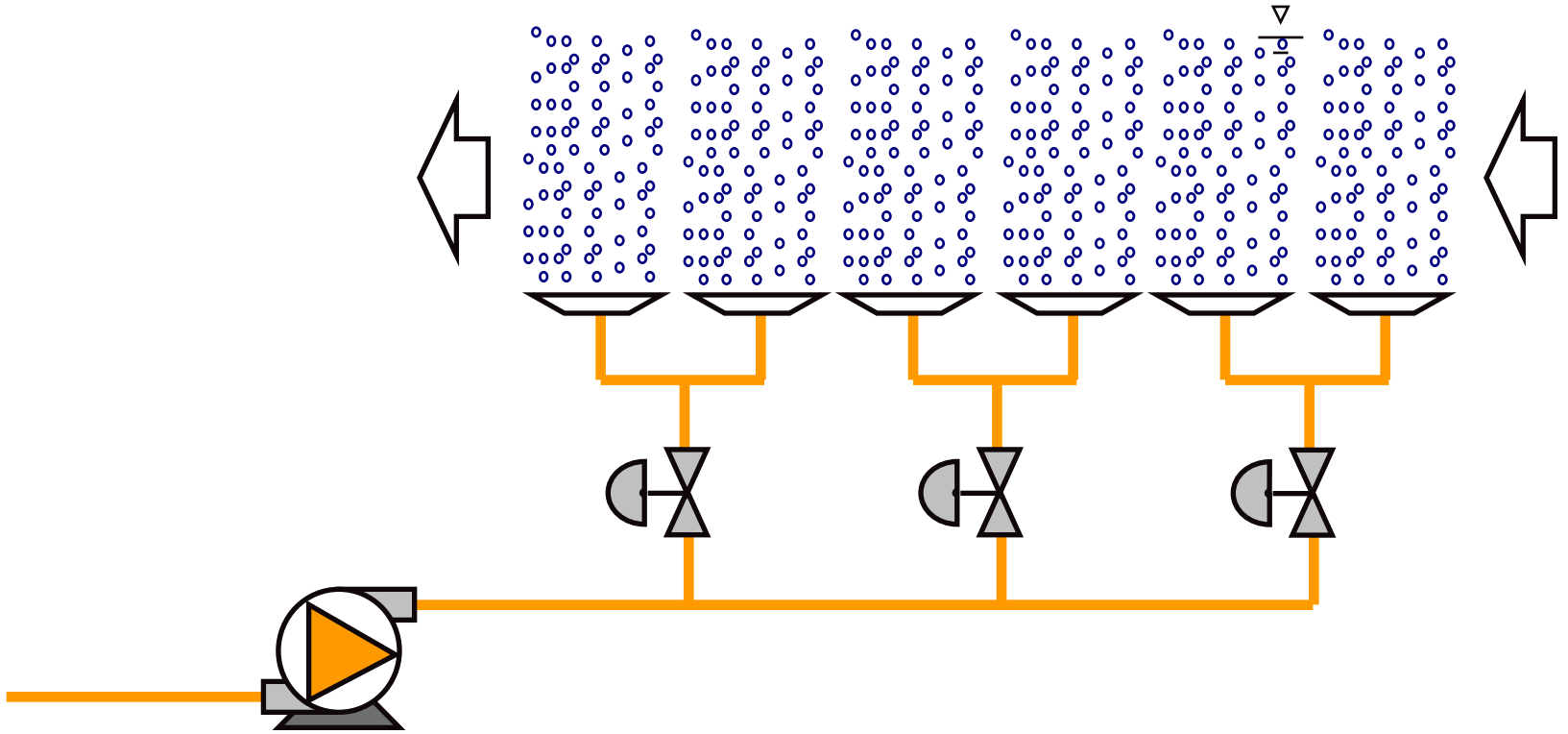
Coarse Bubble Diffused Aeration

- Low Efficiency
- Low Maintenance
- 3 – 4 lb O_2/BHPxHr

Fine Bubble Diffused Aeration

- High Efficiency
- Moderate Maintenance
- 7 – 10 lb O_2/BHPxHr

WHY IS SO MUCH ENERGY REQUIRED?

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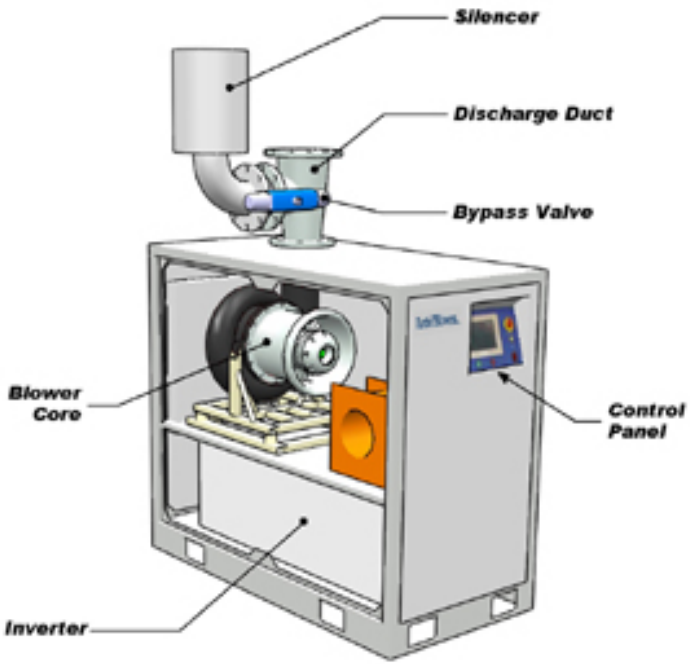
Actions to this Point

- CEE responded to interest from members around emerging turbo blower technology
- W-WW Committee call on May 27 with D. Michelsen (SEA Consultants) & M. Wilson (CH2M Hill)
  - Introduction to turbo blower technology
  - Questions: what do we still need to know?
  - Plan for today's Breakout Session

Technology Overview: Features

- Turbo blowers use advanced bearing design (magnetic or airfoil) to allow for very high impeller speeds (40,000 RPM)
- Units include integrated VFD, DO sensor, and controls
- Enclosed, modular design



Technology Overview: Advantages

- 10-20% more efficient than conventional blower equipment
- Good turndown (to 50% capacity) with little efficiency drop-off
- Small footprint, lightweight
- Quiet, low vibration
- Very low maintenance requirements

Technology Overview: Disadvantages

- New technology
- Small number of U.S. installations
- Limited service network
- Not clear what landscape will look like in 5 years

Member Experiences

- Jim Conlan, Snohomish PUD
- George Lawrence, Efficiency Vermont

Questions/Comments on Member Experiences

- What are the key points that any analysis or turbo blowers should consider?
  - Facility lifetime, energy use drivers, etc.
- 6 members have program experience with turbo blowers: how can CEE help members to track their program experiences?
  - What information should any case study of a turbo blower project include?

Emerging Questions

- What energy baseline should members use to evaluate the energy performance of turbo blowers?
  - “15-20% more efficient” than what? In what terms?
  - How much of this improvement is attributable to integrated DO sensor, VFD, and automatic controls?
- What is the best way to measure the energy performance of turbo blowers?
  - Is ASME PTC-10 test appropriate?
  - CEE received details of Wire-to-Air efficiency methodology from Mike Wilson

Emerging Questions

- What is the size of this opportunity?
  - Are there certain WW applications for which turbo blowers are a slam dunk? Applications for which turbo blowers won't work?
- How significant is the issue of overheating, and does it affect air-bearing units?
- Intake air quality?

Goals Moving Forward

- Develop a methodology to measure and compare the energy efficiency of turbo blowers
- Assist members in sharing experiences around turbo blowers
  - Clearinghouse function for CEE?

Industry Partners Meeting

- Invite turbo blower manufacturers to Industry Partners Meeting
  - Neuros
  - K-Turbo
  - HSI
  - Turblex
  - ABS/HST
  - Atlas Copco
- What questions should the Committee ask blower manufacturers?

References

- AWWARF (2003) *Best Practices for Energy Management*. American Water Works Association Research Foundation, John Jacobs, Thomas Kerestes, W.F. Riddle, EMA, Inc., St. Paul, MN.
- EPRI (2000) *Managing the 21st Century: Water & Sustainability – Electricity Use*. Electric Power Research Institute, Palo Alto, CA
- Jones et. al. (2007) *A National Program Initiative to Support Energy Savings in the Municipal Wastewater Sector*. Ted Jones, Gregory Lapman, & Joseph Cantwell
- Michelsen, David (2008) *Meeting Increased Air Demands with High Speed "Turbo" Blowers: A New Class of Ultra-Efficient Blower.* SEA Consultants, Concord, NH

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