Update on Proposed Solid Waste Rule for Incinerators

Jim Welp
Black & Veatch
NBP-WEF Holds Future of Biosolids Management Forum

- Purpose: Identify trends in technology, operations, and management; regulatory and public policy drivers; research needs; and professional and training needs over the next three, five, and ten years for biosolids.
POTWs are Resource Recovery Centers

- Nutrients – N, P, and soil conditioner
- Energy – heat, power, fuel
- Water – clean water
- Other
All Biosolids Management Options have Issues

- Thermal Oxidation - solid waste and MACT standards, public acceptance
- Land Application (and EQ products) - P, odors, trace organics, public education, public acceptance
- Landfilling - Organics, stabilization requirements, public acceptance
The Broader View

- More stringent requirements are coming that will effect your program
- All options need to be on the table – not one solution
- Competing program investments with CSO’s, stormwater, nutrients,…
Outline

- Combustion principals and benefits
- Proposed ruling
- Impact on thermal oxidation facilities
- Energy recovery
- Conclusions
- Mill Creek and Southerly WWTPs pictures
Combustion Principals and Benefits
Combustion Principles

- Combustion - produces same end products (CO$_2$, H$_2$O, and SO$_2$) as other solids management processes but at different rates
  - Incineration: ~0.1 to 60 minutes
  - Digestion: ~15 to 30 days
  - Composting: ~1 to 2 months
  - Land Application: ~1+ years
Incineration Technologies

- Fluid Bed Incineration
  - Newer technology
  - All new units in last ~12 years

- Multiple Hearth Incineration
  - More units in service but units are older
  - Upgrades needed for energy efficiency and cleaner emissions
MHI and FBI – How do they work?
Fluid Bed Reactor
Windbox
Fluid Bed

- Windbox
- Fluidizing Air Inlet
- Feed Inlet
- Freeboard
- Fluid Bed
- Constrictor Plate
- Fuel Gun
Freeboard
Thermal Oxidation Benefits

- Complete Stabilization
  - Large volume and mass reduction
  - Pre-stabilization not required

- Energy Efficient
  - Low auxiliary fuel requirements
  - Sustainable operation with clean emissions

- Neighbor Friendly
  - Operates continuously without visible emissions
  - Lowest truck traffic
  - Lowest odor potential

- Cost Effective
Proposed Ruling
EPA Offices...Who makes the rules?

- Water – NPDES, 503
- Air – CAA Section 112 and 129
  - Local “non-attainment areas”
- Resource Recovery (Solid Waste) – RCRA, landfills
  - Definition redefined due to activist lawsuit
Regulatory Impacts from EPA Solid Waste Proposed Regulation

- All sewage sludge is a solid waste
  - Intended to cover SSIs - not other biosolids management practices
- Solid waste definition requires Section 129 of CAA
  - MACT (maximum achievable control standards) to replace GACT in Section 112 of CAA
  - Top 12% of operating facilities (or top 5 if less than 30)
- EPA accepts that this may increase landfilling
- Law of unintended consequences…
SSI MACT – pollutants / surrogate list and data requested as part of ICR testing

- **Mercury** – no surrogate
- **Filterable PM** – for non-mercury metallic HAP
- **SO\(_2\)** or **HCl** – for acid gas HAP
- **CO** – for non-dioxin / furan organic HAP
- **Dioxin / furan** organic HAP
- Others: **Cadmium, lead, NO\(_x\)**, and opacity
## Proposed MACT Standards

<table>
<thead>
<tr>
<th>Parameter @ 7% O2</th>
<th>Existing MHI</th>
<th>Existing FBI</th>
<th>New SSI</th>
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<tr>
<td>Cadmium (mg/dscm)</td>
<td>0.095</td>
<td>0.0019</td>
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<td>Dioxin/Furan, TMB (ng/dscm)</td>
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<td>0.061</td>
<td>0.024</td>
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<tr>
<td>Dioxin/Furan, TEQ (ng/dscm)</td>
<td>0.32</td>
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<tr>
<td>CO (ppmv)</td>
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<td>HCl (ppmv)</td>
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<td>Mercury (mg/dscm)</td>
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<tr>
<td>NOx (ppmv)</td>
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<tr>
<td>Opacity, %</td>
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<td>Lead (mg/dscm)</td>
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<td>SO2 (ppmv)</td>
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<td>22</td>
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## EPA “Cherry Picked” Emission Limits

<table>
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<tr>
<th>Parameter @ 7% O2</th>
<th>New SSI</th>
<th>Location</th>
<th>Sample Size</th>
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<td>Dioxins/Furans, TEQ (ng/dscm)</td>
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<tr>
<td>CO (ppmv)</td>
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<td>MIYpsilanti</td>
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<td>HCl (ppmv)</td>
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<td>NOx (ppmv)</td>
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<td>NCTZOsborne</td>
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<td>Opacity, %</td>
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<td>Lead (mg/dscm)</td>
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</table>
Dry ash fluid bed system (St. Paul, MN)
Wet ash system (Ypsilanti, MI)
Timing with Other Regulatory Considerations

- Existing sources to comply by ~ January 2014
- New sources to comply upon startup
Regulatory Update!

- 80 comments received
- EPA does not intend to re-pose the rule
- July 15, 2011 requested to fully consider responses

FOR IMMEDIATE RELEASE
December 7, 2010

EPA Seeks New Timetable for Reducing Pollution from Boilers and Incinerators

Agency committed to developing rules that are protective, cost effective and based on sound science

WASHINGTON – In a motion filed today in the federal District Court for the District of Columbia, the U.S. Environmental Protection Agency (EPA) is seeking an extension in the current court-ordered schedule …
Impact on Thermal Oxidation Facilities
Operational Impacts

- Better understanding of operational changes and impact on emissions
  - No exemption for startup, shutdown, and malfunction
  - Need “steady state” conditions – small changes
- All units likely to need emission equipment upgrades
Real Life Example of Agency with Five MH Facilities

<table>
<thead>
<tr>
<th>Parameter</th>
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<tr>
<td>Dioxin/Furan, TEQ (ng/dscm)</td>
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<td>CO (ppmv)</td>
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<td>HCl (ppmv)</td>
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## Initial Observations of Needs

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<th>E</th>
<th>F</th>
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<tr>
<td><strong>Combustion Efficiency – may need afterburner and or NOx control</strong></td>
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<td><strong>Particulate Control - may need better scrubber and/or WESP</strong></td>
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<tr>
<td>Cd</td>
<td>Control Reqd</td>
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<tr>
<td>Pb</td>
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<tr>
<td><strong>Wet Scubber – may need to add caustic</strong></td>
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<td><strong>Carbon Adsorption - needed for control</strong></td>
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<td>Control Reqd</td>
<td>Control Reqd</td>
<td>Control Reqd</td>
<td>Control Reqd</td>
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</table>
Multiple Hearth Incinerator on steroids…
Energy Production
Green Incineration? YES

- Energy recovery to support process
- Power generation
- Low carbon footprint and air emissions

INCINERATION
- FUEL
- DW CAKE

ENERGY RECOVERY

EMISSION CONTROLS

RESIDUALS MANAGEMENT

No fossil fuel used

Minimal Residue (Ash Product) = Fewer trucks, no ash lagoons
Hartford, CT Decision – Add Energy Production to MHI Upgrade

- B&V designed MHI upgrade and power generation facility
- Waste heat boilers produce superheated steam at 600F which drives a steam turbine generator to produce electrical power
- Steam turbine generating output capacity will be 2 MW providing 45% of the current 3.5 MW plant demand
NEORSD – Renewable energy production @ Southerly WWTP as part of upgrade to fluid bed

- Fluid bed incineration project was the most cost-effective biosolids management option
  - “Green power” system produces 27% of 13 MW plant load
  - Ability to use energy from grease/skimmings
  - Reduced natural gas consumption by $1M/yr
  - Provided energy enhancement to offset purchased power
  - Minimize uncontrollable costs
  - Generate $1.4 M/yr in electrical power to offset purchased power
### Facility Operations at Average Conditions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Hartford</th>
<th>Southerly</th>
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<tr>
<td>No of Units Operating</td>
<td>2</td>
<td>2</td>
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<td>Sludge Feed, dtpd</td>
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<td>163</td>
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<tr>
<td>Total Solids, %</td>
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<td>28</td>
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<tr>
<td>Volatile Solids</td>
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<td>68</td>
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<tr>
<td>Auxiliary Fuel, Btu/h</td>
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<tr>
<td>Turbine Steam Flow, lb/h</td>
<td>24,100</td>
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<tr>
<td>Gross Electricity Production, MW</td>
<td>1.6</td>
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<tr>
<td>Net Energy, kWh/dry ton</td>
<td>362</td>
<td>355</td>
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</table>
Paradigm Shift
Recovering Energy as Resource

- Proposed regulations are driving us to consider energy as a resource for recovery
- Sustainability and public accountability are driving us to consider energy as a resource for recovery

CHEERS... to the Northeast Ohio Regional Sewer District for installing generators at its Southerly Treatment Plant in Cuyahoga Heights that work more efficiently and will turn solid human waste into electrical power to help run the plant.

THE PLAIN DEALER
August 22, 2008
Conclusions

- Incineration is a viable biosolids management option
- MACT standards will impact all facilities
- EPA is at least listening to our concerns
- Facilities should consider recovering energy as a resource
Mill Creek Facilities
November 2008
September 2009
NEORSD Facilities
September 2010
November 2010
QUESTIONS

For more information…

Jim Welp
513-505-1982
WelpJE@bv.com
Workshop Schedule

7:45-8:15  Registration, Coffee, and Pastries

8:15-8:30  Opening Remarks
- Jamie Geilner, Residuals Vice-Chair

8:30-9:15  Sludge Minimization – a Paradigm Shift in Sludge Management
- Dr. Sam Jayanayagam, CH2M Hill

9:15-10:00 Grit Collection and Classification Case Studies
- Brian McNamara, Hampton Roads Sanitation District

10:00-10:15 Break

10:15-11:00 LMI Mixing of Digester Tanks
- Brian Schultz, City of Sidney

11:00-11:45 Microconstituents in Biosolids - What Does It Mean for the Future of Land Application of Biosolids?
- Dr. Lakwinder Hundal, MWRD of Greater Chicago

11:45-12:45 Lunch (provided)

12:45-1:30 Dewatering Improvements - Clarksville Case Study
- Dan Miklos, Hazen and Sawyer

1:30-2:15 Update on Solid Waste Rule for Incinerators
- Jim Walp, Black & Veatch

2:15-2:30 Break

2:30-3:15 Energy Conservation and Recovery in Wastewater Treatment Facilities
- Jim Smith, Malcolm Pirnie, Inc.

3:15-4:00 Basics of Aerobic Stabilization
- Bryen Woo, Orivo

4:00 Adjourn
Auxiliary Fuel Requirements with Hot Windbox

Mill Creek WWTP
Fluid Bed Incinerator @ 96 dtpd

Feed Solids, %TS

- 75 % VS
- 70 % VS
- 65 % VS
- 60 % VS

0.0 5.0 10.0 15.0 20.0 25.0 30.0 35.0 40.0 45.0

Auxiliary Fuel, MBtu/hr

26% 28%
Hartford WPCF Power Generation Schematic
Southerly WWTP Power Generation Schematic