IMPACT AND ANALYSIS OF NEW FEDERAL REGULATIONS ON INCINERATOR MANAGEMENT

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Background on HRSD

• Hampton Roads Sanitation District (HRSD) is located in south eastern Virginia

• HRSD owns and operates 9 wastewater plants

• Population served is 1.6 million people

• Treatment capacity is 230 mgd
HRSD has a diverse background for processing biosolids

- 1 plant - digesters and land application
- 2 plants - digesters and biosolids are used for compost
- 1 plant - digesters and the solids are burned in an HRSD incinerator
- 5 plants - biosolids are incinerated at a multiple hearth incinerator; each incinerator plant has 2 multiple hearth incinerators
On March 21, 2011 the US Environmental Protection Agency (EPA) published the Final Rule for compliance of existing and new sewage sludge incinerators (SSIs) with regulation of sewage solids as “solid waste” under the Clean Air Act Section 129 regulations for solid waste incineration.

The rule is commonly known as the Section 129 SSI MACT standard.

The SSI are now under the Clean Air Act; previously the incinerators were regulated under the Clean Water Act – Section 503.

The new air regulations take effect March 2016.
Potential Impact to HRSD:

• May need to install 5 new afterburners - $60 Million

• May need to phase out the multiple hearth incinerators and look at an alternative technology for processing biosolids

• Either option would have a large impact on HRSD’s CIP Budget
<table>
<thead>
<tr>
<th>POLLUTANT</th>
<th>UNITS</th>
<th>FINAL MACT 129 EMISSION LIMITS</th>
<th></th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>EXISTING MHI</td>
<td>EXISTING FBI</td>
<td>NEW OR MODIFIED MHI</td>
<td>NEW OR MODIFIED FBI</td>
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<td>0.0016</td>
<td>0.0024</td>
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<td>0.10</td>
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<td>64</td>
<td>52</td>
<td>27</td>
<td></td>
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<tr>
<td>HCl</td>
<td>ppmvd</td>
<td>1.2</td>
<td>0.51</td>
<td>1.2</td>
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<tr>
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<td>mg/dscm</td>
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<td>0.15</td>
<td>0.0010</td>
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<tr>
<td>NOₓ</td>
<td>ppmvd</td>
<td>220</td>
<td>150</td>
<td>210</td>
<td>30</td>
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<tr>
<td>Pb</td>
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<tr>
<td>SO₂</td>
<td>ppmvd</td>
<td>26</td>
<td>15</td>
<td>26</td>
<td>5.3</td>
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Source: USEPA, see http://www.epa.gov/ttn/atw/129/ssi/ssipg.html
Note 1: TEQ is Toxic Equivalent
Note 2: TMB is Total Mass Basis.
• With the possibility of spending $60 Million for afterburners or the possibility of no longer having multiple hearth incinerators, HRSD decided to update their biosolids master plan.

• The existing master plan was 10 years old and several of new key drivers were re-shaping the master plan.

• HRSD advertised an RFP and selected Black & Veatch to assist HRSD in developing the new biosolids master plan.
Stack Testing

• In order to see where HRSD was with the new regulations, we hired a contractor to perform stack testing

• There were several of new key parameters in the air regulations that HRSD had not previously included in their stack tests;
  • For example: SOx, NOx, and CO

• We conducted three rounds of testing
  • 1st Round – an initial snap shot of current conditions
  • 2nd and 3rd Round – improve system performance, furnace or scrubber, in order to meet new regs
### Round 1 – MACT Stack Testing

<table>
<thead>
<tr>
<th>POLLUTANT</th>
<th>UNITS</th>
<th>MACT LIMIT “EXISTING” MHI&lt;sup&gt;1&lt;/sup&gt;</th>
<th>AB</th>
<th>BH</th>
<th>CE</th>
<th>VIP&lt;sup&gt;2&lt;/sup&gt;</th>
<th>WB (FOG)</th>
<th>WB (NO FOG)</th>
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<tbody>
<tr>
<td>Cd</td>
<td>mg/dscm</td>
<td>0.095</td>
<td>0.029</td>
<td>0.029</td>
<td>0.031</td>
<td>0.176</td>
<td>0.01</td>
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<tr>
<td>CO</td>
<td>ppmvd</td>
<td>3,800</td>
<td>809</td>
<td>2,524</td>
<td>1,660</td>
<td>1,960</td>
<td>692</td>
<td>535</td>
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<tr>
<td>HCL</td>
<td>ppmvd</td>
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<td>0.2</td>
<td>0.2</td>
<td>0.3</td>
<td>0.5</td>
<td>0.6</td>
<td>&lt;0.2</td>
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<tr>
<td>Hg</td>
<td>mg/dscm</td>
<td>0.28</td>
<td>0.03</td>
<td>0.03</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
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<tr>
<td>NOx</td>
<td>ppmvd</td>
<td>220</td>
<td>218</td>
<td>130</td>
<td>183</td>
<td>257</td>
<td>440</td>
<td>488</td>
</tr>
<tr>
<td>Pb</td>
<td>mg/dscm</td>
<td>0.3</td>
<td>0.09</td>
<td>0.023</td>
<td>0.04</td>
<td>0.57</td>
<td>0.12</td>
<td>0.12</td>
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<tr>
<td>PCCD/PCDF, TEQ&lt;sup&gt;3&lt;/sup&gt;</td>
<td>ng/dscm</td>
<td>0.32</td>
<td>0.07</td>
<td>0.08</td>
<td>0.07</td>
<td>0.30</td>
<td>0.01</td>
<td>0.04</td>
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<tr>
<td>PCCD/PCDF, TMB&lt;sup&gt;3&lt;/sup&gt;</td>
<td>ng/dscm</td>
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<td>8.5</td>
<td>5.8</td>
<td>25.7</td>
<td>1.1</td>
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<tr>
<td>PM</td>
<td>mg/dscm</td>
<td>80</td>
<td>58</td>
<td>28</td>
<td>52</td>
<td>113</td>
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<tr>
<td>SO₂</td>
<td>ppmvd</td>
<td>26</td>
<td>227</td>
<td>2.8</td>
<td>35</td>
<td>336</td>
<td>470</td>
<td>423</td>
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</table>

<sup>1</sup>Corrected to 7% dry O₂

<sup>2</sup>Initial testing with MHI unit with older wet scrubber (re-tested with newer wet scrubber for Round 2 results)

<sup>3</sup>Must meet TEQ or TMB, not both.

Indicates emissions exceeded MACT limit
Conclusions from the Round 1 testing results:

- Boat Harbor (BH) met all the MACT limits. BH has a more advanced wet scrubber (Von Roll Ring Jet) that provided superior performance as compared to older wet scrubbers. The new packed bed scrubber at BH produced better results than the other older impingement scrubbers at the other plants.

- All plants (with the exception of BH) failed to meet one or more of MACT emission limits. Of particular concern were the high SO$_2$ emissions, again attributed to the older wet scrubbers.

- WB and VIP failed to meet NOx emissions. NOx is controlled by the amount of air and temperature of the combustion process. Operational changes may improve NOx emissions.

- VIP did not meet metals emissions for Cd and Pb, and particulates (PM). All of these emissions are controlled by the wet scrubber. The venturi scrubber has been replaced and performance has improved.
Conclusions from the Round 2 and Round 3:

- Emissions of CO and NOx, which are affected by operation parameters, were reduced by operations optimization to meet the MACT emission limits.
  - All of HRSD’s furnaces were able to meet the CO and NOx limits
  - Operating the furnace at lower temperatures and low oxygen levels produced less NOx
  - CO and NOx - inversely related (High NOx:Low CO or Low NOx: High CO)

- The SO$_2$ emissions are removed by the water flowing through the scrubber
  - The VIP plant will need a new scrubber to meet the new Sox regulations
  - Tried adding caustic to VIP scrubber to reduce SOx emissions; the amount of caustic needed to meet the new regs was cost prohibitive
  - The reason the VIP scrubber needed to be replaced was due to the high volume of solids burned per day (~25 dtpd) and the use of an old impingement scrubber.
Conclusions from the Round 2 and Round 3:

• The existing multiple hearth furnaces at HRSD could meet all the new air regs with the exception of the scrubber system at the VIP plant

• The existing furnaces at HRSD use a pre-cooler, venturi scrubber followed by a impingement scrubber. Only the Boat Harbor plant has a new off-gas scrubber system

• The original estimated CIP cost to meet the new regs was $60 Million; the current short range CIP cost is $4 Million.
HRSD’s Short Term Plan for Incinerators

- Keep all of 10 multiple hearth furnaces
- Replace scrubber at VIP plant
- Purchase a Continue Emissions Monitoring System (CEMS) for NOx and CO for re-training the operators
  - HRSD’s Operators are trained for meeting our current permit which includes THC, temperature and water flow through scrubbers
  - The new CEM system will allow us to retrain the operators to meet the new NOx and CO regs
Future Air Regulation Changes

• EPA can change the air regulations every 5 years

• However, EPA tends to update the rules every 10 years

• HRSD is assuming that the next major change to the rules will be in the year 2021, which is 10 years after the changes made in 2011
Possible Options for HRSD’s Long Term Biosolids Plan (10-15+ years):

1. Consolidate the 10 MHF into one large regional fluidized bed incinerator
   • Better energy savings with one large FBI than 10 small MHF

2. Thermal Hydrolysis – for example: Cambi
   • Achieve Class A biosolids; less solids produced

3. Contract with a 3rd party to incinerate our solids and produce electricity
   • Create a partnership where it would be a win/win situation for HRSD and the 3rd party
   • Produce electricity from “green” energy source
Conclusions

• In the future, there will most likely be new regulations for biosolids

• The new biosolids regulations could effect: land app, composting or incineration

• As a result of the new air regulations, HRSD has:
  1. Updated our biosolids master plan
  2. Chosen to spend a minimal amount of capital now
  3. Keep our options as diverse as possible for the future
Questions and Answers