

SSI COMPLIANCE PROJECT MANCHESTER, NH WWTP

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Agenda

- Manchester Background
- A History of Incineration at Manchester
- Benefits of Incineration
- 40 CFR Part 62 Subpart LLL
- Engineer Selection
- Design Criteria and Options Evaluation
- Selection of the Mercury Control System
- Achieving Compliance
- Stack Test Results
- The Project
- Stack Testing Platform
- Lessons Learned and Key Takeaways
- Questions



Background – City of Manchester

- Largest City North of Boston - 110,000 population
- Settled in 1725
- Evolved from Agricultural to Industrial: 1725 - 1815
- Amoskeag Mills: Largest single mill in the world 1915
- Post Industrial Depression: 1935 – 1980's
- Revitalization: 1990 to Present



Environmental Protection Division

- Created in 1975
- Division of Manchester's Department of Public Works
- An "enterprise"
- Staff of 43
- 15 acre campus at 300 Winston Street
- 10 buildings
 - Administration
 - Operations
 - Maintenance



Manchester's Wastewater Infrastructure – WWTP

- 1975 – 26 mgd
- 1994 – Upgrade to 34 mgd
- 2016 – Upgrade to 42 mgd
- Serves four communities
 - Bedford (4.37%)
 - Goffstown (4.11%)
 - Londonderry (10.16%)
 - Manchester (81.36%)
- Metro pop. – 172,000



A History of Incineration at Manchester



Multiple Hearth Incinerator (MHI) – Installed 1975



MHI Second Floor EL 155.83



Multiple Hearth Incinerator (MHI) – Today



Fluidized Bed Incinerator (FBI) – Installed 1993



Fluidized Bed Incinerator Upgrade



- Project Completed 2011
- Project Cost \$4.5 Million
- Project Description
 - Rebuilt the Incinerator
 - Replaced 75% of the vessel's shell
 - New brick interior lining
 - New tuyere system
 - Inlet manifold
 - Heat exchanger



Benefits of Incineration

- 95% Reduction of Biosolids
- Heat Recovery supplements plant hot water demands
- Beneficial Use of Ash



Beneficial Use of Ash



Hot Water Storage



- 4,000 Gallons of Hot Water Storage
 - The Economizer (air to water heat exchanger) from the Fluidized Bed Incinerator converts hot air to hot water.
 - The hot water was once only used as it was produced. With these tanks we are able to capture and retain 4,000 gallons to be used later.



40 CFR Part 62 Subpart LLL

- Applicability
- Timing – Promulgation
- Compliance Deadline – March 21, 2016
- Established new permit limits for constituents
 - PM, HCl, CO, Dioxins/Furans, Hg, NO_x, SO₂, Cd, Pb, Fugitive Emissions from Ash Handling
- Manchester performance relative to LLL
 - Hg & SO₂



Engineer Selection

- Successful installation of mercury control system at other Sewage Sludge Incineration Facilities
- Working Relationship with EPA Region 1



Design Criteria & Options Evaluation

- 2015 Stack Test Results

Pollutant	Measured Average	Subpart LLL Limit
Sulfur Dioxide (ppm)	24.5	15
Mercury (mg/DSCM)	0.073	0.037

- Evaluation of Historical Sludge Data

Statistical Significants	Hg Concentration (mg/DSCM)
Arithmetic Mean	0.050
95 th Percentile	0.117
99.7 th Percentile	0.151



Design Criteria & Options Evaluation

- Non-Incineration Alternatives Analysis
 - While viable, not cost effective given the age and condition of the incinerator
- Fixed Bed Activated Carbon Treatment
 - Potential to achieve greatest removal efficiency
 - Physical space requirements
 - Maintenance requirements of additional equipment (preheat & filtration)
 - Prone to fouling under upset conditions/intermittent operation
- SPC System
 - Relatively small footprint
 - High cost of replacement media
 - More tolerant of intermittent operation



Selection of Mercury Control System

- 10-year NPV Analysis
 - Fixed Bed Activated Carbon System - \$4.58 - \$4.78M
 - SPC System - \$4.07 – \$4.99M
- EnviroCare References (other systems in operation)
- Systems of Comparable Size to Manchester
- Site Visit to North Carolina System and Plant Feedback



Achieving Compliance

- Terms of the Consent Decree
 - Design, Install, Operate a Mercury Control System
 - Commence Operation of the Mercury Control System No Later Than July 11, 2019
 - Interim Period Compliance
 - Mercury Control System in Place
 - Ongoing Compliance requires parametric monitoring as defined by the Control Plan and SSMP



Interim Compliance Period

- Achieving compliance with all pollutants except Hg
 - Control Plan & Site Specific Monitoring Plan
 - Establish Initial Operating Limits
 - Operating Limits serves as surrogates and deviations reported semi-annually
 - Annual Compliance Testing
 - Implement Interim Mercury Management Plan
 - Increased Sludge Sampling
 - Increased Sampling at the Plant and at Metering Stations
 - Dental Office Outreach
 - Industrial Sampling



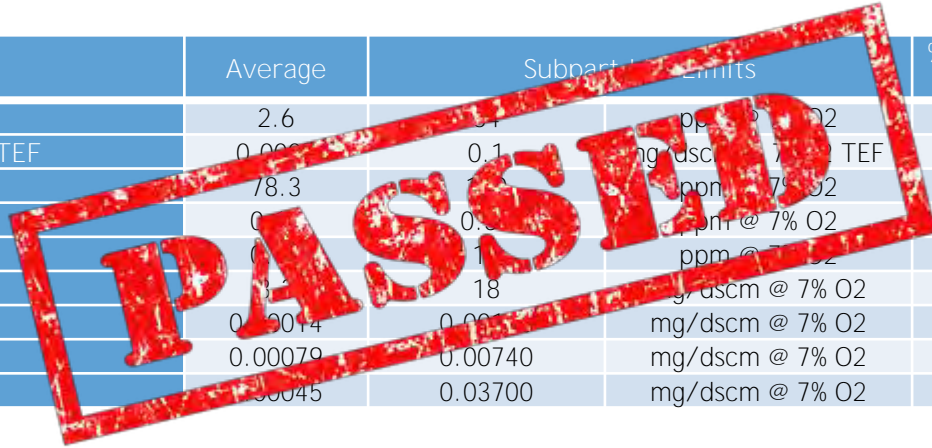
Mercury Control System in Place

- Updates to all documents to include the Mercury Control System
 - Control Plan & Petition
 - Site Specific Monitoring Plan to include Hg Monitoring
- Stack Test to Demonstrate Compliance
 - Stack Testing @ 85% of permitted capacity
- Establish New Operating Limits
- Compliance Testing (frequency based on limits achieved)
- Complexity lies in the dynamic nature of the system and monitoring the parameters on an ongoing basis



Stack Test Results

Pollutant	Average	Subpart LLL Limits	% of Subpart LLL Limit
CO	2.6	64 ppm @ 7% O2	4%
Dioxin/Furan, TEF	0.0000	0.1 mg/dscm @ 7% O2 TEF	1%
NOx	78.3	150 ppm @ 7% O2	52%
HCl	0.0000	0.3 ppm @ 7% O2	34%
SO2	0.0000	6 ppm @ 7% O2	5%
PM	1.2	18 mg/dscm @ 7% O2	18%
Cd	0.0014	0.0015 mg/dscm @ 7% O2	9%
Pb	0.00079	0.00740 mg/dscm @ 7% O2	11%
Hg	0.0045	0.03700 mg/dscm @ 7% O2	1%



SSI Compliance Project



- Project Completed 2019
- Project Cost \$8.0 Million
- Project Description
 - Installation of mercury removal vessel, new economizer, and recuperator base
 - Added removal of two multiple hearth incinerators
 - Added installation of two new scum tanks

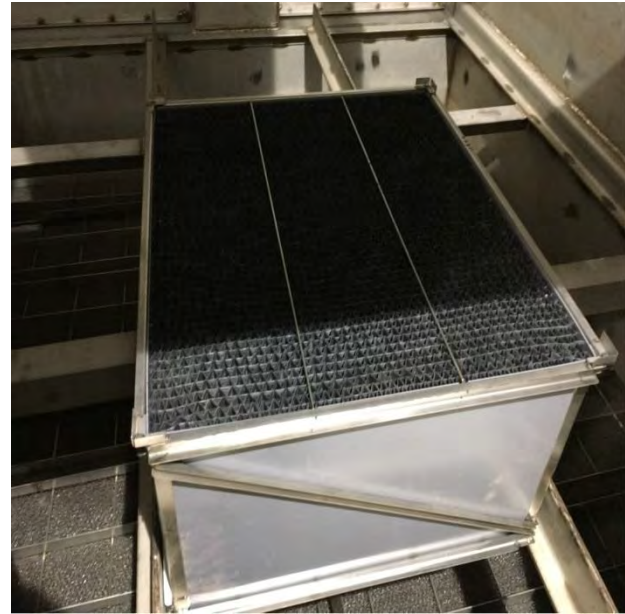


Mercury Removal Unit



Mercury Removal Unit

- EnviroCare MercuryPak Scrubber
 - Sorbent Polymer Composite (SPC)
 - 81 Modules
 - 9 Layers of 9 Modules in each Layer
 - Size: 13"x25"x27"
 - Weight 72 Pounds Dry

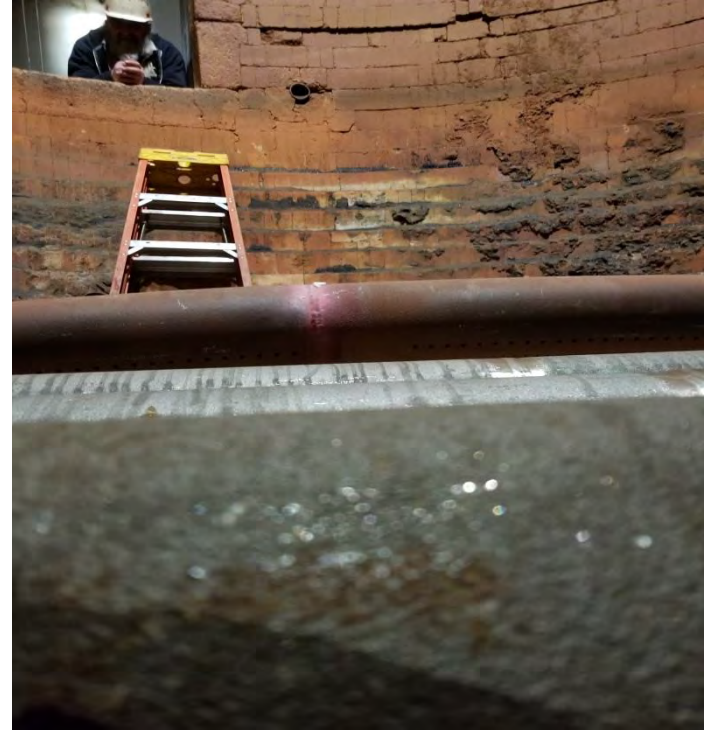


Tuyere Replacement

- FBI Tuyeres
 - 12 Tuyeres in the Vessel
 - To fluidize the air
 - 4 Replaced initially
 - 3 Additionally replaced



Tuyere Replacement



Economizer Replacement

- New Economizer
 - The Air to Water Heat Exchanger



Recuperator Base Replacement

- New Recuperator Base
 - The rest of the unit remained
 - Had issues fluidizing
 - Replacing some expansion joints
 - Replace the center section?



Recuperator Expansion Joint Replacement



Stack Sampling Platform



Lessons Learned & Key Takeaways

1. Replace equipment in its entirety
2. The documentation can be cumbersome
3. Operating limits change each year
4. 85%+ Throughput is tough to achieve
5. The stack sampling platform was the best money spent
6. Plan for “Murphy’s Law”
7. Have a good backup plan
8. Plan for life after incineration



Acknowledgements







Thank You...