Process Testing & Evaluation Services

- *Full-service testing of air pollution control technologies*
- *Onsite sampling and evaluation services*
- *Proven experience demonstrating particulate, NOx, mercury, and dioxin control technologies*
- *Assessment and resolution of industrial emission problems*

Process Testing - Evaluation

● Full-Service Testing ● Onsite Sampling ● Onsite Evaluation Services ● Assessment / Resolution Services

MSE - Process Testing and Evaluation Services - On site testing - Evaluation - Assessments

Process Testing Services / Capabilities

MSE is committed to working with customers to provide high quality, cost-competitive support that meets both technical and scheduling requirements. Our engineering staff is available, qualified, and experienced to help you

- Develop experimental designs
- Modify test bed configurations
- Install and test equipment
- Perform testing, sampling, and data reduction
- Write technology evaluations and recommendations so you can evaluate results

Process Testing Equipment

MSE has a full-scale offgas treatment system and a quarter-scale test bed available to demonstrate innovative APC technologies. The mass flow rate capacity of the main offgas treatment system is approximately 20 lb/min. Both systems can be easily modified to test a variety of APC technologies and emission monitoring equipment.

By simulating emission conditions and accurately assessing system performance, MSE can provide the information and field data with which to make informed decisions without the investment of large capital costs and facility downtime.

Emissions Monitoring Equipment

To support these activities, we also maintain a variety of emissions monitoring equipment, ranging from manual particulate sampling test trains to continuous gas analyzers. These systems can be used for process evaluations at our test site or deployed in the field as required.

Sampling

To quantify emission reductions, and to calculate operating efficiencies of the APC technologies being tested, we collect and analyze inlet and outlet offgas samples for targeted criteria and hazardous air pollutants. Typical sampling methods and protocols include both automated instrumental analysis methods and manual sampling methods. EPA sampling methods employed by MSE include the following:

- Method 5, Determination of Particulate Emissions from Stationary Sources
- Method 12, Determination of Inorganic Lead Emissions from Stationary Sources
- Method 18, Measurement of Gaseous Organic Compounds by Gas Chromatography
- Method 23, Determination of Polychlorinated dibenzo-p-dioxins and Polychlorinated dibenzofurans
- Method 25A, Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer
- Method 29, Determination of Metal Emissions from Stationary Sources
- Method 101A, Determination of Mercury Emissions from Stationary Sources
- Method 306A, Determination of Chromium Emissions from Electroplating and Anodizing Operations

In addition to these EPA sampling protocols, MSE also can verify system performance from a qualitative perspective using three gas chromatography (GC) instruments equipped with various detectors including two mass spectroscopy (MS) units. During past projects, the GC/MS units have provided both qualitative and quantitative results on the destruction efficiencies for principle organic constituents, primarily chlorinated solvents. The GC/MS operate in scanning mode to provide a qualitative assessment of the organic constituents within flue gas. MSE also provides an automated column cleanup unit, a thermal gravimetric analyzer, and a differential scanning calorimetry unit.

Analysis

We can perform a variety of analyses including real-time process emission monitoring using continuous gas analyzers, which facilitates instantaneous tracking of emission trends as operating conditions are changed.

We also perform manual sampling methods involving collecting emitted pollutants on pre-weighed filters and/or in liquid solutions. We send these materials to certified analytical laboratories for quantification. Periodically, we audit these labs to ensure that EPA protocols are being followed and that the analytical equipment is in proper working condition. We combine the analytical results with sampling field data to produce evaluations of process efficiency and pollution control according to customer specifications.

MSE personnel performing stack sampling.

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process testing - evaluation

MSE Process Testing & Evaluation Project Experience

Particulate Control Filter Efficiency: One concern of hazardous waste incinerator operators is confining radiological contamination upstream of the wet scrubber and downstream APC devices. MSE worked with the DOE to identify numerous vendors that manufactured high-temperature ceramic and high-efficiency particulate air-grade filters. We modified a slipstream test bed to produce a >1,600 °F gas stream for filter testing and evaluation. Then, we collected gas samples using EPA Method 5 and quantified the particulate removal efficiencies of the individual filters.

NOx Abatement Technologies: Although oxides of nitrogen (NOx) abatement technologies are relatively standardized, MSE has evaluated a multicombustion unit designed to reduce high concentrations of NOx (30,000 to 50,000 ppm) to mandated compliance levels (<200 ppm). The technology—developed by John Zink, Inc.—uses stage combustion to control NOx emissions. Major challenges on the project included designing a NOx formation system and accurately quantifying the NOx concentrations upstream and downstream of the test unit. To measure the high NOx emissions, we designed, fabricated, and commissioned a dual-stage dilution probe that met the sampling requirements for the project. Work in this field led to follow-on projects to assess the system's impact on mercury speciation, and to determine whether it could reduce sulfur trioxide (SO_3) emissions.

Other demonstrations for NOx abatement include selective catalytic reactor technologies that used non-hazardous catalysts. We developed and commissioned a multiport sampling probe to measure the NOx concentrations at various stages within the catalyst system. We also evaluated a pulse-corona discharge system for NOx abatement.

Thermal Oxidizers for Incinerators: An integral part of a typical hazardous waste incineration process is a thermal oxidization unit to reduce emissions of principle organic constituents (POCs). Typically, these units use natural gas or fuel oil to heat the inlet gas stream to > 2,000 °F and provide a gas residence time of 2 seconds. The additional mass added by the fossil fuel source increases the volumetric flow rate of the offgas treatment system, which affects capital and operational costs of the facility. To minimize the increase in volumetric flow associated with conventional fossil fuel thermal oxidizers, MSE tested various flameless or low-flow thermal oxidizers that used electrical heaters to increase the offgas temperature to >2,000 °F and maintain the temperature for 2 seconds. To enhance oxidation of POCs, these oxidizers used oxygen enrichment to oxidize the POCs, minimizing flow increase.

Chromium Emission Venturi-Vortex Scrubber: The Watervliet Arsenal, near Albany, NY, is one of DOD's primary facilities for chrome plating of large gun barrels. MSE evaluated a venture/vortex scrubber assembly that reduces chrome emissions from the electroplating process by causing chrome-containing aerosols to be reabsorbed into the plating solution. We monitored Chromium concentrations (both in-stack and ambient) under a variety of operating conditions and configurations to quantify the reductions achieved by individual segments of the venture/vortex scrubber system. In addition to calculating emission reductions, we performed a mass-balance analysis to determine overall system efficiencies, and the mass of chromium removed under different operating conditions. This work was performed for the U.S. Army's Construction Engineering Research Laboratory (CERL).

Dioxin Control. One problem associated with burning chlorinated wastestreams is the formation of dioxin and furan compounds. Typically, these toxic compounds are formed by slowly cooling the offgas in the presence of a catalyst. To prevent the formation of dioxin compounds, MSE has investigated and tested hot filtration and quenching systems located immediately downstream of the thermal oxidizer.

Mercury Reduction Systems: Current legislation limits mercury emissions from hazardous waste incinerators and coal-fired generators. Current technology to reduce mercury emissions is either to inject activated carbon into the flue gas or pass the gas through a thin bed containing layers of activated carbon. As the gas mixes with the carbon, mercury is adsorbed by the carbon and removed from the gas stream. For DOE, MSE evaluated three adsorbent technologies and developed the expertise to chemically oxidize elemental mercury for capture by wet scrubbing systems.

VOC Paint Booth Emissions. Fort Hood, near Killeen, TX, has facilities to paint tanks and other large military vehicles. The painting activities release significant amounts of volatile organic compounds (VOC), which are increasingly regulated because of their contribution to ambient ozone concentrations. MSE conducted continuous emissions monitoring to evaluate the effectiveness of a Catalytic Recuperative Oxidizer (CRO), which was designed to make painting operations essentially pollution-free. This included monitoring of VOC from the existing operation to establish a baseline, followed by simultaneous monitoring upstream and downstream from the CRO during full-scale operations.

Monitoring Systems/Permitting: We also conduct frequent compliance sampling, test and evaluate emission monitoring systems (metals, organics, dioxins, and mercury).

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