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DIAGNOSTIC INSTRUMENTATION AND ANALYSIS LABORATORY

TECHNOLOGY NEED

Better and improved monitoring and control methods are needed to optimize the thermal treatment processes, in particular the plasma torch treatment system.

TECHNOLOGY DESCRIPTION

Accurate characterization and control of plasma torch facilities for mixed waste remediation is currently a major effort at the Diagnostic Instrumentation and Analysis Laboratory (DIAL) at Mississippi State University. Although plasma torch systems have been used commercially for many years, most notably in material science applications and for the treatment of incinerator ashes, the extension to mixed waste presents challenges. Specific issues are concerned with the composition of the input waste stream, the longevity of torch components such as electrodes and vortex generators, refractory wear, the quality of the final waste form, downstream gas compositions, and the performance of air pollution control devices. Evaluation of these factors requires a systematic approach including instrument development, materials studies, systems integration, modeling, and control system development.

BENEFITS

The DIAL activities support ongoing test facilities and provide improved characterization, monitoring, and control instrumentation systems. They also provide diagnostic field measurements and demonstrations.

COLLABORATION/TECHNOLOGY TRANSFER

Cooperative research and development (R&D) efforts, with an emphasis on mixed waste treatment, are underway with the following participants:

- Westinghouse Savannah River Technology Center, Aiken, South Carolina, and Clemson University, Clemson, South Carolina
- Argonne National Laboratory-West, Idaho National Engineering Laboratory, Idaho Falls, Idaho
- Western Environmental Technology Office, Butte, Montana
- Various industrial affiliates

ACCOMPLISHMENTS

A major thrust of the work is to maximize the torch lifetime from an operational approach, to look at improved electrode materials, and to provide warning of an imminent electrode failure. The overall progress of the DIAL program has also been demonstrated by the activities of the field operations program. The field program is designed for the rapid demonstration and implementation of modern field-ready diagnostic methods for characterization, monitoring, and control purposes.

DIAL's mobile instrument laboratory was used to support a series of measurements on the Transportable Vitrification System (TVS) at Clemson University. At Clemson, exploratory measurements on the TVS focused on determination of the melt temperature, the melt discharge temperature, thermal images of the melt discharge, offgas compounds, the heavy metals in the molten glass, and the offgas local flow velocity and velocity profile exiting downstream of the melters.

The primary objectives of the measurements on the TVS were to: (1) characterize the gas stream at the measurement locations; (2) demonstrate the capability of the measurement technique; (3) provide useful facility data; and (4) enable planning for future tests.

Preparations are underway for a field trip to the Environmental Protection Agency (EPA) test facility in North Carolina. Continuous emissions monitoring of offgas heavy metals will be conducted, and the results will be compared to those obtained with conventional EPA multi-metals methods.

TTP INFORMATION

Diagnostic Instrumentation and Analysis Laboratory technology development activities are funded under the following Technical Task Plan (TTP):

TTP No. CH03C231 "Diagnostic Instrumentation and Analysis Laboratory (DIAL)"

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