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High-Temperature, High-Pressure Probe for Hazardous Air Pollutants Sampling
in Advanced Power Systems

Authors:

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C R A D A facts

DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY

FILTRATION
PROJECT

HIGH-TEMPERATURE, HIGH-PRESSURE PROBE FOR HAZARDOUS AIR POLLUTANTS SAMPLING IN ADVANCED POWER SYSTEMS

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Capabilities

The Morgantown Energy Technology Center (METC) has developed a number of new technologies for efficient utilization of coal in the generation of electrical power. The superior performance of these systems is currently being demonstrated in a number of locations through the Clean Coal Technology program and other programs managed by METC. However, the environmental performance of these systems has not yet been thoroughly characterized, so METC has initiated programs to address this lack of data. The first step in this regard is to measure the eleven elements identified by the U.S. Environmental Protection Agency as being air toxics.

The best way to characterize advanced systems with respect to the fate of the eleven toxic elements is to perform a mass balance as they move through the various components of the system. Irrespective of the instrumental method used to analyze a sample extracted from within an advanced system, the sampling probe will need to gather a representative sample from a high-temperature, high-pressure environment. To this end, METC tasked Radian Corporation, now known as Radian International, with the design, construction, and application of a suitable probe.

The probe was used to gather data on hazardous air pollutants (HAPs) at the Destec LGTI gasifier in Plaquemine, Louisiana, in 1995. The probe performed well and provided useful particulate and gas-phase sample from the middle of the gasifier itself, prior to any cooling or pressure letdown.

The probe is a concentric tube with a ceramic filter located at the tip. A flow of nitrogen cools the probe and quenches the gas stream shortly downstream from the tip. The probe is inserted through a pair of block and bleed isolation valves, and the pressure seal around it was kept by multiple graphite gaskets. The probe is inserted and retracted by a system of hand-cranked winches, with positive action both on insertion and retraction. Two operators can readily insert the probe against a 40 bar (600 psi) pressure.

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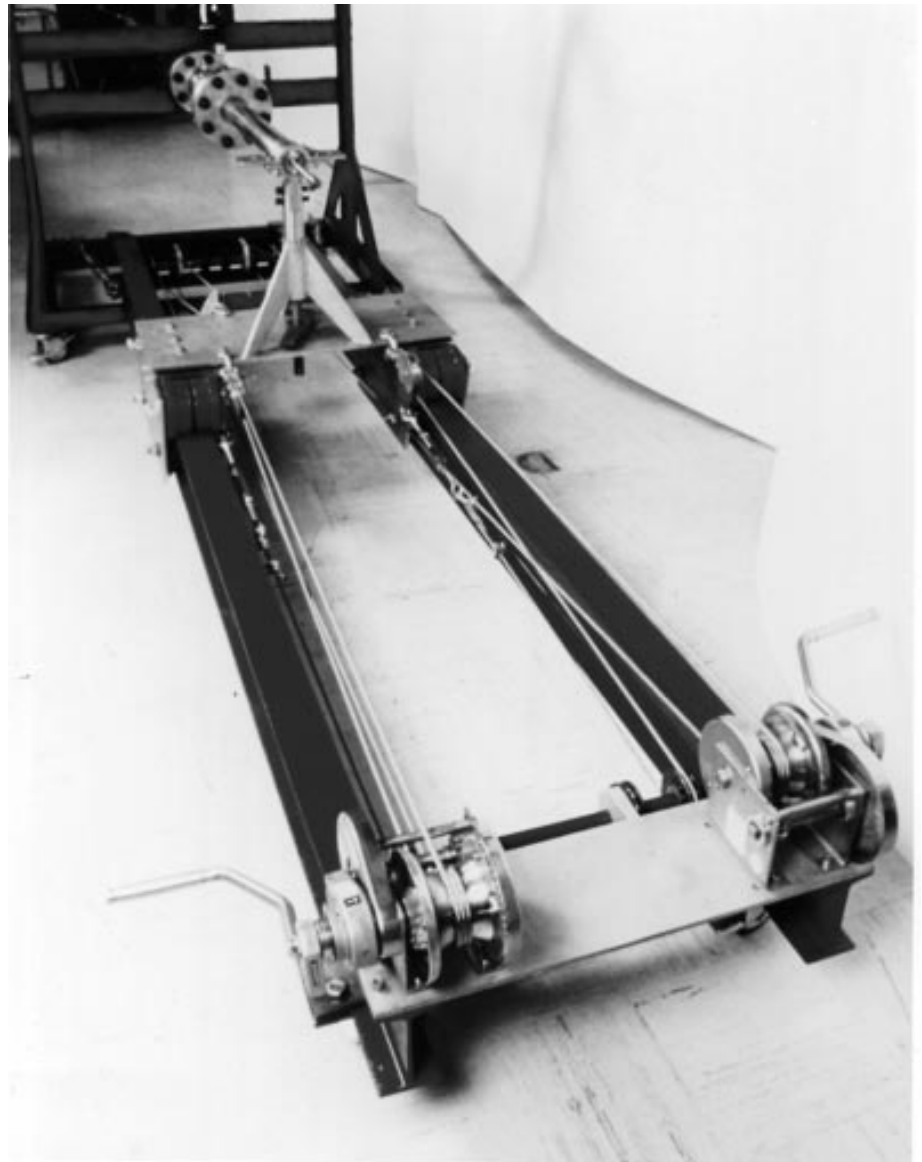
Opportunities

Hardware available for application to any pressurized system where a flange can be installed, such as:

- Gasifiers
- Pressurized combustors
- Pressurized cleanup systems

The Probe

This photo shows brass winches, rails (red), stainless steel probe and flanges, and pressurized test stand (blue).



HTHP probe inserted into test stand