# Multi-fuel Stoker Combustor

## 1. Capabilities

A pilot-scale multi-fuel combustor (MFC) with three interchangeable, alternative stoker grate systems is located at APPCD research laboratories. The MFC is designed to be operated under mass burn, spreader stoker, and batch feed firing modes. The MFC is capable of burning a wide variety of solid fuels, including municipal solid waste (MSW), refuse-derived fuel (RDF), biomass fuel, and coal. The processes controlling pollutant formation and destruction can be studied during combustion on the fuel bed, in the radiant furnace or the convective section, as well as with a variety of air pollution control devices such as baghouses and scrubbers. Access ports are installed throughout the MFC for sampling and for visual observation. APPCD's in-house laboratories have the capability of analyzing combustion emission samples for dioxins, organics, and metals. The MFC is equipped with continuous emission monitors (CEMs) to measure air emissions.

## 2. Size

The MFC is sized to generate 0.58 MW (2,000,000 BTU/hr) maximum thermal output which is sufficient for the combustor to be used as a research tool for simulating the full range of conditions that might be encountered in practical systems. The MFC facility is housed in an 1800 $ft^2$ high-bay laboratory.

## 3. Test Requirements

All process temperatures, pressures, feed, and flow rates of the MFC are monitored by sensors installed at various locations of the combustor. The research facility requires an engineer and two technicians to operate. More technicians are needed if sampling is required for organics and particulate, such as semivolatiles and metal aerosols.

## 4. Raw Materials Required

The MFC is installed with a natural gas burner for start-up and shut-down operations. Combustion tests of MSW, RDF, biomass, and coal can be performed using the facility with the restriction that the feed materials need to be less than two (2) inches in size. The maximum feeding rate of the MFC is 400 lb/hr of RDF.

## 5. Data Produced per Run

CEMs including $O_2$, CO, $CO_2$, $SO_2$, $NO_x$, and total hydrocarbon (THC) are installed for combustion emission monitoring. CEM data and all process temperatures, pressures, feed, and flow rates of

the MFC are recorded by an on-line real-time computer (Macintosh) data acquisition system.

## 6. Length of Run

It will require a minimum of three working days (8 hrs/working day) for the MFC to perform one test. A working day is required to start up the combustor, i.e., bring it from a cold start-up to operating temperature, and set up all the necessary sampling equipment for the test. The actual combustion tests will require eight hours per test. Another working day is required to disassemble and clean up the sampling equipment. The MFC can be kept in stand-by mode at night by using its natural gas burner.

## 7. Cost per Run

The cost for operating the MFC to perform one test is about $8000 which includes labor, routine maintenance, and expendables such as calibration gases for CEMs and filters and sorbents used for sampling. Costs for performing the chemical analyses on the emission samples which depend on the analyses required are additional.

## 8. Contact Person

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