

Rotary Kiln Incinerator Simulator

1. Capabilities

The EPA Rotary Kiln Incinerator Simulator (RKIS) is a flexible bench-scale rotary kiln incinerator system fitted with an innovative secondary combustion chamber (afterburner). The RKIS is permitted with a RCRA RD&D permit which allows a variety of surrogate or real hazardous waste materials to be burned. Primary areas of interest for this facility would be in examining phenomena associated with rotary kiln incineration of organic or metal containing wastes, including transient puff formation, products of incomplete combustion (PIC) formation/destruction, development of incinerator performance indicators, and also phenomena associated with secondary combustion chambers, including mixing/flame contact issues, or the influence of time/temperature histories on the destruction of organic materials. The RKIS is equipped with two sets of continuous emission monitors (CEMs) that can allow simultaneous sampling of O₂, CO, CO₂, NO, and hydrocarbons upstream and downstream of the afterburner, including a computer-aided data acquisition system that provides real-time indicators of all monitored variables.

2. Size

Main Burner Firing Rate: 250,000 BTU/hr
Afterburner Firing Rate: 250,000 BTU/hr
Kiln Diameter: 30 in. ID, 24 in. long cylindrical recess
Secondary Combustion Chamber Diameter: 24 in. ID plug flow section

3. Test Requirements

Testing requires an approved Quality Assurance Project Plan (QAPP) and a Health and Safety Protocol. Testing also requires the operation of the Wing-G Flue Gas Cleaning System (FGCS). It takes one technician to operate the FGCS, plus one engineer and one technician to operate the kiln during tests. Any additional extractive sampling procedures (MM5, VOST, multi-metals train) require additional sampling technicians.

4. Raw Materials Required

Batch charges generally consist of one-quart containers, but other incinerable solids can be fed continuously. For soil experiments, one gallon of material produces approximately a 2% fill fraction of the kiln chamber.

5. Data Produced Per Run

Data consists of strip charts with CEM data, plus tab-delimited ASCII files of the CEM and thermocouple data. Spreadsheet macros are used to plot the data automatically after acquisition. Additional data from extractive samples are also produced based on the type and quantity of sampling/analysis.

6. Length of Run

For batch runs, several (approximately 10) replicates are performed at each kiln condition. Each set of conditions takes approximately one day to acquire. Soil studies may include solid phase residence times of up to an hour. Time between samples is determined by how long it takes the RKIS to return to thermal equilibrium. If extractive sampling is done, approximately one-half day of set-up and take-down time must be allowed aside from normal run times.

7. Cost per Run

Operating costs of approximately \$1200/day assuming the use of a Unit Technician, an FGCS Technician, a Lead Engineer, and including maintenance and other expendable materials. Other services provided by a Sampling Technician (for non-routine chemical analysis) or materials for other analytical work are not included in this estimate.

8. Contact Person

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