

Advanced Combustion Test Facility for Diversification of Available Fuel Types

Background

From the view point of fuel security and fuel cost, diversification of available fuel types including low grade coals is important in Japanese coal-fired power stations. Furthermore, in order to reduce CO₂ emission, biomass co-firing with coal is proceeding. This facility consists of two furnaces, namely combustion test furnaces with a single burner and a small combustor (TCMF; Turbulent Combustion Modeling Furnace). The combustion test furnace

with a single burner is able to evaluate grinding and combustion characteristics of solid fuels since the combustion conditions are almost the same as that of actual power stations. In TCMF, combustion phenomena of various fuels are investigated. The results improve a numerical analysis model for combustion, which is effective in the advancement of combustion technologies.

Outline

- Combustion test furnace with a single burner
Combustion conditions in the test furnace simulate those of actual power stations. It is possible to evaluate the grinding characteristics of solid fuel using a roller mill, combustion characteristics such as ignitability and combustion efficiency, as well as the emission characteristics of a pollutant. Advanced combustion technologies such as oxygen enriched combustion are also developed for various types of fuel.

- Turbulent Combustion Modeling Furnace (TCMF)
Precise laser measurements of gas velocity, temperature, particle diameter and gas components in the simple combustion field are utilized to improve a numerical analysis model for combustion. Estimated combustion characteristics using this model are utilized to reasonably decide combustion conditions and investigate scale-up effects.

Specifications

- Combustion test furnace with single burner
Pulverizer: Roller mill (Coal grinding rate; approx. 300 kg/h)
Furnace: Water cooled and horizontal cylindrical type with single burner (Φin 850 mm × Length 8,000 mm)
Thermal input; 760 kW
Function: Coal feeding rate; approx. 100 kg/h, Liquid fuel injecting rate; approx. 30 L/h
Oxy-fuel combustion (Flue gas recirculation and oxygen injection (max. 200 m³/h))
- Turbulent Combustion Modeling Furnace (TCMF)
Furnace: Vertical cylindrical type (I.D. of 250 mm × height of 2,000 mm)
Thermal input: 10 to 80 kW
Function: Coal feeding rate: 1 to 10 kg/h
Measurement equipment: LDV (Laser Doppler Velocimeter), PIA (Particle Image Analyzer), TDLAS (Tunable Diode Laser Absorption Spectrometry) and so on.

[Location and date of installation]

Yokosuka area / January, 2014

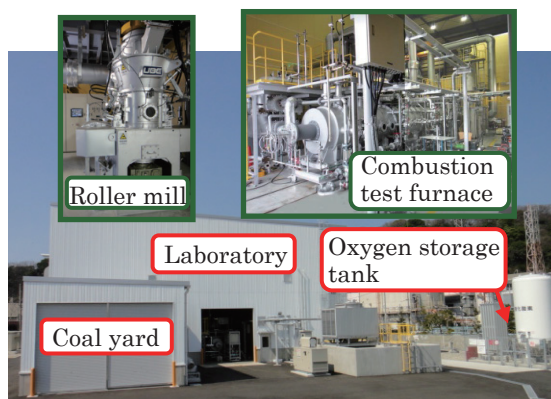


Photo 1: Coal combustion test facilities in the laboratory
Roller mill and combustion test furnace with single burner

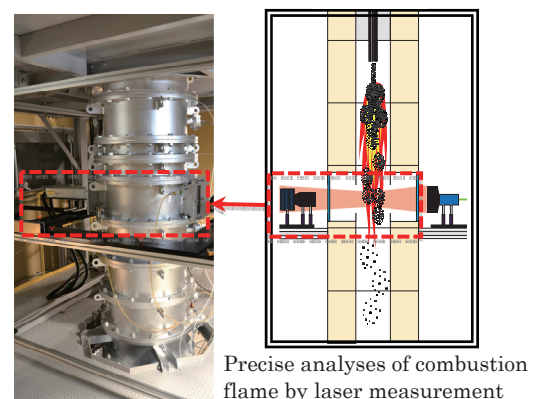


Photo 2: Turbulent Combustion Modeling Furnace (TCMF)
Measuring point in the furnace center