7. Energy Engineering Research Laboratory

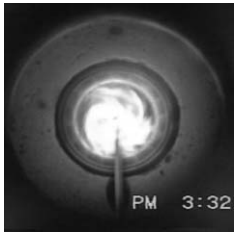
◆Operation and maintenance technologies for thermal power generation

[Objectives]

To understand the basic combustion characteristics of new liquid fuels, establish base technologies for combustion and develop a reliability assessment tool for equipment operating under a high temperature at existing thermal power plants to advance the operation and maintenance technologies for thermal power generation.

[Principal Results]

- A survey was conducted on such new types of liquid fuel as palm oil (palm methyl ester) and a burner of the existing basic combustion experiment facility was improved for better assessment of liquid fuel (Fig.8).
- The knowledge accumulated in the Laboratory was systematised to develop a simplified analytical remaining life assessment method targeting the progressive creeps and cracks of boiler pipes and a comprehensive report was prepared.



The flame around the periphery of the burner is blue, leaving hardly any soot deposit.
(Air temperature: 400℃; fuel temperature: 52℃; fuel pressure: 0.69)

Fig.8 Combustion Flame of Palm Methyl Ester (PME: a type of fuel of which the viscosity and ignition point have been lowered by making palm oil into ester through its reaction with methanol)

◆Fuel reforming and environmental conservation technologies

[Objectives]

To develop base technologies relating to the reforming of low grade fuels or coal ash and a technology to remove volatile trace substances for the purpose of contributing to the diversification of fuel and environmental conservation.

[Principal Results]

- To facilitate the efficient use of low grade coal, it was confirmed that the reforming of brown coal by super-critical water will generate methanol and other low grade hydrocarbons as well as phenol cresol and other phenols.
- A prototype volatile organic compound (VOC) cracking module with a ceria oxide catalyst on ceramic honeycomb was produced and it was confirmed that a decomposition rate of more than 95% at 250℃ could be achieved to render the toluene discharged by printing, painting and other processes harmless.

◆Highly efficient energy conversion technologies

[Objectives]

To develop fuel cell technologies, clean fuel technologies, a cooling medium heat transfer technology for heat pumps, heat storage technologies and an evaluation technology for various energy systems, all of which will form the basis for highly efficient energy conversion technologies in the future.

[Principal Results]

- Basic technologies for the search for and feasibility assessment of a high efficiency power generation system in the future, assessment of various fuel cell power generation technologies and the low cost production of MCFC unit cells were developed.
- Element technologies relating to heat pumps and heat transfer and dry gas refining were assessed.