Development of Monitoring and Control Technologies of Industrial Systems Using Advanced Laser Diagnostics

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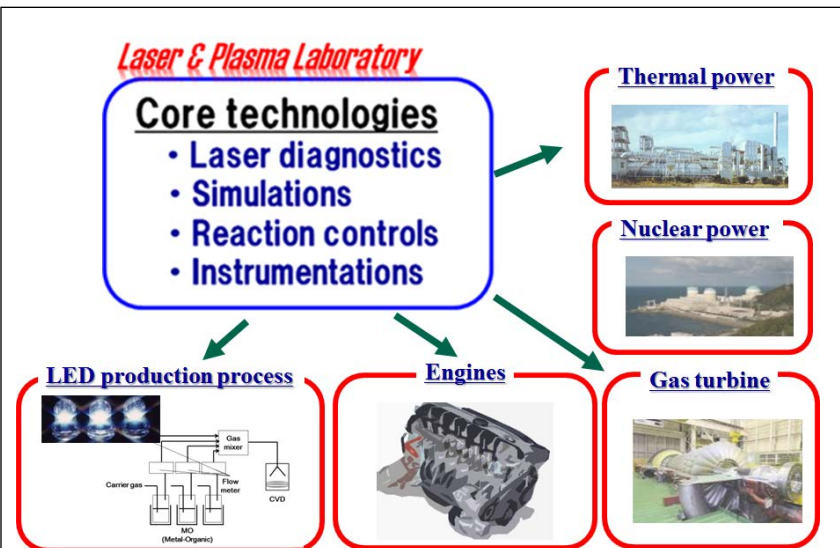Faculty of Science and Technology
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Laser & Plasma Laboratory

Core technologies
- Laser diagnostics
- Simulations
- Reaction controls
- Instrumentations

Thermal power

Nuclear power

LED production process

Engines

Gas turbine

Fig.1 Application diagram of core technology

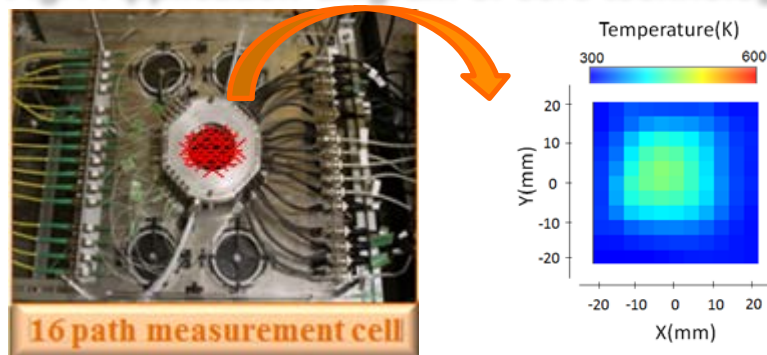16 path measurement cell

Temperature(K)

Fig.2 2D temperature and concentration measurement using CT-TDLAS
(Application to engine, boiler and gas turbine)

➢ Background

It is becoming more important to reduce anthropogenic carbon dioxide emissions and improve the efficiency of industrial systems. Considering the situation mentioned above, detailed measurement techniques using advanced laser diagnostics have been developed to monitor and control the industrial systems such as engines, boilers, and gas turnines.

➢ Merit of laser diagnostics

	Conventional method	Laser Diagnostics
Physical Probe	Necessary	**Unnecessary**
Response	Slow (sec.～day)	**Fast (ms～min.)**
Measurement	One point	**Multi-point(2D, 3D)**
Sensitivity	Low	**High**

➢ Applications

1) Combustion systems : Exhaust gas, Combustion control
2) Plants(thermal, nuclear) : Process monitor and control
3) Semiconductor : Raw material monitor, Trace species
4) Food and medical application : Visualization and analysis

Keywords：Laser Diagnostics
　　　　　　Real-time Monitoring
　　　　　　Industrial Applications
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