Low–NOx Combustor Design by Using Laser Diagnostics Techniques

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- Technology to obtain various information on velocity/concentration/mixedness /temperature/droplet distribution using non–intrusive laser–based measurement techniques in a high–temperature and high–pressure conditions
- Advanced combustor design for low emission of air pollutant through detailed analysis to combustion phenomena in complex flow field

Client / Market

- Companies that need accurate measurement and analysis on combustion phenomena
- Companies that need to development a combustor for boiler/power plant/heating furnace / incinerator or to retrofit old combustor for better performances

Necessity of this Technology

- Combustion phenomena should be accurately understood and controlled to satisfy various requirements for industrial combustor, such as high combustion efficiency, low pollutant emission, wide operation range and so on
- Accurate measurement of complex combustion phenomena in turbulent flow field is very difficult.
- For a gas turbine combustor which operates under high–temperature and high–pressure conditions, there are concerns about accessibility and durability of a sensor.
- Therefore, non–intrusive sensing techniques (laser diagnostics) are required to measure quantitative data for various information including velocity/concentration/mixedness/temperature/droplet distribution.

Technical Differentiation

- Laser diagnostics applies directly to real scaled combustor and it will be conducted under high–temperature and high–pressure condition such that the reliability of data could be maximized.
- Air flow rate 3.6 kg/s, 9.5 BarA, 900 K max./Fuel flow rate 180 kg/h (gas), 500 kg/h (liquid)
- Because the laser diagnostics are accomplished through a specially designed optical window system, clear measurements can be made under high–temperature, high–pressure and even high–sooting conditions

Excellence of Technology

- Knowledge for laser control, optical system organization, signal synchronization, signal correction, and data analysis required for accurate laser–applied measurement

DESIRED PARTNERSHIP

Technology Transfer | Licensing | Joint Research | Other

TECHNOLOGY READINESS LEVEL [TRL]

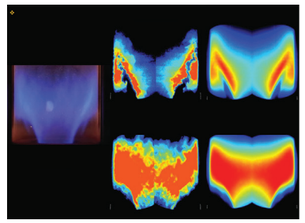
Research, basic explanation | Project concept or idea development | Technology idea verification | Prototype development | Trial product production/ evaluation in similar environment | Pilot field demonstration | Development and optimization of commercial model | Commercial product demonstration | Mass production and initial market launch

- With simultaneous measurement of multiple laser diagnostics techniques, detailed analysis is possible.

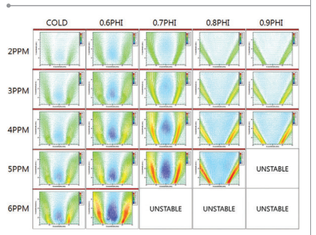
List of Technologies for Simultaneous

Stereoscopic PIV	Velocity flow field (2D3C)
OH – PLIF	Concentration field (OH radical)
Acetone – PLIF	Gas–fuel mixedness
Kerosene PLIF	distribution (mixture fraction)
High – speed Chemiluminescence	Reaction flow field
Spray Mie Scattering	Spray pattern
2D SMD (Fluorescence / Mie)	2D SMD distribution
PDPA	Velocity and droplet size

OH–PLIF, High–speed OH Chemiluminescence Measurement



PIV Measurement and Flame Stability



Current Intellectual Property Right Status

KNOW–HOW

- Combustion–flow field interrelation analysis technology using simultaneous measurement of OH–PLIF and stereo PIV
- Fuel mixedness quantification technology using acetone PLIF technique
- Liquid fuel atomization performance quantification technology using the PDPA technique
- Investigation of combustion instability by using high speed chemiluminescence and synchronized dynamics pressure measurement
- High–temperature, high–pressure flow chamber design and operation