ディーゼル燃焼チーム クラスター大学(1)（グループ1）

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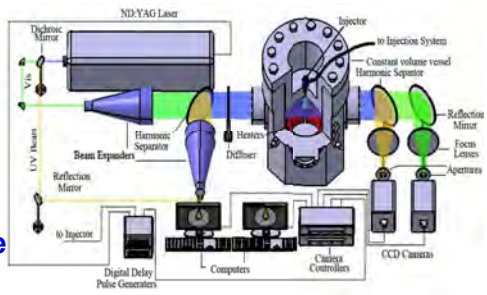
Quantitative Measurements of Spray Development and Mixture Formation

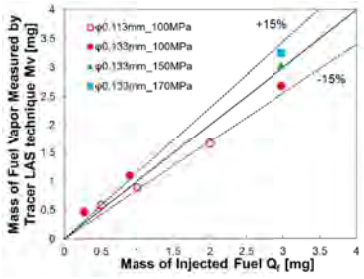
Objectives

- Measure the liquid/vapor mass distributions of diesel spray
- Correlate mixture formation with nozzle internal flow behaviors
- Provide mixture formation data for the validation of CFD models

Optical System and Spray Test Rig



Measurement Accuracy of Vapor Mass

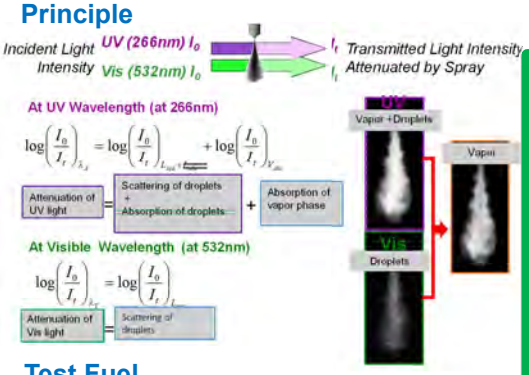


Measurement error is within 15%.

Experimental Method

Laser Absorption Scattering Technique

Principle

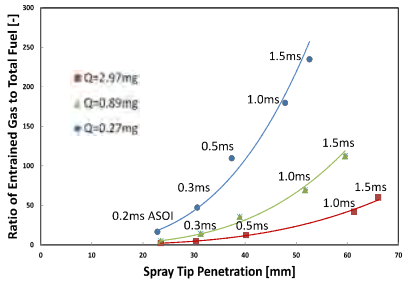


Test Fuel

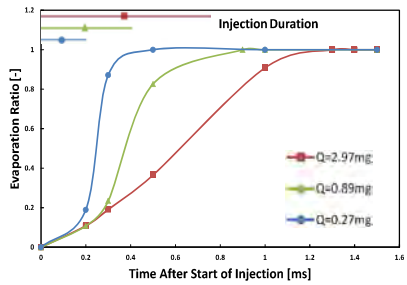
Base fuel Tridecane 97.5%
- Physical properties of diesel fuel
- Extremely weak absorbance by UV (266nm) light
- Visualization of liquid phase

Tracer fuel α-MN 2.5%
- Strong absorbance by UV (266nm) light
- Good compatibility with tridecane
- Visualization of vapor phase

Ratio of Entrained Gas to Total Fuel



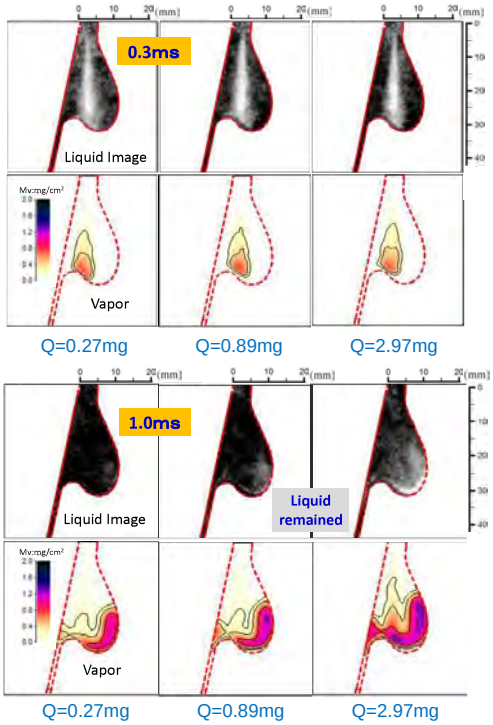
Evaporation Ratio



2-D Cavity Impinging Spray

Effects of Injection quantity

Liquid/Vapor Mass Distributions in 2-D Cavity

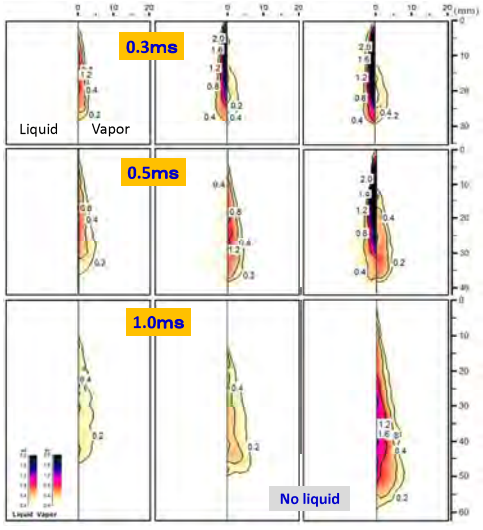


Results

Free Spray

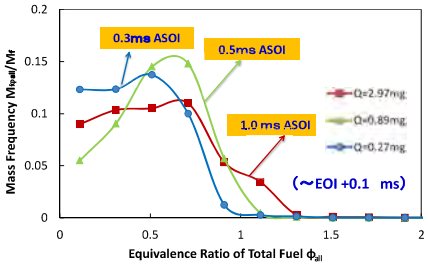
Effects of Injection quantity

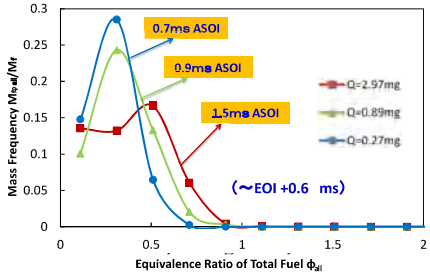
Liquid/Vapor Phase Equivalence Ratio Distributions



(P_{inj}=150MPa, P_{amb}=3.6MPa, T_{amb}=760K, ρ_{amb}=16kg/m³)

Probably Density Function of $M_{f\Phi all}/M_f$





Summaries

- With a decrease in injection quantity
  - ✓Air entrainment enhanced
  - ✓Higher mass frequency at lower Φ
- Evaporation suppressed in 2-D cavity

Future Work

- Tracer LAS experiment under the SIP standard conditions
- Correlate the tracer LAS experimental results with
  - ✓Flow behaviors inside a nozzle hole (Tottori University, AIST)
  - ✓Nearfield spray data (Nagasaki University)