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# Gas Turbine Industrial Fellowship Program 2005

## Fuel Nozzle Testing

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# Gas Turbine Need / Project Objectives

- Increased combustion efficiency means a decrease in wasted fuel and formation of pollutant emissions.
  - Fuel nozzles atomize the fuel being injected into the combustor.
  - Atomization produces a fuel spray with optimal fuel/air ratio for a more efficient combustion.
  - In this project the spray of various parker nozzles are analyzed to ensure sufficient atomization.
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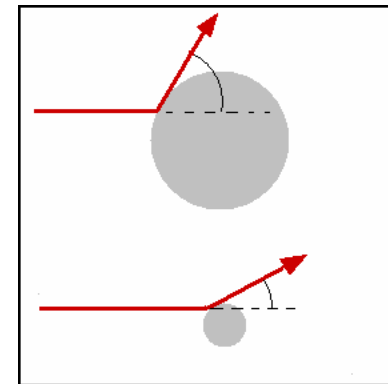
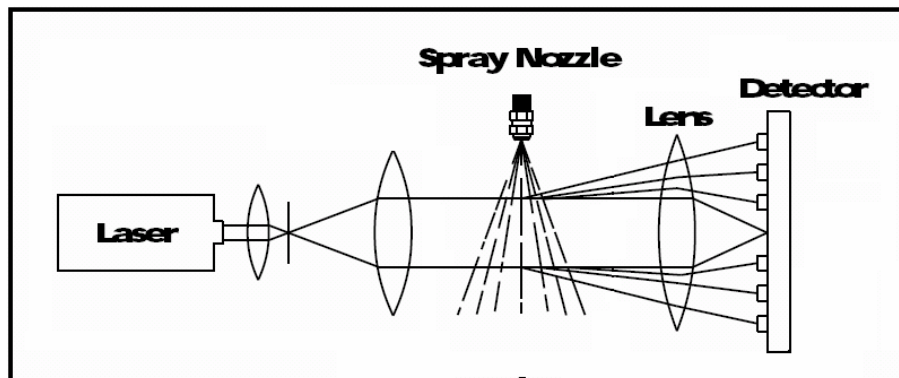
# Project Approach

- Important spray characteristics
  - Droplet size
  - Droplet size distribution
  - Cone angle
  - Patternation
  
- The Sauter Mean Diameter (SMD) is a spray drop size reference measurement



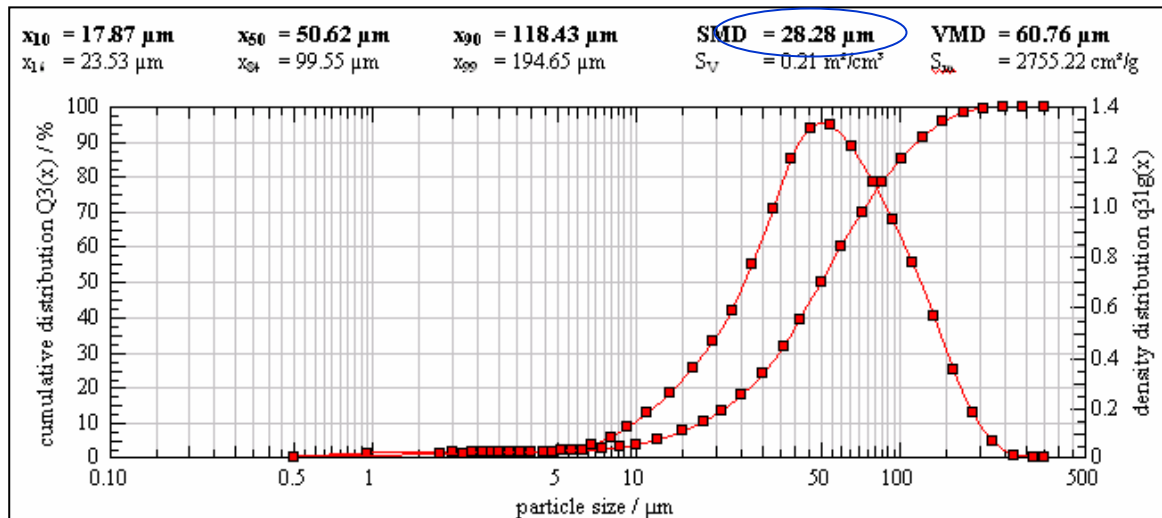
# Project Approach

- SMD Test
- Performed on Sympatec HELOS laser
- A laser is passed through the spray at various pressures
- The beam is diffracted by the spray
- Larger drop diameter causes greater angle of scatter



# Results

- Below is a sample output of one Parker nozzle at 100 psi
- SMD: 28.28  $\mu\text{m}$
- Normal partial size distribution with a mean of around 45  $\mu\text{m}$  at 100 psi
- Additional Measurement: Cone angle of 75°



# Summary/conclusion



- The Sympatec HELOS laser is a precise and accurate tool when comparing relative nozzle drop sizes.
- With an SMD of 28.28 at 100 psi the nozzle specimen tested gave results .
- The nozzle will provide a good air fuel mixture to facilitate combustion.
- Thanks to Adel Mansour, Keith Gaydos, and Dimitri Turko for their help and assistance.