Overview of Spray Testing Capability at En’Urga

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Background

- En’Urga provides spray characterization services for all types of fuel injectors, urea dosers, and nozzles using real world fluids.
- En’Urga Inc. has over 25 years of experience in developing spray characterization products.
- En’Urga Inc. has over 20 years of experience in providing spray characterization services.
- Our test capabilities are highlighted in the following slides.
Spray Injection Capability

- Steady state and pulsed injectors for pressures up to 30 MPa – typically using pressure vessels and accumulators
- Pressure up to 60 MPa – accumulator with intensifier
- Fuel flow rate up to 500 kg/hr and air up to 100 kg/hr
- Real world or synthetic fuels – gasoline, diesel, JP-8, kerosene, heptane, furnace oil, Mil C-3024, API solvents
- Different liquids – water, polymers, solids containing fluids, pharmaceuticals, etc.
- Short duration consumer sprays such as fragrances, cleaners, etc. with automatic dispensing
Diagnostics Capability

- Spray patternation (SETScan optical patternator, En’Urga Inc.)
- Drop sizing – laser diffraction (PODscan, Malvern)
- Drop sizing & velocity – PDA (Dantec)
- High speed spray imaging – 10,000 Hz (Quantum Tech.)
- Infrared spectrometry – 1,320 Hz (Spectraline Inc.)
- Visible spectrometry – 60 KHz (Spectraline Inc.)
- Mass flow measurements – gravimetric
- X-Ray tomography (dense sprays, windowless combustors, particulate filters, pharmaceutical powders, etc.)
- Correlation velocimetry (SPIvel – En’Urga Inc.)
Spray Environment Capability

- Pressure rating – 20 PSI to 400 PSI
- 10 inch nominal ID
- 5 inch fused silica window on 2 sides
- Switched to sapphire for infrared diagnostics
- 34 inch tall vessel reduces spray bounce back
- Fully indexable injector mount
- Fitted with AP400 patternator
- Temperature controlled injection to 90°C
- Temperature controlled ambient up to 440 F
Hazardous Material Testing

- Pharmaceutical APIs
- Hydrocarbon solvents
- Volatile fuels
- Chiller for condensing sprayed material
- Fully contained nitrogen purge
- Safe disposal of waste
- Walk-in fume hood for mixture preparation
Mixing capability

- Stainless steel tank
- 100 liter capacity
- 100 PSI working pressure
- Teflon O-rings
- Air driven mixer
- Stainless steel blade
- Direct feeding into high pressure tanks
- Inside fume hood
Resources

- Fully equipped combustion, optical diagnostics, and electronics laboratory
- Lead lined X-Ray room (12 x 12 x 8 feet)
- Design software for mechanical, optical, and electronic components
- Access to the extensive laboratory facilities at Purdue University
- Fully developed supply chain for outsourcing
- Highly skilled technical staff
- Full facility leasing option
Sample Results (GDI injector)

Injection pressure 10 MPa gage
Chamber pressure 80 Kpa absolute
Liquid temperature 30 °C
Plume analysis for angles, % flow, and centroid locations
Quality Audit of Injectors

- SETscan patternator based quality audit of injectors
- 1000’s of nozzle per day
- Currently used for 100% testing in the Aerospace and Automotive industry
- Complete turn key solution with spray stand and equipment
- Contract quality audit for statistical quality assurance
- Highly repeatable and accurate results
- Address production problems as soon as it occurs
### Partial list of customers

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