

Implementing Agreement for Energy Conservation and Emissions Reduction in Combustion

Belgium, Canada, Finland, Italy, Japan, Korea,
Norway, Sweden, Switzerland UK, USA (China
and Russia interested in participating)

Chair 2009: Gurpreet Singh, USA
Vice Chair 2009: Bernt Gustafsson, Sweden
Operating Agent: Dennis Siebers, USA
ExCo Secretary: Bob Gallagher, USA

Sprays in Combustion, Organization from April 1, 2009

Chair: Martti Larimi, Finland

Co-chair: Yasuo Moriyoshi, Japan

Technical Committee:

Martti Larimi, Finland

Yasuo Moriyoshi, Japan

Gerardo Valentino, Italy

Research Manager/ Technical Coordinator

Dr. Ossi Kaario, TKK, Finland

Program plan approved by Finland, Italy,
Japan, Switzerland and UK.

Focus in 2009

The main focus of the Collaborative Task is on **engine sprays**, including compression ignition engines, spark ignition engines and new engine combustion concepts, as well. Also sprays of advanced fuels are included and basic spray phenomena studies are accepted. Other combustion related spray studies can be accepted as subprojects too.

Sprays play a major role in **air/fuel mixing**. Therefore the role of the sprays in combustion is very important. The improved performance of internal combustion engines and emission reduction are the ultimate goals of the spray studies. The collaborative task will have sub-projects on computational and experimental research. The aim is to **increase the understanding of spray physics** and also **promote collaboration** between experimental and computational research.

- **Administrative framework existing**

Collaborative Task Benefits

1. Networking, Discussions
2. Bringing Experimentalists and Simulation Experts together
3. Learning from each other

Fuel Spray Work Shop in Detroit in Connection with the Annual SAE World Congress

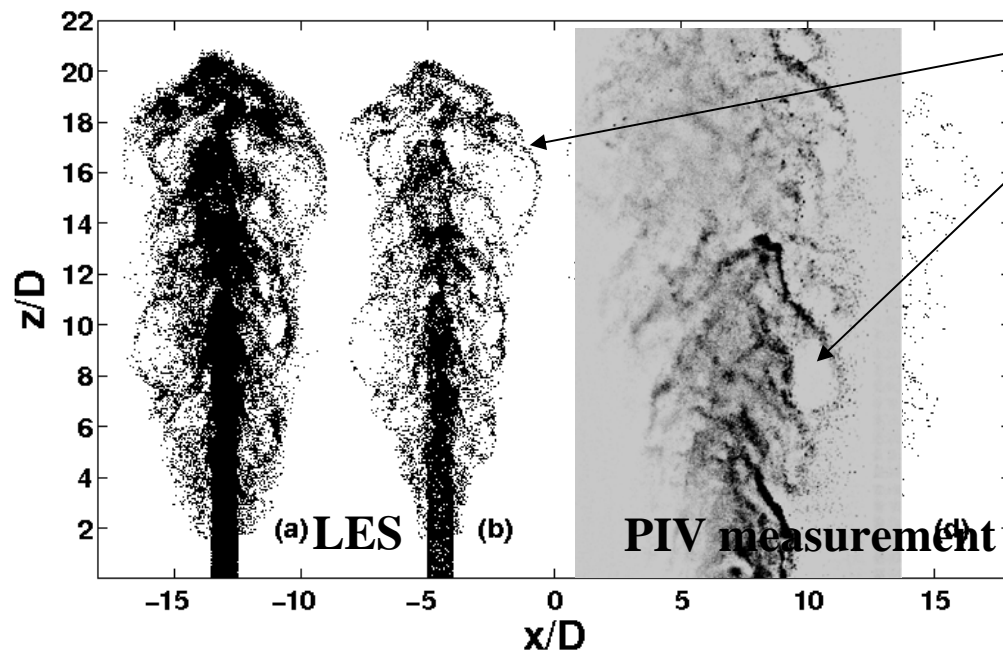
- Arranged in 2007, 2008 and 2009
- 14 to 20 delegates from countries
- Japan, Korea, USA, Italy, Sweden and Finland

Fuel Spray Work Shop April 18, 2009 in Detroit

- 1. “Study of Diesel Spray Primary Breakup using Ultrafast X-Ray Phase-Contrast Imaging”, Jian Gao, Won-Geun Lee, and Rolf D. Reitz from the Engine Research Centre, University of Wisconsin-Madison, and Zun-Ping Liu, Jin Wang from the Advance Photon Source, Argonne National Laboratory, USA
- 2. “Progress of spray formation and ambient gas flow in the high-pressure swirl spray”, Yoshiyuki Kobayashi, Tsuneaki Ishima, Gunma University, and Tomio Obokata, Tokyo Denki University, Japan
- 3. “Modeling sub-grid scale mixing of vapor in diesel sprays using jet theory”, Neerav Abani and Rolf D. Reitz, Engine Research Centre, University of Wisconsin-Madison, USA
- 4. “A Comparison of RANS and LES Models for Non-Evaporating Sprays using OpenFoam”, Yejun Gong and Franz X. Tanner, Michigan Technological University, USA
- 5. “Effect of Nozzle Orifice Geometry on Diesel Spray and Combustion Characteristics”, Som, Sibendu, Anita I. Ramirez, and Suresh K. Aggarwal, Department of Mechanical and Industrial Engineering, University of Illinois at Chicago, USA
- 6. “Experimental Studies of the Spray-Wall Interaction of Diesel Sprays”, Alf-Hugo Magnusson, Sven Andersson, and Ingemar Denbratt, Chalmers, Sweden
- 7. “Diesel Spray Visualization”, Harri Hillamo, Ville Vuorinen, Ossi Kaario, and Martti Larmi, TKK Helsinki University of Technology, Finland

Example of contribution to others

1. Spray physics experimental data (inner structure)
2. Spray experimental data with different nozzles
3. Spray simulation data with LES. Especially drop gas face interaction (inner structure)



preferential
concentration

LES Reproduces the PIV-
like Spray Structure
(Hillamo & Vuorinen, TKK,
2009)

Collaborative Task on “Sprays in Combustion”

Plans 2009–2010

- Sub-project approval and documentation
- TLM-meeting session in Canada
- Fuel Spray Work Shop in Detroit 2010

Paper from technical presentations

- Extended abstract
- Typically 1–5 pages
- Submit to Dr. Bob Gallagher