

Les sprays

*S Sazhin¹, S Martynov¹, C Crua¹, E Sazhina¹,
M Gorokhovskii², A Chtab²*

¹ *School of Engineering, Faculty of Science and Engineering,
University of Brighton, Brighton, BN2 4GJ, UK*

² *CORIA UMR 6614 CNRS, University of Rouen, 76 801 Saint-
Étienne du Rouvray, France*

Sprays in Engineering and the Environment

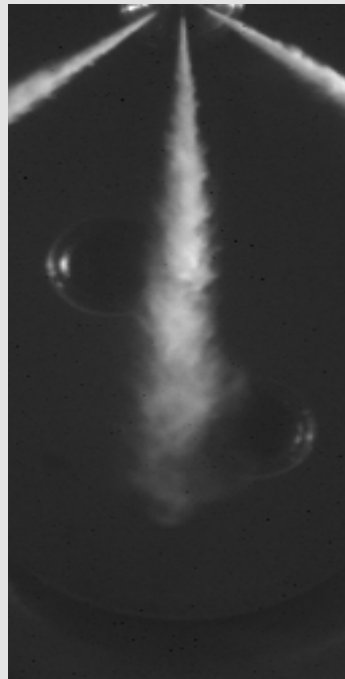
- **Sprays in Engineering (fuel injection, painting/coating, cleaning/cutting)**
- **Medical Sprays (drug delivery)**
- **Agricultural Sprays**
- **Fire Extinguishers**
- **Sprays in Nature (rain, fog)**

The main direction of work

- **Experimental studies of sprays (C.Crua)**
- *Development of theoretical and numerical models of cold sprays (S Martynov, E Sazhina, S Sazhin)*
- **Development of the models of droplet heating and evaporation (S Sazhin + research student)**
- **Building bridges with SMEs (S Sazhin, S Martynov)**

Experimental studies of sprays

7-hole injector at injection pressure 600 bar;
ambient air pressure 20 bar; air temperature 570 K,
nozzle diameter 0.135 mm; the length of the
domain 100 mm

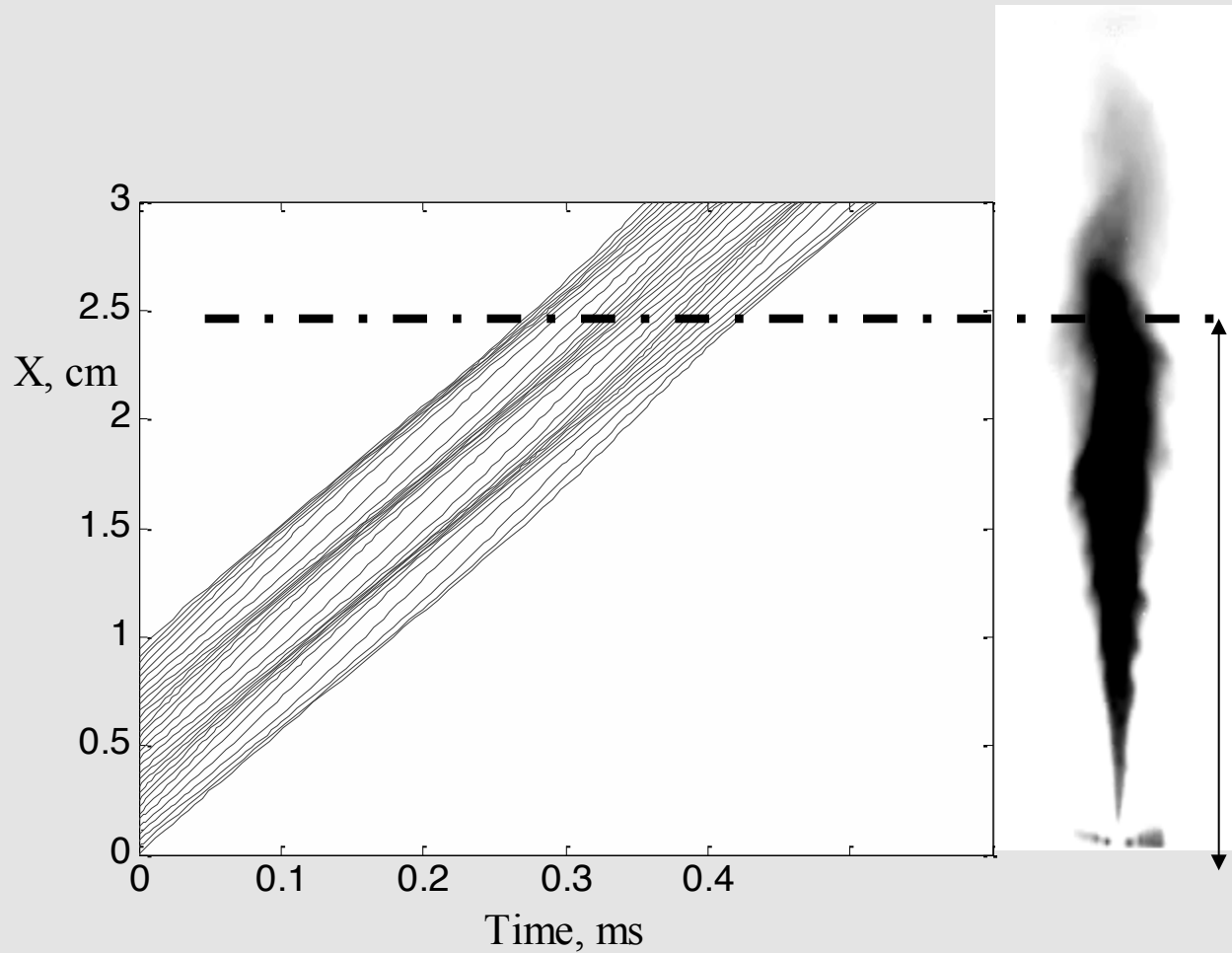


Spray Penetration



Droplet grouping

(EPSRC project, collaboration
with Ben-Gurion University, Israel)



Development of the models of droplet heating and evaporation

- **Development of the numerical code taking into account the temperature gradient inside droplets**
- **Approximate analysis of thermal radiation absorption in droplets**

Building bridges with SMEs

- **All developed models can be easily generalised to *any* type of sprays.**
- **Numerical simulation of various types of sprays using conventional models.**
- **Taylor-made developments for specific needs of a company**
- **Possible future joint projects partly funded by EPSRC, EU, Royal Society etc.**

Dissemination of the Results

International conference presentations

- Sazhin S.S. **Multiple Scales in Spray Modelling**, *International Workshop on Multi-Scale Processes & Hysteresis*, University College Cork, Ireland, April 3-8, 2006 (invited lecture).
- Sazhin, S., Martynov, S., Crua, C., Sazhina, E., Heikal, M., Chtab, A., Gorokhovskii, M. and Katoshevski, D (2006) **Modelling of the dynamics and break-up of jets and sprays**. *The 6th Euromech Fluid Mechanics Conference*, KTH - Royal Institute of Technology, Stockholm 26-30 June 2006 (book of abstracts).
- Sazhin, S., Martynov, S., Shishkova, I., Crua, C., Karimi, K., Gorokhovski, M., Sazhina, E. and Heikal, M. (2006) **Modelling of droplet heating, evaporation and break-up: recent developments**. *International Heat Transfer Conference (IHTC-13)*, Sydney, Australia, 13-18 August, 2006.
- Martynov, S., Mason, D., Heikal, M, Sazhin, S. and Gorokhovski, M. (2006) **Modelling of cavitation flow in a nozzle and its effect on spray development**. *International Heat Transfer Conference (IHTC-13)*, Sydney, Australia, 13-18 August, 2006.
- Karimi, K., Sazhina, E.M., Abdelghaffar, W.A., Crua, C, Cowell, T., Heikal, M.R., Gold, M.R. (2006) **Developments in Diesel spray characterisation and modelling**. THIESEL 2006 Conference on Thermo- and Fluid Dynamics Processes in Diesel Engines, September 13-15, Valencia, Spain.

National conference presentations

INTERREG PROJECT “LES SPRAYS”

S. Sazhin, M. Heikal, C. Crua, S. Martynov, E. Sazhina, M. Gorokhovski, and A. Chtab

Poster at the INTERREG Showcase Event, 1 March, 2006, Ashford.

MODELLING OF CAVITATION FLOW IN A DIESEL INJECTION NOZZLE

S. Martynov, D. Mason, Heikal and S. Sazhin

Poster presented at the UK national science week 2006. Annual Presentations by Britain Top Younger Scientists, Engineers and Technologists at the House of Commons, London, Monday 13 March 2006.

OSCILLATING JETS AND SPRAYS IN MODERN TECHNOLOGIES,

S. Martynov, S. Sazhin, and M. Heikal

Poster submitted to the BISME conference, KTP, September 10 – 12, 2006, University of Brighton.

Publications in International Refereed Journals

- Sazhin, S.S., Kristyadi, T., Abdelghaffar, W.A. and Heikal, M.R. **(2006) Models for fuel droplet heating and evaporation: comparative analysis, *Fuel*, v. 85(12-13), 1613-1630.**
- Sazhin S.S. **(2006) Advanced models of fuel droplet heating and evaporation, *Progress in Energy and Combustion Science*, v. 32(2), 162-214.**
- Sazhin S.S. **(2006) Multiple scales in spray modelling, *J Physics, Conference Series* (in press)**

Related Developments

- **Development of the dynamic decomposition method for numerical solution of the system of stiff ODEs (in collaboration with V Bykov, I Goldfarb, V Goldshtein) [Computers and Fluids (in press)].**
- **Development of the new numerical algorithm for the solution of the Boltzmann equation and its application to modelling of diesel fuel droplet evaporation (in collaboration with I Shishkova, A Kryukov and V Levashov) [J Computational Physics (in press)]**

Acknowledgements

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Thank you for your attention

Any comments or suggestions

would be highly appreciated

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