BRNO UNIVERSITY OF TECHNOLOGY

FACULTY OF MECHANICAL ENGINEERING

ENERGY INSTITUTE

Dept. of Thermodynamics and Environmental Engineering

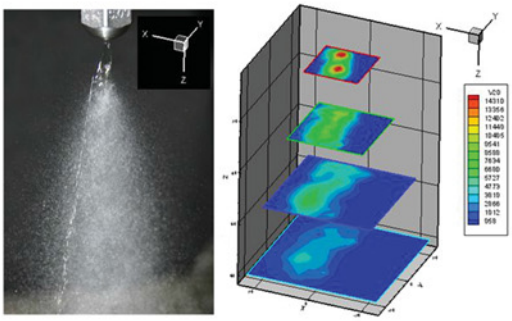
Spray research laboratory

The workplace has 15 year hands-on experience in the field of atomizers. It runs a laboratory unique to the Czech Republic that is equipped competitively with other top laboratories across Europe. The typical application lies in research and diagnostics of atomizers for automotive industry, combustion chambers of turbo charged engines, desulphurization plants, cooling in metallurgic processes, combustion of waste fuels, pharmaceutical industry, air humidification etc.

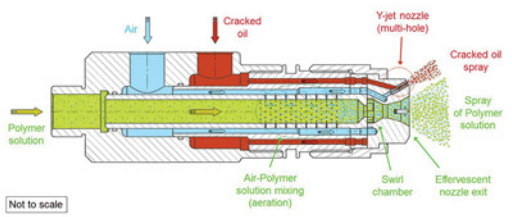
The laboratory equipment enables nozzle cold testing in a wide range of operating pressures, flow rates, and fluid types with complex measurement of their properties: flow characteristics, internal flow, time/frequency and space resolved size characteristics, droplet speed and concentration in the spray, mass flow rate of the liquid, spray geometry.

TEST ROOM SPECIFICATION

- testing of pressure, two and/or three media pneumatic nozzles
- pressure of the liquid up to 3 MPa, flow rate up to 2000 litre/hour, temperature stabilisation between 15 and 50 °C
- operates with hydrocarbon fuels (oils, kerosene), water and suspensions
- pressure of the air up to 1.5 MPa
- computer controlled 3D positioning system
- device for suspension preparation and atomization
- measurement of pressure, temperature, operating fluid flow rate, PC data acquisition
- spray measurement employing up-to-date laser diagnostic methods: phase Doppler anemometry, Particle Image Velocimetry, optical patternation (Planar Laser-Induced Fluorescence)



▪ Rychlost kapek ve spreji



▪ Combined nozzle for suspension atomization

ACTIVITIES CARRIED OUT

- research, development and testing of various type atomizers, injectors and nebulizers
- design of pressure and twin-fluid effervescent nozzles based on in-house methodology, design of atomizers for high viscosity liquids, waste fuels and suspensions of solid particles
- measurement of spray properties employing advanced diagnostics methods as the input data for CFD simulations
- visualization of nozzle internal flow and research into two-phase flow
- solution to two-phase discharge flow (liquid-gas) using an in-house code
- spray stability assessment using in-house developed methods along with the published ones

REFERENCES

- ERC GmbH Germany (Twin-fluid effervescent nozzle, Combined three media atomizer for waste fuel combustion, Pressure-swirl nozzles of enhanced atomization characteristics for industrial burners, Effect of additives and nozzle wear on the Danfoss nozzle generated spray) (2003-2006)
- První brněnská strojírna Velká Bíteš, a.s., (Fuel atomizers for small scale turbine engines) (2011)
- První brněnská strojírna Třebíč, a.s., (Industrial burners with atomization system of effervescent design for emission reduction) (2002-2005)

COOPERATION

- Loughborough University, UK
- Erlangen Universitaet, Germany

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INVESTMENTS IN EDUCATION DEVELOPMENT

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