# Pool Scrubbing system for aerosol removal: focus on bubble characteristics and modeling

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Keywords:Pool Scrubbing, Nuclear Aerosol, Bubble, Experiment, Modeling.
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The removal of fine and ultrafine toxic particulate from gaseous streams is important in several energy-engineering applications. Among the removal mechanisms used, the pool scrubbing allows the removal of particles by bubbling the gas inside a liquid pool (usually water). This method is used in nuclear engineering as a safety system to reduce the dispersion of radioactive aerosols to the environment due to a severe accident, but can be also used as a filtering system to purify polluted gas streams like combustion fumes created by boilers or steam generators fuelled with coal or biomass.

The PASSAM project (Passive and Active Systems on Severe Accident source term Mitigation, 7th framework programme of EC, 2013-2016), has been built to explore potential enhancements of existing source term mitigation devices and check the ability of innovative systems to achieve even larger source term attenuations.

With regards existing devices, RSE is involved in experimental and modeling activity on pool scrubbing dedicated to significant weaknesses on this topic (i.e. lack of systematic analysis of the parameters influencing pool scrubbing, no experimental tracking of variables like bubble size and shape). This work shows the first part of the RSE work dedicated to experimental studies of bubble behaviour, characteristics and modelling. RSE has performed an experimental campaign on the facility SCRUPOS (SCRUbbing by POol and Spray), shown in Figure 1, that reproduces small scale pool with a single nozzle, with aerosol injection at the bottom of the pool.

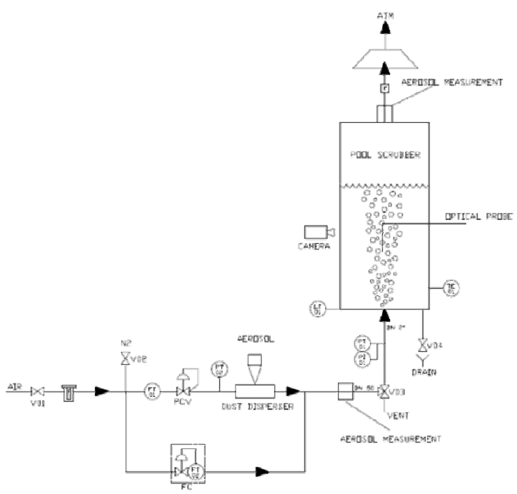


Figure 1. SCRUPOS Facility.

Tests were performed using demineralized water and air, the diameter of the nozzle in the range 10- 50 mm) and the gas flow 5- 25 kg/h at the inlet. Bubble chord distributions, Sauter mean diameters , rising velocities and the local void fractions were measured by a double fibre optical probe while a photocamera was used to evaluated bubble shape, and water velocity. The analysis of the data obtained during experimental tests allowed validating a simplified model to describe the evolution of the bubbles inside the pool. The developed model, describe the bubbles history, their break up and the stability and it is based on deformation energy, confinement energy, break up time and dissipation rate. The comparison between experimental data and model results show a general agreement of the trend and stability prediction, while the evaluation of the firsts bubbles dimension is over predicted (Figure 2).

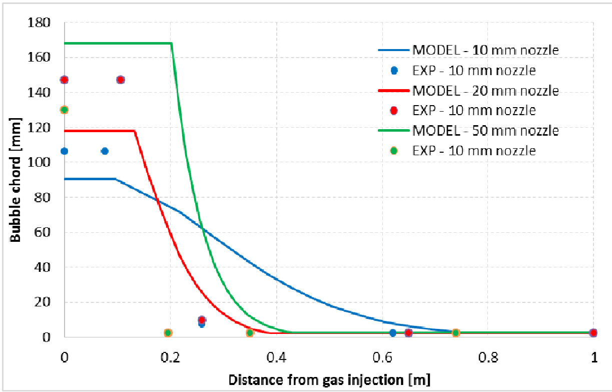


Figure 2. Comparison between experimental data and modelling.

## Acknowledgments

The authors thank the European Atomic Energy Community (Euratom) for showing a strong interest in the PASSAM Project, and for funding it in the frame of the 7th framework programme FP7/2007-2013 under grant agreement n° 323217.

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