SCALE-MODEL EXPERIMENTAL INVESTIGATION OF VENTILATION AND GAS DISPERSION IN A SEMI-ENCLOSED CAR PARK

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To establish new input for ASHRAE-type norms with regards to ventilation inside the semi-closed car parks, an experimental simulation of the smoke dispersion into such a car park has been conducted. The car park model is being built already and it is the representation of a real car park in Ghent where several field tests have been carried out.

A theoretical study on a full scale and model scale pool fire is conducted by employing Froude similarity, and obtaining an isothermal model able to model the full scale buoyant fire plume in the 1:25 car-park scale model by preserving the same Convective Heat Release Rate between the two cases.

The study aimed to investigate the back-layer development as a result of the interaction of the pool fire flow and the ventilation flow rate, for different pool fire and ventilation scenarios. In particular two main parameters that control the smoke dispersion in such an enclosure are studied: the back-layering distance and the critical velocity.

Due to the large field of view involved, to investigate the velocity fields for different inlet flow rates and at different planes, Large Scale PIV, instead of the classical PIV, was employed so that smoke structures instead of the single particles can be detected and followed.

The concentration fields are obtained using the Laser Scattering Technique employing the images acquired for the LS-PIV to obtain 2D relative concentration fields.

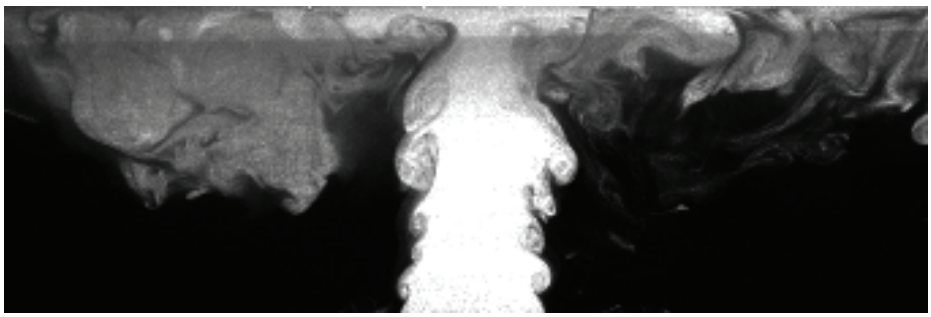

Figure 1: Model scale isothermal pool fire flow