

EXTREME PIV APPLICATIONS: SIMULTANEOUS AND INSTANTANEOUS VELOCITY AND CONCENTRATION MEASUREMENTS ON REAL AND MODEL SCALE CAR PARK FIRE SCENARIOS

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Through this study instantaneous and simultaneous velocity and concentration measurement technique and its applications are presented. The name of the new technique derived from the names of the acquired parameters shall be VELCO. After the validation of this new technique it is applied in order to investigate car park fire cases. In this part of the study the theory of fire related measurements and an isothermal model are described and important conclusions are drawn in order to increase fire safety. Tunnel and car park fires are hot concern around the world due to big fire disasters. Even in not far distances there are several fatal examples (**Error! Reference source not found.**) such as Mont-Blanc tunnel (1999) → France/Italy; Gotthard road tunnel (2001) → Switzerland; Frejus alpine tunnel (2005) → France/Italy, Buchanan Galleries in Glasgow (2010) → United Kingdom.

Mont Blanc (1999)	Gotthard (2001)	Frejus (2005)	Buchanan (2010)
			

1. Recent Car Tunnel and Car Park Fires

VELCO (Figure 1) proved to be an adequate technique to measure the simultaneous concentration and velocity fields with a simplified test case with the constraints described. Full scale measurements (30 x 30 x 2,6 m – Gent / WFRGENT - Figure 2) evoked the necessity and verified the model scale measurements (1:25 – Rhode Saint Genese / VKI) where the full scale fire was modelled by an isothermal model. Finally VELCO was successfully applied on the model scale car park model as well in order to draw important conclusions about fire safety for more complex car park configurations than those realized in the full scale model. The measurements were carried out in the frame of the European SBO Project.

All the methods for modelling and measuring and programs for processing the acquired data are developed. Relevant descriptions can be found in this study however for more detailed insight especially into the programs the cited manuals are advised (Horvath I. A., PIV Image Pre-processing by Tucsok, 2011) & (Horvath I. A., Rabon v01 - User's Manual, 2011).

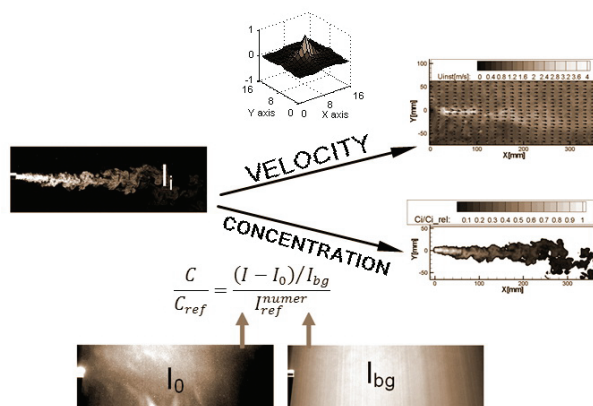


Figure 1: Instantaneous and Simultaneous Velocity and Concentration Measurement: VELCO

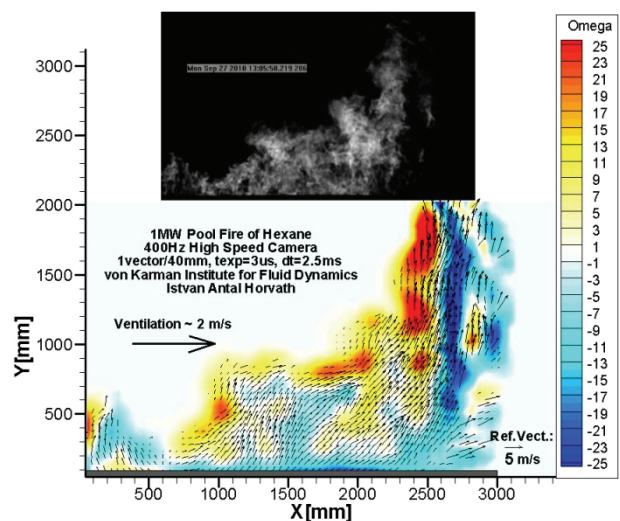


Figure 2: PIV on Real Scale Pool Fire of 1 MW – Vorticity (Ω) Colour-map with Velocity Vectors