EXPERIMENTAL STUDY OF WATER SPRAY CURTAIN

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Nowadays the mitigation of the consequences of accidental releases of dangerous toxic and/or flammable cloud is a serious concern, mainly for the chemical industry. To reduce the risks involved with these accidental spills it is necessary to decrease the concentration of the gas cloud to values that are lower than the toxic and/or flammability limit. A very attractive technique is to use a water spray curtain as technological barrier against toxic or flammable releases.

The project is aimed to assess the effectiveness of different water spray curtain configurations. The first phase of the project is devoted to a detailed study of the hydrodynamic behaviour of four single sprays. The experimental investigation is carried out in the VKI Water Spray Facility. Nozzles with the same geometrical design but different geometrical scales are tested. In particular the effects produced by nozzles' dimensions on the spray characteristics are examined. The investigation allows the definition of new similarity rules.

The second phase of project concerns wind gallery tests. They aim to evaluate the forced dispersion effectiveness of the spray curtain in function of parameters such as the wind velocity, the water pressure and the curtain flow rate. Similarity rules are proposed to pass from laboratory tests to field tests. These laws are fundamental to design real water spray curtains basing on the wind gallery data. Finally, a simple engineering model is proposed to estimate the forced dispersion factor FD of the water curtain.
The results show that FD can be correlated with the curtain-to-wind momentum ratio R_M. Good agreement is obtained between the different approaches as shown in Figure 1.

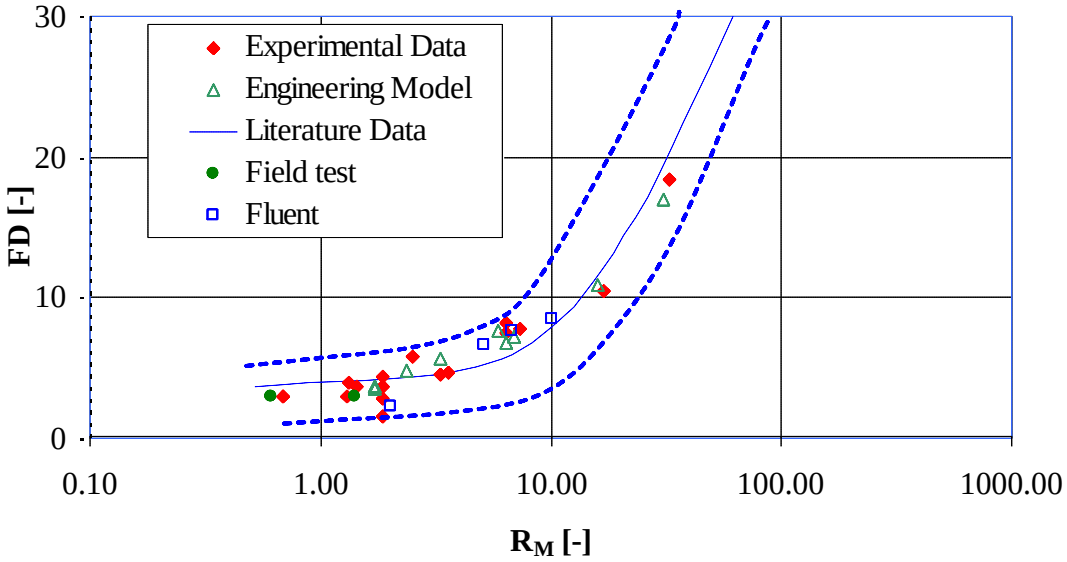

Figure 1: Water Spray Curtain Effectiveness or Dilution Factor FD