Blind prediction of dispersion and explosion experiments using CFD

Olav R Hansen and Prankul Middha,
GexCon, Norway
olav@gexcon.com

Abstract

CFD is used widely in safety assessments around the world and predictions often influence decisions on strength of structures. Since simulations are performed at scales and in scenarios where no experimental tests are available, it is essential that the predictive capability of the tools is acceptable. Frequently the predictive capability of CFD softwares is "proven" by simulating a couple of existing, well known, experiments which are usually at smaller scale than the scenario to be modeled. If the simulation tool is not reliable, the modeler has many possibilities to manipulate input and use tuning parameters to achieve good performance simulating the well known experiment. A more challenging and convincing way to validate CFD-softwares is to take part in blind prediction benchmark activities, where the experiments are either not performed at the time of prediction, or is made available after predictions are submitted. Over the past 2 years GexCon has used the CFD-software FLACS to blind predict a range of different scenarios, both dispersion and explosion, natural gas as well as hydrogen, with very good performance. The paper will describe some of the various experiments and blind predictions:

* 6 different methane explosions in mine galleries (up to 18m long gas cloud)
* Hydrogen dispersion test in garage sized building, with 15 different CFD-users participating
* Hydrogen explosion test in mock-up refuelling station
* The release and ignition of hydrogen jets in workshop scenario