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Using CFD to analyse the impact of forced ventilation on water mist and sprinkler systems.

Max Lakkonen, IFAB

Alexander Schmidt, IFAB

There are projects where different special risk scenarios have been defined and typical approval fire testing is not counted sufficient enough, but further studies are required. Such special cases are typically related to the special requirements of the local fire safety authorities. An example of this is the impact of a forced ventilation system. Sometimes this needs to be analysed before installing any system. CFD (computational fluid dynamics) has been proven to be a suitable methodology for doing such special analyses.

This paper presents the use of CFD for assessing the impact of a forced ventilation system on water mist and sprinkler systems. It is carried out together with an example case where the intention was to quantify the influence of the ventilation coming from a pressurised stair case for both sprinkler system and water mist system. The results were further analysed using Python to compare the results between no ventilation and maximum ventilation. The sprinkler system was analysed based on the surface area (accumulated mass) and the water mist based on the flux density as these systems work differently. The results showed that the water mist system was logically more influenced by the ventilation as the droplets were smaller. Both systems were considered to meet the normal performance as safety margins in terms of water amount compared to nominal values (fire tested one) were very high.