

Flammable mist hazards involving high-flashpoint fluids

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Abstract

In 2009, the UK Health and Safety Executive (HSE) published a review of serious incidents involving ignition of flammable mists of high-flashpoint fluids, i.e. fluids whose vapours cannot be ignited and sustain a flame at normal room temperature (e.g. kerosene, diesel, lubrication oils and hydraulic oils). The review identified 37 incidents which together were responsible for 29 fatalities. In response to the findings, HSE and a consortium of other regulatory and industrial sponsors funded a Joint Industry Project (JIP) on the subject, which ran from 2011 to 2015. The work included a detailed literature review and a series of experiments at Cardiff University on a mist release configuration consisting of a downwards-pointing spray from a 1 mm diameter circular orifice. Test pressures ranged from 1.7 bar to 130 bar and three fluids were tested: Jet A1 (kerosene), a light fuel oil and a hydraulic oil. Computational fluid dynamics simulations were also performed and results were compared to existing hazardous area classification guidelines. The work was used to devise a preliminary classification scheme for mist flammability, based on a fluid's flashpoint and ease-of-atomization.

Several important questions remained unanswered following the first JIP relating to the effect of the orifice shape, size and release configuration, and the ignition characteristics of other common fluids, notably diesel. In 2018, HSE launched a follow-on JIP (currently ongoing) which aims to address these issues. The work started with an updated review of flammable mist incidents, published in 2019. Experiments on diesel have started in 2020 at Cardiff University and further, larger-scale experiments are planned for 2020-2021 at the HSE Science and Research Centre, Buxton.

This presentation at MKOPSC International Symposium will provide an overview of the work led by HSE on flammable mists over the last decade and a summary of the preliminary results from the ongoing experiments.

Keywords: flammable mist, high-flashpoint fluid, spray, ignition

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