ORGANIZATION OF INDUSTRIAL STORAGES IN VIEW OF RISK OF FIRE ACCIDENTS

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Abstract

Highly diverse strategies are employed in the organization of commercial/industrial storages around the globe and dependence of key storage parameters on severity of fire accident is not well established. This experimental study is aimed to perform scale down fire experiments to see the effect of key storage parameters such as; dimensionless building ventilation level (GF), dimensionless distance between storage units (D*) and number of storage units (N) on fire performance. These parameters were varied using central-composite-orthogonal test plan of 15 experiments in which each parameter was varied at three levels. GF is defined as the ratio of width of opening between two adjacent walls to the gap between two opposing face walls and varies as 0.25, 0.5 and 0.75, respectively. D* is defined as ratio of center to center distance between two adjacent fuel pans "D" to the diameter of fuel pan "d" and varies as 2, 3 and 4, respectively. Similarly, N was varied as an array of 2x2, 3x3 and 4x4, storage units. In each experiment, 20 ml of Kerosene oil was taken in glass crucibles (diameter = 5 cm) and ignited with a specially designed igniter to limit the ignition delay time below 10 sec. All the experiments were video tapped. The value of maximum flame height (H) was measured using IMAGEJ 1.49v and burn out time (BOT) was estimated from the video films. The parameter GF found to have strongest effect on BOT and H. Changing the value of GF from lower level setting (0.25) to higher level setting (0.75) caused an increase in the value of BOT by 158 sec and decreased the flame height by 27 cm. Furthermore, data suggests that D* contributes in increasing the margin of fire safety by increasing BOT but does not contribute significantly in limiting the flame height. On the other hand, BOT found to be indifferent with respect to the settings of "N" but flame height found to strongly depend on the settings of "N". The importance of two-way interactions of studied parameters on BOT and H is also discussed in the article.

Keywords

Fire Whirls, Multiple fire points, Fire interaction, Storage structures, Fire safety, Flame height, Burn out time, Interactive burning, Fire whirl, Industrial storage