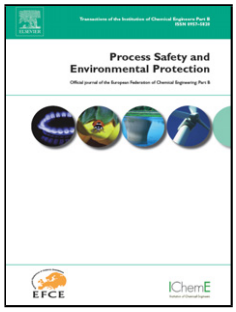

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Explosion Flame Acceleration over Obstacles: Effects of Separation Distance for a Range of Scales

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HIGHLIGHTS

1. A dependence of overpressure and flame speed on the obstacle scale agrees with a square relationship between them.
2. The maximum overpressure and flame speed increased with reduction in number of flat-bars.
3. The worst case obstacle spacing increase with increase in obstacle scale.
4. The average value of S_T/S_L obtained is similar to that from the analysis of some real gas explosion incidents.

Abstract

The influence of obstacle separation distance on explosion flame acceleration was studied for 10% methane-air mixtures using two 20% blockage obstacles with variable number and width of bars (variable obstacle length scale) were investigated in a 162 mm diameter 4.5 m long tube with ignition on the centre of the closed end and flame propagation towards the open end. The spacing between the obstacles was varied from 0.25 m to 2.75 m. It was observed that the maximum overpressure and flame speed increased with the reduction in number of flat-bars (i.e. with increasing obstacle length scale). A maximum overpressure of 129 kPa at 2.25 m obstacle spacing was achieved with 1-flat-bar obstacles, followed by 118 kPa and 110 kPa for 2 and 4-flat-bars respectively at 1.25 m and 0.5 m obstacle separation. Turbulent to laminar burning velocity ratios