

## Experimental study on vented gas explosion in a cylindrical vessel with a vent duct

### Abstract

A study of vented explosions in a length over diameter ( $L/D$ ) of 2 in cylindrical vessel connecting with a vent duct ( $L/D = 7$ ) is reported. The influence of vent burst pressure and ignition locations on the maximum overpressure and flame speeds at constant vent coefficient,  $K$  of 16.4 were investigated to elucidate how these parameters affect the severity of a vented explosion. Propane and methane/air mixtures were studied with equivalence ratio,  $F$  ranges from 0.8 to 1.6. It is demonstrated that end ignition exhibited higher maximum overpressures and flame speeds in comparison to central ignition, contrary to what is reported in literature. There was a large acceleration of the flame toward the duct due to the development of cellular flames and end ignition demonstrated to have higher flame speeds prior to entry into the vent due to the larger flame distance. The higher vent flow velocities and subsequent flame speeds were responsible for the higher overpressures obtained. Rich mixtures for propane/air mixtures at  $F = 1.35$  had the greatest flame acceleration and the highest overpressures. In addition, the results showed that Bartknecht's gas explosion venting correlation is grossly overestimated the overpressure for  $K = 16.4$  and thus, misleading the impact of the vent burst pressure.