

Investigation of Fire and Explosion Properties Caused by Pre-Mixed Hydrocarbon-Air in Oil and Gas Industries

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Fire and explosion caused by premixed hydrocarbon-air is a major safety concern in industries handling these compounds such as petrochemical. This paper aims to simulate the characteristics of fire and explosion may occur in a fuel-vent line attached to an abatement unit. The outcomes of this study assist with better understanding of the flame propagation properties as well as determine the most appropriate fire and explosion mitigation method.

Simulations were conducted using FLACS 10.6, developed by Gexcon, to simulate the open-ended premixed combustion of methane-air in a long straight tube. The concentrations of methane were 6%, 7%, 9%, and 9.5% of methane in air, and the fuel region sizes considered were 6, and 12 m within a 0.5 m diameter 30 m long open-ended tube. In addition, the effect of scale and geometry on the flame propagation characteristics was studied on a smaller tube of 5 m long and 75 mm in diameter. The software was then used to simulate the effect of initial ignition energy on flame propagation velocity.

Explosion over pressures were found to be under predicted by the software, though, flame speeds and pressure wave behaviours had a correlation with experimental results from previous studies. It was predicted that fuel concentration and tube length have a significant impact on the explosion properties and flame propagation speed.

Biography:

Dr Jafar Zanganeh is a Chemical Engineer with over 12 years of experience in the chemical and fireengineering field. He completed his PhD in 2010 at the University of Newcastle, NSW. Dr Zanganeh has sustained a steady record of quality publications since 2008, comprising 25 refereed journal articles, 17 peer reviewed conference papers and posters which has been in notational and international conferences. He equally values the importance of research training and, as such, he is supervising number of postgraduate students and technical staff. Since 2014, Dr Zanganeh has had 1 PhD completion by student under his supervision. He currently supervises 4 PhD students. He has heavily been involved as one of the CI in the VAM Safety project grant application which attracted \$25M fund from the industry (ACALET) partner and (Federal government) in Australia. Dr Zanganeh is currently employed as project manager with PRC for Frontier Energy Technologies and Utilisation Faculty of Engineering and Built Environment at the University of Newcastle.