Determination of Effectiveness of Safety Control Measures on Offshore Platforms

Vitor De Toledo\(^1\), Paul Amyotte\(^1\) and Faisal Khan\(^2\)
\(^1\)Department of Process Engineering and Applied Science, Dalhousie University, Halifax, NS, Canada B3J 2X4
E-mail: vitoreugeniojr@gmail.com
\(^2\)Faculty of Engineering and Applied Science, Memorial University, St John’s, NL, Canada A1B 3X5

ABSTRACT

Known for having a high degree of congestion and confinement, an offshore platform has a critical design in terms of installation/field configuration. If a release of potentially dangerous flammable material takes place and it finds an ignition source, the release of energy due to fire and explosion can have catastrophic effects due to flame acceleration and overpressure. Consequently, both parameters are functions of congestion and confinement.

Safety stakeholders, together with project engineers, design and implement safety measures to mitigate the consequences of such events. Best achieved through the hierarchy of controls, these measures are grouped into four categories ordered from most to least effective: inherent safety, passive engineered safety, active engineered safety, and procedural safety.

The current study is focused on determination of the effectiveness of safety measures applied in fire and explosion scenarios that may result in losses of personnel, assets, business operations and the environment. The measures taken are: reduction of inventory through injection of an inert (inherent safety), application of safety barriers such as blast walls (passive engineered safety) and finally the use of a water deluge system (active engineered safety).

To predict the consequences of an explosion, the FLame ACceleration Simulator (FLACS) – a Computational Fluid Dynamics (CFD) model – has been used to simulate these scenarios. FLACS was chosen due to its ability to: represent complex geometries, describe the fluid flow field, and take into account further physical parameters.