# MODELLING OF THERMAL RADIATION FOR TRANSIENT HIGH-PRESSURIZED HYDROCARBON FIRES

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## ABSTRACT

Fire following the immediate ignition of the escaping gas from the leakage of a high-pressurized pipeline containing flammable gaseous hydrocarbons is one of the most critical problems in the process industry, resulting in a catastrophic accident. The transient radiant heat poses a serious hazard to personnel and industrial installations and is the leading cause of severe injuries and fatalities. As a result, determining the safety distances in the case of fire-originating thermal radiation effects in different severity harm scenarios is of practical importance in investigating the potential risks of fires. The purpose of this paper is to improve the accuracy of the thermal radiative prediction of an actual process industrial fire by considering the complex three-dimensional geometries of the flame that could radiate to the target. The transient pipeline discharge model based on the numerical solution of the conservation equations using the Method of Characteristics provides the input data for simulating thermal radiation from a transient jet fire in the event of an accidental pipeline rupture. The thermal radiation model, which represents the flame as a frustum of a cone radiating as a solid body and an arbitrarily positioned receiver object, combines an empirical jet fire model with a numerical method for estimating the radiation view factors between the flame and the various target geometries. The transient thermal radiation field results are validated with the relevant published data. In addition, the parametric sensitivity study and the numerical convergence study are discussed.