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Numerical Simulation of Natural Gas Dispersion from Low Pressure Pipelines

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Abstract : Gas release from the pipelines is one of the main factors in the gas industry accidents. Released gas ejects from the pipeline as a free jet and in the growth process, the fuel gets mixed with the ambient air. Accordingly, an accidental spark will release the chemical energy of the mixture with an explosion. Gas explosion damages the equipment and endangers the life of staffs. So due to importance of safety in gas industries, prevision of accident can reduce the number of the casualties. In this paper, natural gas leakages from the low pressure pipelines are studied in two steps: 1) the simulation of mixing process and identification of flammable zones and 2) the simulation of wind effects on the mixing process. The numerical simulations were performed by using the finite volume method and the pressure-based algorithm. Also, for the grid generation the structured method was used. The results show that, in just 6.4 s after accident, released natural gas could penetrate to 40 m in vertical and 20 m in horizontal direction. Moreover, the results show that the wind speed is a key factor in dispersion process. In fact, the wind transports the flammable zones into the downstream. Hence, to improve the safety of the people and human property, it is preferable to construct gas facilities and buildings in the opposite side of prevailing wind direction.

Keywords : flammable zones, gas pipelines, numerical simulation, wind effects
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