Model of the Thermal Effect of a Spill Fire on an Oil Product-Containing Tank

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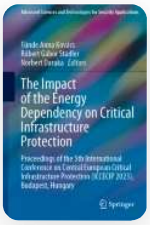

The Impact of the Energy Dependency on Critical Infrastructure Protection

(ICCECIP 2024)

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Abstract

Chemical industry companies show a tendancy to consolidation and it results in a continouous increase in the concentration of hazardous chemicals in a relatively small space. In spite of safety measures taken by different branches of industry, storage and transportation agencies, major accidents still occur. A significant percentage of such accidents can be attributed to the spill of flammable liquid and its ignition. The heat flow from the fire to the neighboring technological facilities can result in the cascading spread of the fire to these facilities due to the heating of the metal structures that contain combustible liquids attaining self-ignition temperatures therein. This paper deals with a construction of a model of the thermal effect of an oil spill fire on a neighboring oil product-containing tank. This model is based on a differential equation of a parabolic type that describes the distribution of heat along the wall and roof of the tank. This model takes into account radiative and convective heat exchange with the fire, the environment, the liquid in the tank and the vapor-air mixture in its gas space. The finite difference method was used to derive the temperature distribution. The obtained results can be used to assess the consequences of the thermal impact of the fire and to take a decision as for the need for tank cooling.

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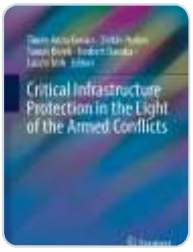

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