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COMBUSTION OF LIQUID FUELS FLOATING ON WATER

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ABSTRACT

The research presented consists of a study of the burning characteristics of a liquid fuel floating on water with emphasis in the phenomena known as boilover. The problem is of technical interest in the petro-chemical industry, particularly from the point of view of pollution and fires resulting from accidental liquid fuel spills in open water. Testing with multicomponent fuels gives informations about events that can occur in a practical situation, while testing with single component fuels permits obtaining fundamental information about the problem. It evidences the major effects caused by the transfer of heat from the fuel to the water underneath. One of these effects is the disruptive burning of the fuel known as boilover, that is caused by the water boiling and splashing, and results in a sharp increase in burning rate and often in the explosive burning of the fuel. It is shown that this event is caused by the onset of water boiling nucleation at the fuel/water interface and that it occurs at an approximate constant temperature that is above the saturation temperature of the water (water is superheated). These measurements conducted in two laboratories, address the major issues of the process by analyzing the effect of the variation of the parameters of the problem (initial fuel-layer thickness, pool diameter, and fuel type), on the burning rate, time to start of boilover, pre-boilover mass ratio, and boilover intensity. Finnaly, two types of modeling are proposed to describe the heat transfer in fuel and water phases: one simple for practical purposes, the other, more elaborated and transient, taking particularly into consideration the radiation in depth.

KEYWORDS

pool fire, boilover, crude-oil, nucleation, superheated, interface

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