A Study of In Situ Spreading and Burning of Oil in an Ice Channel

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ABSTRACT

In situ burning is one method of oil spill mitigation that is particularly relevant in arctic and sub-arctic conditions where traditional equipment used in oil spill cleanup may not be practical. A series of bench scale tests was conducted to study the effects of varying ice channel widths on the spreading and burning rates of an oil mixture, to mimic sea ice conditions that may be found in higher latitudes. Our experiments sought to calculate spread and mass loss rates of oil mixtures to determine the efficiency with which it burns on ice. Preliminary results suggest that spread rates of oil in ice channels are faster than on water and that the smaller channels have faster spread rates than larger channels. Burn efficiencies are low for all channel widths due to the widening of the channel. Melting of the channel walls causes an increase in the surface area and results in the critical thickness of the oil to be reached sooner. A test to separate the cooling versus spreading effects on mass loss indicate that spreading of the oil is the dominant inhibitor of burn efficiencies. By conducting dimensionless analyses, our in situ results from spreading and burning experiments can be scaled up to reflect real-life scenarios.