Burning of oil as a response method to oil spills in the Arctic

Conference participation and external research visit as part of a DTU Ph.D. study

With the ice coverage in the Arctic decreasing each subsequent year, oil exploration and shipping activities will become more frequent. These events increase the risk of oil spills in this sensitive environment. The combination of harsh conditions and a sensitive environment requires well-studied response methods to reduce the impact of any future oil spills. The burning of the oil is one of the methods considered to be effective under these circumstances. This method converts the oil in combustion products such as carbon dioxide, water and soot and thereby removes the oil from the water surface.

A crude oil is a mixture of hundreds of different chemical compounds and the interactions between these chemicals during burning is not well understood. In previous research at the DTU Fire Lab, a theoretical model was proposed for the burning mechanism of crude oil that could be used to predict the chemicals left in the residue after the burning. Such predictions are a useful tool for risk assessments and determining the effectiveness of burning as a response method.

In the funded study the proposed model will be presented at an international conference to other experts in the oil response field and to assess the value of the proposed model. The Arctic and Marine Oilspill Program (AMOP) conference is a well-established conference in the field of oil spill contingency planning and provides a good opportunity to introduce the DTU Fire Lab and its research.

Following the conference, a three-week visit at Princeton University will be used to test the model with a specific experimental setup developed by Prof. C.K. Law. In this setup, individual oil droplets are burned during a free fall and are closely monitored for their diameter and fall distance. This information can be used to determine the diameter of the droplet as a function of time, which is indicative for the burning mechanism of the droplet. Confirming the proposed model will be a good step forwards in predicting the effectiveness of burning as a response method under different circumstances and the chemicals left in the burning residue. Future steps would be to use these predictions for risk assessments of oil related activities in the Arctic.