Abstract

Fire-fighting systems on vessels have been used for some time to apply chemical dispersants, but little effort has been made to ensure that the dispersant is applied effectively. Generally, sprays from fire monitors do not dose oil slicks evenly and do not contain the right drop sizes for effective mixing with oil slicks. This study, continuing the effort begun by Exxon researchers in the early 1990s, investigates new nozzles and methods to improve the situation.

As a starting point, a long-throw foam application nozzle manufactured by Wormald Fire Systems was identified as a promising device for applying sprays in the right manner. The nozzle was tested at its design flow and pressure. Unfortunately, it was found not to generate a spray pattern suitable for dispersant application.

Step-by-step modifications were made to the basic design of this nozzle, leading to a configuration that appears suitable for dispersant application. The nozzle consists of a blunt orifice plate that generates the required drop sizes, and a short discharge tube with tabs cut in its end and bent into the flow field. These tabs "knock-down" dispersant near the source to create a uniform fallout along the spray path. It was found that by increasing the discharge tube length the spray drop sizes could be increased. The larger drops could be used to advantage during windy spray conditions to reduce dispersant loss and improve the ability to place the dispersant on the target oil.

The small nozzle and portable fire-pump systems tested in this study could be used in a neat spray application mode. The 80 gpm (300L/min) flow from such a system is slightly higher than many of the neat spray boom systems currently in use, but the spray reach is greater than the boom systems. This combination generates a dispersant application capacity similar to existing neat spray boom systems. The complications associated with educting dispersants into a water flow prior to application (as is recommended today for most fire-monitor type dispersant applications) are eliminated by spraying the dispersant neat through the small nozzle. The possibility of reduced dispersant efficiency due to its dilution prior to application is also eliminated. The single-nozzle, neat-dispersant, application spray system can be scaled to a size suitable for most slick thicknesses and vessel spray speeds.