Engineers create decision-making tool for oil spill clean-up

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A team of Southwest Research Institute engineers has created an interactive decision tree aimed at finding the best solution for specific oil spill scenarios. Numerous chemical dispersant technologies are available to address different types of oil spills and countless variables and external conditions can play into the effectiveness of any given dispersant. SwRI's decision-making tool helps bridge this gap to determine how a dispersant technology will perform under different spill scenarios.

Led by SwRI research engineer Dr. Amy McCleney, the team designed the decision tree for the U.S. Department of Interior's (DOI) Bureau of Safety and Environmental Enforcement (BSEE) as a training tool for individuals who respond to oil spill incidents.

"When an oil spill occurs, chemical dispersants, distributed by boat or airplane, are used to enhance the breakup of spilled oil on water into small droplets, which disperse into the surrounding ocean. Microorganisms in the water then degrade the small oil droplets to remove the harmful pollutants from the water," McCleney said.

The interactive decision-making tree was created with the programming language Visual Basic for Applications in Microsoft Excel, with the aim of making it accessible to as many people as possible. It contains hundreds of scenario combinations, allowing a user to select certain environmental and oil conditions, and outputs the most efficient dispersant delivery approach and equipment to clean up the spill.

"This is a game changer for oil-spill preparedness, because oil spill cleanup thus far has been a relatively subjective process. This tool can help transition spill response operations into a more systematic and measurable approach," she said.

The decision tree is the first tool that successfully measures how effective different dispersant delivery technologies are at applying dispersants onto spilled oil. Additionally, it was previously unknown how effective the applied chemical dispersants break up oil under different environmental conditions, oil types and spill sizes.

Choosing the best technology for oil spill cleanup is extremely challenging due to the numerous spill scenario combinations that can affect the overall response outcome. For example, the thickness of an oil slick is a major variable affecting how much dispersant is needed to break up the spill.

McCleney and fellow SwRI engineers Maria Cortes, Jacqueline Manders and Kevin Supak developed the interactive tool based on a previous system developed by SwRI for equipment efficiency calculation. The team spent a full year researching literature and interviewing industry experts to identify the most efficient oil spill cleanup practices to incorporate into the decision tree.

"The team had to research and consolidate information about oil-spill cleanup using chemical dispersants from across the industry to one location," said McCleney. "In the end, this is all about protecting our coastlines and the public from oil. In the event of a large spill incident such as the Deepwater Horizon oil spill, this tool can be used to train responders to select the best oil cleanup method before it even occurs, so an effective and timely response can be implemented."

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