STIC Note

Hydrocarbon Detection Test Strips

BACKGROUND/PROBLEM

The U.S. Coast Guard is required by statute to respond to reports of oil and chemical discharges that occur in or near navigable U.S. Territorial waterways and their tributaries.

Response missions can be hazardous because the discharged substance is often unidentified and retrieving samples appropriate for testing can often pose risks to personnel. In addition, sending an unknown substance for analysis can be expensive and time consuming. Unknown samples need to be treated as Hazardous Material (HAZMAT) with associated incremental cost. Often times what appears to be an oil spill - identified as a rainbow sheen on the water surface - turns out to be rotting vegetation or an algae bloom. The sheens that these substances exhibit have the same appearance as gasoline or diesel fuel making visual identification difficult, if not impossible.

In remote areas like Hawaii, the decision to incur the expense of sending HAZMAT samples for analysis can be particularly difficult due to the extra cost of shipping from an island. Often times the sample test results are identified as naturally occurring algae blooms. It has been suggested that hydrocarbon test strips may be used to help make a more informed decision whether to take and send samples for analysis.

The STIC investigated hydrocarbon test strips to evaluate if they could be an effective tool to make such informed decisions.

Figure 1. Hydraulic sheen.

Figure 2. Diesel sheen.

METHODS

Market research found that there are many commercial companies that sell oil test strips. Samples were purchased to test their usefulness. Several substances were tested including food oils to see how the strips reacted when they were introduced to these oils. The

oils were also tested on soil to see how the test strips reacted with other substrates. The evaluation was duplicated in Hawaii.

Figure 3. Organic sheen.

EVALUATION

The samples tested showed that there are color differences between oils. The heavier the oil, the darker it appears on the test strip. The hydrocarbons penetrated the strip and water beaded up and rolled off. When the same oil samples were tested in soil, the results were the same. The color of the test strips in soil was the same as when the test was done on water. The water control sample and the soil control did not show any change in color. No color change was observed when testing organics in water. Making a case requires a source, identification, and a reportable quantity. Regardless of quantity, test strips can give an indication of the source and its makeup to use as a process of elimination when developing a case.

The Science and Technology Innovation Center (STIC) is a DHS S&T and USCG collaboration.

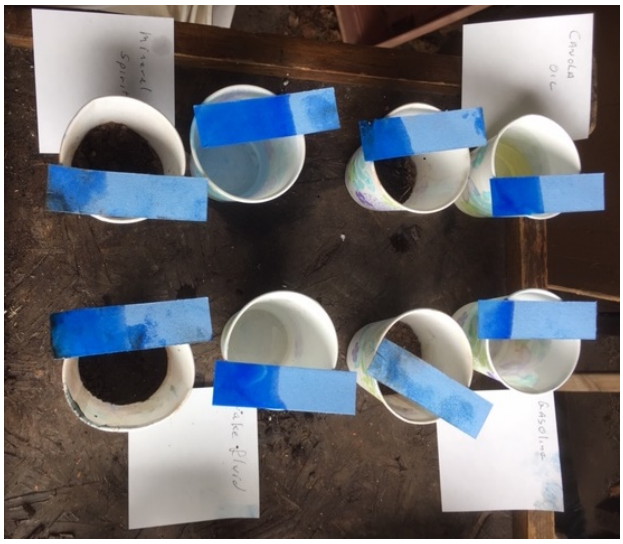

Figure 4. Test sample display.

CONCLUSIONS

Although the test strips detect oil, it was difficult to determine the type of oil that created the sheen. A comparison key (perhaps developed by the manufacturer) could help with that determination so that the source could be better identified. Development of such a key was deemed to be out of scope of the evaluation. It was the consensus of the test team that the test strips are useful to aid in eliminating some potential sources and to indicate the merit of additional sampling. Test strips would be used only to eliminate potential sources, but not be suitable for use as evidence. At less than $0.50 each, test strips are inexpensive making them very affordable for purchase with unit funds.

FUTURE WORK

The STIC team identified sources to purchase these test strips and have provided sample test strips to the Incident Management Division at Coast Guard Sector Long Island Sound for further evaluation.