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Oil-spill Remote Sensors: New Tools that Provide Solutions to Old Problems

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Abstract

Remote sensors used for oil-spill slick detection and monitoring are reviewed, and new technologies and developments are highlighted. At the present time, the most commonly employed sensor is an infrared (IR) camera or combination infrared/ultraviolet (IR/UV) system. This sensor class can detect oil under a variety of conditions, discriminate oil from some backgrounds and has the lowest cost of any sensor. The inherent weaknesses include the inability to discriminate oil on beaches, among weeds or debris, through fog and at dawn and dusk (due to solar radiation conditions), oil is not detected. Furthermore, water-in-oil emulsions are sometimes not detected in the infrared. Older IR systems required cryogenic cooling of the detector element(s) in order to function adequately. This cooling requirement added to the size and cost of the system. New technology employing room temperature micro-bolometers has made IR technology more practical and economical, so despite its limitations, it will be a very important tool in the future. Recent results have provided some long sought after answers related to the thickness detection limits of infrared sensors.

The laser fluorosensor is an instrument of the future because of its unique capability to identify oil on backgrounds that include water, beaches, soil, ice and snow. It is the only sensor that can positively discriminate oil on most backgrounds. Radar offers the only potential for large area searches and foul weather remote sensing. Radar systems are costly and require dedicated aircraft. Radar is prone to many interferences, where false targets can be as high as 95%.

Equipment operating in the visible spectrum, such as cameras and scanners are useful for documentation or providing a basis for the overlay of other data. They are not useful beyond this because oil shows no unique spectral characteristics in the visible region. In the future, it is anticipated that less use will be made of equipment operating in the visible band.

The use of satellite imagery for the tracking of oil spills is reviewed. Sensors employing detectors in the visible region of the electromagnetic spectrum offer only marginal utility to the oil-spill response worker. Radar satellite imagery can provide useful overviews on known spills. One important new trend will be the use of a radar satellite for wide-area searching.

1.0 Introduction

Remote sensing is an accepted tool in the arsenal of oil spill response personnel. The minimum expectations of society are that the government and the