OIL SPILL REMOTE SENSING: A REVIEW

Prepared by the Chevron Oil Spill Workshop: Sept 24-27, 1991
San Francisco, California

Merv Fingas
Emergencies Science Division
Conservation and Protection
Environment Canada
Ottawa, Ontario

INTRODUCTION

Remote sensing is an important part of oil spill countermeasures. Public expectations with respect to the environment are increasing. The minimum expectation is that the government or the spiller know the location and extent of the contamination. It is also being recognized by spill cleanup personnel that remote sensing can be used to increase spill cleanup efficiency. Furthermore, the advance in electronics has made the instrumentation much cheaper and provides capabilities where none existed before.

The definition of remote sensing implies that a sensor, other than the eye, is used to detect the target of interest at a distance. The most common form of remote sensing as applied to oil spills is aerial remote sensing - that is using aircraft as a platform. Visual observation - irrespective of the platform used, is by definition, not remote sensing. Remote sensing does however, include the use of satellites. This technology will be briefly reviewed in this article along with aircraft-mounted remote sensors.

OPTICAL TECHNIQUES

Optical techniques are the most common means of remote sensing. Cameras, both still and television, are particularly common because of their low price. Aerial mapping is very common and many companies are equipped with aircraft and cameras to perform this function. Many cameras have been commercially available over the past 10 years. Table 1 lists a number of these.[1,2] It is important to note that this and other tables in this paper include sensors that were available in the past, those that are currently available and in some cases, those under development. Many older sensors are still in service and are frequently offered for sale or for use.

The large format cameras listed in Table 1 are largely used for mapping purposes, however are occasionally used for oil spills.

Oil has an increased surface reflectance above that of water in the visible, but also shows some non-specific absorption tendencies to allow use of the visible spectrum as an oil detection means. The visible spectrum is from approximately 400 to 700 nm (blue to red). Oil has several manifestations throughout the spectrum. Heavy oil appears brown, showing up in the 600 to 700 nm region. Mousse shows up in the red-brown or closer to 700 nm. Sheen shows up silvery and reflects light over a wide spectral region up to the blue. There is no strong information in the visible region from 500 to 600 nm, so often this region is filtered out, to give stronger contrast. It should be stressed that oil shows little spectral differences from most backgrounds. Detection in the visible region