

Application Note

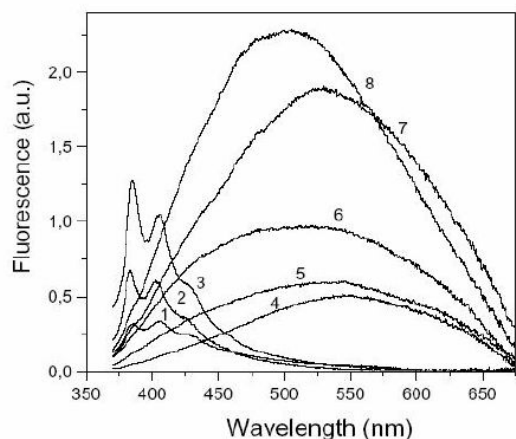
Detection of Oil Contamination Using UV Fluorometer

Background:

PAHs (Polycyclic Aromatic Hydrocarbons) are one of the most widespread organic pollutants. In addition to their presence in fossil fuels, they are also formed by incomplete combustion of carbon-containing fuels such as wood, coal, diesel, fat, tobacco, and incense. PAHs are lipophilic, meaning they mix more easily with oil than water. The larger compounds are less water-soluble and less volatile. Because of these properties, PAHs in the environment are found primarily in soil, sediment and oily substances, as opposed to in water or air. However, they are also a component of concern in particulate matter suspended in air. Hydrocarbon emissions from fossil fuel-burning engines are regulated in developed countries. Natural crude oil and coal deposits contain significant amounts of PAHs, arising from chemical conversion of natural product molecules, such as steroids, to aromatic hydrocarbons. They are also found in processed fossil fuels, tar and various edible oils. Due to their physical properties, PAHs are widely used in many industrial applications, such as lubricating oil, hydraulic oil, and electro-hydraulic control fluid. Their applications also could produce man-made contamination in the water systems due to leakage of the oils.

Fluorescence Detection:

The aromatic fraction of PAHs can be excited with UV or near-UV light to emit fluorescent light. The fluorescence intensity is linear with the concentration of the oil. This technology is ideal for monitoring leaking lube oil in the cooling systems or power plants, or leaking crude oil in ocean/lake environment, and there is no significant effect from turbidity or suspended solid in the water. The typical fluorescence spectra of different lube oils and crude oils when excited by 300-400nm light are shown below:



- 1 – Motor oil
- 2 – Shell Diala oil
- 3 – Oil SAE 30
- 4 – Bunker Fuel oil
- 5 – Arabian Medium crude oil
- 6 – Basra crude oil
- 7 – German crude oil
- 8 – Nihian crude oil

Oil Grade	Detection Limit [mg · L ⁻¹]
Nytro 10XN Lube Oil	0.78
Mobil Gear 600 XP	0.1
Mobil DTE 220	0.1
Mobil DTE Extra Heavy	0.3
Royal Purple ISO 320	0.2
Royal Purple ISO 220	0.3
Royal Purple 46	0.2
Mobil SHC 220	0.6
Mobil DTE 25	0.5
Mobil Gear SHC 220	2

The table to the right also shows the detection limit of several lube oils using an industrial fluorometer with proper excitation and emission wavelength setting. Due to the low interference from other substances, we can see that this technology has the potential of detecting sub-mg/L (<1ppm) level of oil contamination in water samples from the environment. W2 Optronics's handheld fluorometer (model#: FQ-360/460-A) has been proven to detect such low level of lube oil in water, and due to its high portability, it can be used anywhere in the field to conduct environmental inspection for potential oil contaminations.

