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RRT III Fact Sheet

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Group V Oils and the Environment

What Are Group V Oils?

Group V oils are by regulation categorically separate from other oils based on their specific gravity. Any oil that has a specific gravity higher than 1.0 or API (American Petroleum Institute) gravity value of less than 10 is a Group V oil. This classification is based on concerns that these oils have characteristics and behaviors that may be very different from other typical lighter oils. Some of these differences may lead to non-floating behavior of these heavier oils or fractions of these oils thereby presenting very different concerns with regard to environmental impacts and response capabilities.

There are three distinct types of Group V oils with very different properties and behaviors. These types include:

- Group V Residual Fuel Oils (GPVRFO), known by the industry term LAPIO (Low API Oil);
- Asphalt and Asphalt Products; and
- Orimulsion.

Group V Residual Fuel Oils (GPVRFO)

To produce a GPVRFO produce the heavy residues from several refining operations are typically blended with the lighter distillants and by-products. Because of this process, GPVRFOs vary greatly with respect to composition, exhibiting very different properties and characteristics. GPVRFO is blended to meet specifications of viscosity, pour point and sulfur defined by the power plant purchasing the fuel. GPVRFO represent the low API gravity end of the conventional 46 fuel oil spectrum. GPVRFO generally contain more of the heavier components than typical #6 fuel oils. Depending on the composition of residual by-products used and the blending process, the stability of the mixture may vary. Instability, either because of the incompatibility due to incomplete mixing or thermal dynamic properties of the blended residues, could lead to separation of the various fractions of the mixture and subsequent sinking or suspension in the water column of the heavier portions. This phenomenon has been observed in several laboratory experiments.

When spills of GPVRFOs float, they are likely to pose similar environmental concerns as with typical #6 fuel oil. Generally, these heavy oils would be of most concern to birds and fur bearing manimals that may get coated and to sea turtles which may ingest floating tar balls. These oils weather slowly and are very persistent in the environment. GPVRFOs are generally not acutely toxic (this could vary depending on the components used for the blend).

GPVRFOs that sink to the bottom or remain suspended in the water column raise concern for resources that normally would not be affected by floating oil due to lack of exposure and non-bioavailability. These resources, which would be at greater risk include fish, shellfish, seagrasses, and other benthic habitats and subsurface biological resources. Submerged oil may also provide for future episodic re-oiling of shorelines.

Cleanup costs for submerged oils have historically been substantially higher than shoreline cleanup. Also the costs for waste disposal generated will be much greater for submerged oil recovery, if dredging or pumping operations create large volumes of sediment and water.

Asphalt and Asphalt Products

These very heavy products, normally used for paving of roads and other surfaces all have specific gravities greater than fresh and seawater; all will sink. They are normally loaded and shipped as heated cargo in order to prevent solidification. It is expected that these products, if spilled, would quickly cool, solidify and sink to the bottom. Pnvironmental concerns would generally be limited to localized effects from heat and generated steam of the spilled cargo and smothering of any benthic resources. These products are generally not very toxic and would

not be expected to impact fish or other water column resources.

Orimulsion

Orimulsion is an oil-water emulsion produced in Venezuela, containing approximately 70% Orinoco bitumen and 300/o water. As surfactant, nonyl phenol ethoxylate (<l%) is added to stabilize the emulsion. Although a consistent and predictable blend, Orimulsion has characteristics very different from the GPVRFOs or heavy #6 fuel oils. The characteristics of this product include the fact that it spills as a dispersed product which later transforms into raw bitumen that can form a heavy, viscous and very thick surface stick if the droplets recoal - esce. These characteristics suggest that effective response will be limited in many situations, and environmental concerns will be different from oils which either primarily float or sink.

Aquatic resources may be a greater risk from an Orimulsion spill than other oils since it disperses into the water column and organisms would be more readily exposed to the toxic components of the product. The subsequent formation of a bitu'men slick during a spill of Orimulsi-on would likely have similar environmental impacts as associated with other heavy floating oils. Coating organisms would be the primary concern at this stage.

Prevention Methods

Recovery of spilled Group V oils is expensive and sometimes ineffective, with no guarantee that any'method will be effective in a given scenario. Keeping in mind that for Group V oils an once of prevention is worth a pound of cure, the following list of removal and prevention methods was compiled. While far from comprehensive, the list may be used as a starting point for decision-making and further discussion. Given currently available recovery methods, prevention is the key to preventing environmental damage caused by Group V oils. The following methods have been identified as having potential in preventing releases of Group V oils:

Solid Curtain - a fixed, solid steel curtain frotp, the bottom to the water's surface mechanically/hydraulically swung out from the pier to the vessel sideshell;
Hose Sleeve - a flexible sleeve which slides over the transfer hose and is secured at both ends;
Vessel Booming - deploying containment boom around a vessel during transfer operations. In addition to standard surface booms, new technology curtains and bottom booms may be employed;
Vessel Design (e.g. double hulls,etc.); and
Operational Restrictions (e.g. crew/personnel requirements, vessel movement controls, pre-testing, duplicate hardware, etc.).

Group V Oil Spill Mitigation Methods

Removal of spilled Group V oils presents several interesting challenges. Due to many variables including oil makeup and environmental conditions, this oil, if spilled, may exist in several different states; floating, sinking and/or spreading throughout the water column.

It is obvious that a variety of recovery techniques will be required to successfully mitigate Group V spills. No technique has been found to be effective in all situations, and techniques found to be even marginally effective are very costly.

There is a widespread belief that floating Group V oils may behave in a manner similar to waxy crude oils. These products are difficult to remove as they are very viscous, do not adhere well and are resistant to dispersants. Response strategies are highly dependent on environmental conditions, such as salinity of water, current, temperature, shoreline particulars, etc.

The following list of detection, containment, and recovery methods are not intended to be comprehensive. No attempt was made to validate any of these methods. The list may, however, be used as a starting point for follow-on research or discussion.

Detection

Sonar vessel mounted bottom scan sonar;
Diver/Camera;
ROV/Camera - remotely operated vehicles with associated cameras;
Aircraft;
Photobathymetry - photographic mapping of subsurface details;
Diaper Drops - sorbents (often disposable diapers) wrapped around a lead ball are bounced on the bottom then checked for presence of oil. This method may be effective in determining the presence and extent of oil on the bottom;
Dragnet - seine net or chain-link fence is fitted with sorbent materials and towed through the water;
Snare Drops - sorbents (pom poms, snare etc.) *are* attached to line or chain, submerged, anchored and later raised to surface. The purpose of these drops is to locate and track oil movement on the bottom;
Side Scan Sonar - vessel mounted side-scan sonar;

Containment

Bottom Boom - weighted boom placed on the bottom;
Bubble Curtains - massive amounts of bubbles released from a perforated manifold on the bottom contains oil through turbulence caused by their rising action;
Water Jets - water jets consist of nozzles placed above the surface of the water impinging on the %vater's surface, thus containing the oil;
Jackson Net - a boom-type device consisting of a double layer of