Sorbents

Sorbents are insoluble materials or mixtures of materials used to recover liquids through the mechanism of absorption, or adsorption, or both. *Ab*sorbents are materials that pick up and retain liquid causing the material to swell (50 percent or more). *Ad*sorbents are insoluble materials that are coated by a liquid on its surface. To be useful in combating oil spills, sorbents need to be both oleophilic (oil-attracting) and hydrophobic (water-repellent).

Although they may be used as the sole cleanup method in small spills, sorbents are most often used to remove final traces of oil, or in areas that cannot be reached by skimmers. Sorbent materials and any oil that is removed from sorbant materials must be disposed of in accordance with approved local, state, and federal regulations.

Sorbents can be divided into three basic categories:

Natural organic sorbents include:

- peat moss,
- straw,
- hay,
- sawdust,
- ground corncobs,
- feathers, and
- other readily available carbon-based products.

Organic sorbents can adsorb between 3 and 15 times their weight in oil, but there are disadvantages to their use. Some organic sorbents tend to adsorb water as well as oil, causing the sorbents to sink. Many organic sorbents are loose particles and are difficult to collect after they are spread on the water. These problems can be counterbalanced by adding flotation devices. For example, empty drums attached to sorbent bales of hay overcome the sinking issue. Mesh can be wrapped around loose particles to aid in collection.

Natural inorganic sorbents consist of:

- clay,
- perlite,
- vermiculite,
- glass wool,
- sand, or
- volcanic ash.

They can adsorb from 4 to 20 times their weight in oil. Inorganic sorbents, like organic sorbents, are inexpensive and readily available in large quantities. These types of sorbents are not used on the water's surface.

Synthetic sorbents include man-made materials that are similar to plastics, such as polyurethane, polyethylene, and polypropylene. They are designed to adsorb liquids onto their surfaces. Other synthetic sorbents include cross-linked polymers and rubber materials, which absorb liquids into their solid structure, causing the sorbent material to swell. Most synthetic sorbents can absorb up 70 times their own weight in oil.

The characteristics of both sorbents and oil types must be considered when choosing sorbents for cleaning up oil spills:

- **Rate of absorption** -- The absorption of oil is faster with lighter oil products. Once absorbed the oil cannot be re-released. Effective with light hydrocarbons (e.g., gasoline, diesel fuel, benzene).
- **Rate of adsorption** -- The thicker oils adhere to the surface of the adsorbent more effectively.
- **Oil retention** -- The weight of recovered oil can cause a sorbent structure to sag and deform, and when it is lifted out of the water, it can release oil that is trapped in its pores. Lighter, less viscous oil is lost through the pores more easily than are heavier, more viscous oils during recovery of adsorbent materials causing secondary contamination.
- **Ease of application** -- Sorbents may be applied to spills manually or mechanically, using blowers or fans. Many natural organic sorbents that exist as loose materials, such as clay and vermiculite, are dusty, difficult to apply in windy conditions, and potentially hazardous if inhaled.

Any new sorbent materials may need to be listed on the National Contingency Plan, Subpart J, Product Schedule.

Please contact EPA's Oil Program at 202-564-1970 for more information.