Frequently Asked Questions About Oil Spill Dispersants

Q: Why are chemical dispersants used on an oil spill?

A: Dispersants are used to minimize the environmental impact of an oil spill. Dispersants do not eliminate the problem of an oil spill, but are intended as a means of reducing the overall environmental impact of an oil slick at sea. Dispersant use accelerates the weathering and biological breakdown of oil at sea and reduces the impact of oil on sensitive nearshore environments.

Dispersants are also highly effective in reducing exposure of sea birds and marine mammals to oil as most sea birds are oiled by slicks on the surface of the sea or in near shore coastal habitats.

Undispersed slicks and residual oils are a persistent threat to nearshore, birds, mammals and intertidal communities due to the toxicity of, and contact with oil. Dispersed oil is less “sticky” than undispersed oil; therefore, the adhesion and absorption onto surfaces and sediments of dispersed oil is greatly reduced compared with the original oil slick.

In a spill incident environmental trade-offs of protection and sacrifice will occur. These decisions are not taken lightly by response authorities and will be based on the best available advice and scientific data to achieve a net environmental benefit.

Q: What are oil spill dispersants?

A: Dispersants are chemical formulations with an active ingredient called surfactants. Surfactants are specifically designed chemicals that have both hydrophilic (water liking) and oleophilic (oil liking) groups in the chemical compound. These chemicals reduce the interfacial tension between the oil and water and helps the creation of small oil droplets, which move into the water column facilitating quicker natural biological breakdown (biodegradation) and dispersion. By decreasing the size of the oil droplets, and dispersing the droplets in the water column, the oil surface area exposed to the water increases and natural breakdown of the oil is enhanced. Thus removing the threat of the oil from the water surface to within the water column.

Dispersion is a natural process that occurs in surface slicks as wind and wave action break up the surface slick. However, naturally dispersed oil droplets tend to recoalesce and return to the water surface and reform as surface slicks. The addition of chemical dispersants allows the wind and wave action to then carry the small oil droplets away and dilute the concentration of the droplets in the water column; these dispersed oil droplets are then targeted by indigenous oil-consuming microbes where they are broken down into the ultimate components, carbon dioxide and water.

Q: On what basis is the decision made to use dispersants in a spill incident?

A: The main basis for decision making in determining whether oil spill dispersant will be used is:

“Will the application of the chemical dispersant to the spilled oil minimize the overall environmental impact of the oil spill?”

Except for the impact on marine birds and mammals, the most damaging effect of oil spills is when the oil strands on shorelines or enters restricted shallow waters like estuaries. Dispersants are a prime and vital response tool to stop oil coming ashore or from entering sensitive nearshore environments especially when weather and sea conditions do not allow the use of oil containment and recovery equipment.

Dispersants are usually not applied to oil spills in “near shore areas,” for example, where sea grass beds, oyster beds, mariculture or coral reefs are present. However, dispersant use may be authorized by the Region IX Regional Response Team in these circumstances when there is a possibility of an impact of oil on a more sensitive nearhore habitat, or wildlife impacts are possible. For example, when an approaching oil slick may impact sensitive mammal breeding areas, or endangered species such as migratory birds.

Q: What are the negative effects of dispersants on the environment?

A: The acute toxicity of dispersed oil generally does not reside in the dispersant but in the more toxic fractions of the oil. Dispersing oil into the water in situations where there is little water movement or exchange, such as shallow embayments, increases exposure of subsurface, benthic organisms and fish to the toxic components of the oil.

Fish and other marine life in the larvae stage or juvenile stages are more prone to the toxicity effects of oil and dispersants. Therefore it is unlikely dispersants will be used near commercial fisheries, important breeding grounds, fish nurseries, shellfish aquaculture etc. unless it is to protect a more important environmental resource.

Seagrasses and coral reef communities are particularly sensitive to dispersed oil because instead of the
oil “floating over” the reefs and submerged seagrass beds the oil/dispersant mixture in the water colour will come into direct contact with these sensitive ecosystems.

Generally there is a reluctance by spill responders to use dispersants in shallow waters less than 30 feet deep, although there may be situations where using dispersants could save nearshore impacts or wildlife.

Q: Who authorizes the use of dispersants during an oil spill response?

A: Under the Oil Pollution Act of 1990, the Region IX Regional Response Team is vested with the authority over dispersant use for marine oil spills. The National Contingency Plan (NCP) provides that the Federal On-scene Coordinator, with concurrence from the U.S. EPA and the State

representatives, may authorize the use of dispersants. However, only dispersants listed in the NCP and licensed for use by the State of California may be used.

Criteria detailed in the California Dispersant Use Plan must be met before the Federal On-scene Coordinator can authorize dispersant use. If it is determined that a spill does not meet the pre-approval, then the final decision for a dispersant-use determination rests with the RRT.

Q: How effective are oil spill dispersants?

A: Chemical dispersants aid the natural dispersion of oil by reducing the oil/water interfacial tension and, along with the natural motion of the sea, allow the break up of oil on the water into very fine droplets.

Effectiveness of oil dispersion by chemical dispersants at sea is governed by a range of conditions and include the type and chemistry of the oil, degree of weathering of the oil, the thickness of the oil slick, type of dispersant, droplet size and application ratio, prevailing sea conditions (wave mixing energy), and sea temperature and salinity.

Q: Will dispersants work on all types of oils?

A: No, dispersants will not work on all oil spills. The first rule in combating oil spills with dispersants is that the oil must be amenable to dispersant use. It is also well understood by oil spill response agencies that dispersants are only effective on certain types of oils and the first priority is always to determine the spilled oil's physical and chemical properties in order to assess combat options.

Non-dispersable oils include: 1) non-spreading oils (pour point is higher than sea temperature), 2) highly viscous oils (> 2000 Centistokes (cSt) - a measurement of the mobility of oil), 3) a water-in-oil emulsion has formed (mousse).

A "rule of thumb" is a dispersant may have a reasonable success rate if the oil is continuing to flow or spread as a fluid (not just sheening).

Unfortunately this "rule of thumb" is only partly correct. The properties of these oils are determined by their chemical composition which vary widely. For the purposes of determining the use of dispersants at various sea temperatures the important properties are: 1) the specific gravity (or API gravity), 2) pour point, and 3) viscosity.

Q: How quickly do we need to apply dispersants to an oil spill?

A: As quickly as possible! There is only a limited "window of opportunity" to use chemical dispersant in an oil spill incident. This is primarily due to the changing properties of the spilt oil due to weathering of the oil, but is also governed by the location and speed of movement of the slick onto the foreshores or into estuarine environments. This window of opportunity may be as little as only a few hours. Sometimes if the conditions are favourable, a day or two.

Therefore, it is essential that the capability exists to quickly activate and deploy resources anywhere

across California to deliver and apply oil spill dispersants at sea.

Q: What are the health and safety issues associated with the use of chemical dispersants?

A: Response workers must be careful to ensure that personnel do not get sprayed by the dispersants, or come in contract with any of the overspray. Vessels must only be deployed under safe sea conditions.

Q: Are there any waster generation of disposal issues associated with the use of dispersants?

A: Effective use of dispersants should signficatly reduce the amount of oil waste generated.