What are dispersants?

Showing application of subsea dispersant injection (SSDI)

Dispersants are a blend of surface active agents (surfactants) and solvents that help break up oil, making it easier to disperse and be degraded by natural processes. They can either be applied by spraying onto surface spills (surface dispersants) or underwater injection close to the point of oil release (subsea dispersants).

The surfactant molecules in dispersants are attracted to both oil and water. When the surfactant contacts the oil, it causes tiny oil droplets to form—often a fraction of a millimetre in diameter—which break away from the main body of oil.

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Dispersants in Australia

Use of dispersants offshore is described in the National Plan for Maritime Environmental Emergencies and by the Australian Maritime Safety Authority (AMSA).

See the following links:

www.amsa.gov.au/marine-environment/national-plan-maritime-environmental-emergencies

www.amsa.gov.au/marine-environment/pollution-response/register-oil-spill-control-agents

Section 8 of the Environment Plan for Stromlo-1 assesses environmental and socioeconomic consequences and risks in the unlikely event that dispersant is used. The process to implement and assess use of dispersant has been set out in our Oil Pollution Emergency Plan (OPEP). The OPEP adheres to the National Plan and submitted to the National Offshore Petroleum Safety and Environmental Management Authority for assessment and acceptance before drilling can commence.

What are dispersants?

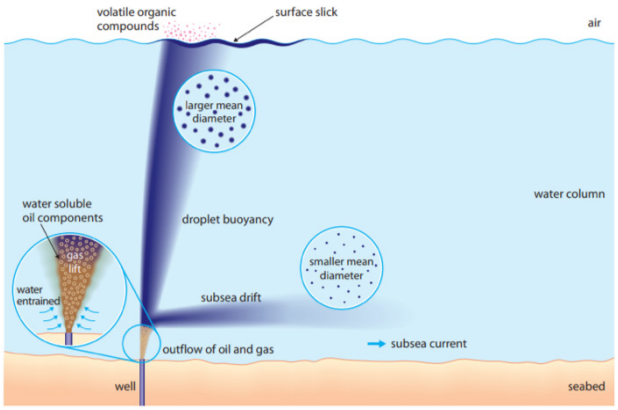
According to API Energy, "Dispersants are chemical agents (similar to soaps and detergents) that help break up an oil slick into very small droplets, which disperse throughout the water. While this does not remove the spilled material, smaller oil droplets are more easily biodegraded, and it provides a measure of protection for sensitive habitats otherwise threatened by a surface slick".

www.oilspillprevention.org/oil-spill-cleanup/oil-spill-cleanup-toolkit/dispersants

Surface dispersants

Applying dispersants to oil on the surface enhances the natural dispersion process (caused by breaking waves turbulence) and increases the oil weathering processes of dissolution, dispersion and biodegradation. Applied on the surface, it will generally shift the potential environmental impact to the upper water column.

a) Without dispersant



b) With dispersant

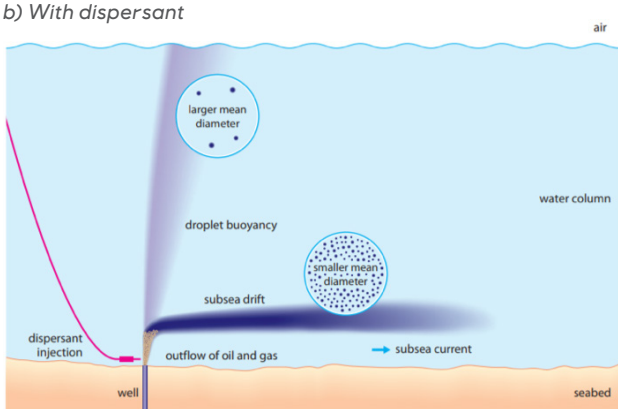


Image courtesy of IPIECA

Subsea dispersants

Applying dispersant subsea close to the outflow of oil and directly into a highly turbulent jet of oil will generate smaller oil droplets with less buoyancy, which is more effective than application at the sea surface level. The oil droplets will remain deeper and for a longer period in the water column as their buoyancy is less and increases the subsea drift transported by the currents. Further away from the outflow, concentration levels will be below accepted thresholds due to dilution, dispersion, weathering and biodegradation.

Effectiveness

From a technical perspective, application of subsea dispersant can effectively treat almost 100 percent of the oil released if the dispersant is injected at enough quantity within a couple of meters of the discharge location where the velocity of the oil is sufficiently high. Use of dispersant on the surface is less effective.

Why use dispersant?

The purpose of using dispersants is to reduce the amount of oil on the surface, and to increase the dilution and the biodegradation of the oil. This will decrease potential consequences of oil to sensitive marine species such as seals, whales and seabirds.

In combination with the energy provided by waves, currents and turbulence of the release, the use of dispersant will:

- reduce the potential for oil on the surface
- reduce the persistence of surfacing oil
- enhance natural biodegradation* of the oil
- decrease the likelihood and amount of oil reaching the shoreline

** Oil-degrading bacteria occur in oceans and have evolved to consume oil that is naturally released from the earth by natural oil seeps. Natural seeps and oil degrading bacteria are known to occur in the Great Australian Bight, see Section 4 of the Environment Plan.*

Where and when can dispersants be applied?

For preparedness and rapid deployment, we will preposition equipment and dispersants. If oil is released, after surfacing the oil will be tested and assessed for the appropriate dispersant application. Application of surface dispersants will take place by vessel and/or air after day one or day two. From day nine, dispersant equipment and delivery hoses for subsea injection on a vessel will be used in combination with a remote operated vehicle (ROV). The ROV will direct the dispersant into the oil and gas jet (Figure 2) and the effectiveness of the dispersant injection closely monitored. Application of dispersants will take place close to the release location and more than 350 km offshore and continuously assessed and optimised as long as needed.

What are the potential impacts of dispersants and how will they be managed?

The consequence of reducing surface and shoreline oil by using dispersant is an increase in oil dispersed and dissolved in the water column. This raises the potential risk for marine species such as plankton, fish, squid and krill and to a lesser degree species living on the sea bed. In an area such as the Bight, the concentration of dispersed oil will likely decrease rapidly from the release site due to large water depths and circulation pattern of the currents.

Increased dilution of dispersed and dissolved oil through the water column also means the concentration of oil quickly decreases. Similarly, the smaller droplet size generated by the subsea dispersion injection increases the rate of biodegradation and furthermore, reduces potential environmental impacts of oil.

Net Environmental Benefit Analysis (NEBA) evaluates and compares the benefits and trade-offs of using dispersants to other response options. After an accident, NEBA helps select the best suite of response strategy that reduces the overall impacts of the oil spill to the environment. This is a continuous process, used throughout the response.

Monitoring of water chemistry and environmental receptors in the water column, sea bed, sea surface and shoreline will be undertaken to support the NEBA and confirm dispersant application effectiveness and that dispersant application is an appropriate mitigation measure going forward.

Have dispersants been used in Australia?

Surface dispersants have been used during several maritime vessel spills and the Montara spill (2009), as well as close to shore.

Subsea dispersants have not been applied in Australia and were first used as a major response strategy during the Macondo accident in the Gulf of Mexico (2010).

Following this, the American Petroleum Institute funded a multi-year research program that confirmed the application can significantly reduce oil droplet size for a range of oil spill conditions, oil types and dispersants. The development and accessibility of the technology has continued in regional centres, and the oil and gas industry in Australia has invested in subsea dispersant equipment

With worldwide research, development and innovation, subsea dispersant injection continues to evolve as a primary oil spill response strategy for subsea spill from deep-water oil wells.

Are dispersants harmful?

The surfactants and solvents in dispersants are selected for low toxicity as well as performance. Modern dispersant components are also biodegradable and have low potential for bioaccumulation in seafood.

Safety data sheets identify potential hazards and safety controls required to protect responders responsible for handling the dispersants. In the case of the Bight, application of dispersants would take place more than 270 km from the coast and are expected to be rapidly diluted. As such, the likelihood of exposure of the public to dispersant is extremely low.

References to the Environment Plan

For more information on and the use of dispersants in this EP, see Section 8 (Risks associated with spill response), Appendix 7-1 Oil spill modelling study and Appendix 9-1 (Oil Pollution Emergency Plan).