Frequently-Asked Questions

General Questions

Here are answers to some questions that people have asked about general in-situ burning topics.

Q. What is in-situ burning (ISB)?

A. ISB involves controlled burning of oil that has spilled from a vessel or a facility, or burning oil on the vessel itself before it has a chance to spill into the environment. When burning is done on open water, the oil is contained within a boom and ignited using a hand held igniter, or an igniter from a helicopter. The burn continues only as long as the oil is thick enough--usually about 1/10 of an inch or 2 to 3 millimeter. When conducted properly, in-situ burning significantly decreases the amount of oil on the water, thereby preventing that oil from reaching the shore. Burning can be a useful tool in oil spill response.

Q. Is ISB an effective way to remove oil from the water?

A. Although the efficacy of ISB is highly dependent on a number of physical factors, test burns and applications in actual spill situations suggest that ISB can be very effective in removing large quantities of oil from the water. Under the right environmental and oil conditions, burning can remove up to 95-98% of contained oil from the water. While all spilled oil cannot generally be burned, ISB can remove large quantities of oil from the water, preventing or significantly reducing the extent of shoreline impacts.

ISB is more effective in removing crude oil than other types of oil from the water surface. With lighter, lower viscosity oils, it is difficult to maintain the necessary slick thickness; heavier, less volatile oils are difficult to ignite.

Q. Does the spill response community compare the potential harm to the air versus the water and surrounding environment?

A. Yes. The goal when conducting in-situ burning is to protect the environment as much as possible while ensuring that air pollution impacts do not jeopardize human health. Uncollected oil can adversely affect wildlife, fish, recreational beaches, and the rest of the marine environment for a long time. Usually, the air pollution impacts of a burn are short-lived, but they may be substantial. A smoke plume caused by the burning of oil will usually be confined to a relatively narrow band that may stretch for some miles, while uncontained oil will likely be taken by the currents over a wide geographic area.

An oil spill causes air pollution whether or not burning is used. Therefore, responders must consider the relative risks of evaporating vapors against the smoke created by burning. Vapors from a large spill in a populated area could

pose a significant health threat. Up to 50 percent of a light crude oil spill can evaporate fairly readily, and that 50 percent contains the acutely toxic, lighter fractions, or volatiles, that move quickly into the atmosphere. The volatiles released from spilled oil may be more toxic to humans than the smoke from burned oil, depending on the concentrations. They may contain volatile organic compounds, including benzene (a known human carcinogen), toluene, xylene, hexane, and others. Whether the oil is burned or allowed to evaporate, air quality will be compromised for a certain period of time.

Q. Why do we have to burn the oil? Why not just clean it up?

A. In-situ burning is one of several options available to combat a spill. It should **complement** other options, not exclude them. When possible, spill responders start mechanical recovery immediately, using booms, skimmers, and other equipment. When feasible to carry out, in-situ burning is fast and efficient. It can remove up to 99 percent of the oil contained in the boom, and reduce the need for storage and disposal. When it is safe and environmentally wise to use in-situ burning, the environment benefits because more oil will be removed from the water.

Q. Under what circumstances can in-situ burning occur?

A. There are a number of physical limitations that restrict the feasibility of burning, including wind speed, wave height, oil type, and the degree of emulsification of the oil (how much it has mixed with the water). The basic criteria are that:

- human populations will not be exposed to smoke that exceeds state and federal health standards.
- the burn must be monitored for the safety of cleanup crews and potentially affected populations, and will be stopped if safety standards cannot be maintained.
- sea and weather conditions must allow for an effective burn.

Q. What if the weather changes? Can the fire be put out?

A. Monitoring will be conducted to ensure conditions remain appropriate for a burn. (More information about monitoring in-situ burning is available **here**.) If conditions do not remain appropriate, a burn on open water can be extinguished very quickly simply by releasing the end of the boom containing the oil. This allows the oil to spread to its natural thickness, which is ordinarily too thin to sustain combustion. When a burn is done on a ship or on land, extinguishing the burn is difficult, and in some cases, impossible.

Q. What does the smoke contain? Are the emissions from the fire harmful?

A. Burning oil produces a dense cloud of black smoke. The dark color of the smoke is due to very small black particles of carbon. Very fine particles can lodge inside the lungs and cause respiratory problems, mostly to individual already suffering from other respiratory diseases. Other substances can adhere to particles and be inhaled. While it is generally long-term (months or years) exposure to these small particles that impact health, short-term exposure in sufficient concentrations can cause the aggravation of symptoms in sensitive individuals with existing heart or lung disease.

An oil fire also produces water vapor and invisible gases, mainly carbon dioxide, carbon monoxide, sulfur dioxide, and oxides of nitrogen. Studies of the gases produced by oil fires show that the concentration of gases produced during in-situ burning are within safe levels for humans beyond three miles downwind of the source. Oil is composed of hundreds of hydrocarbons, some of which don't burn completely. As a result, the emissions from the fire can include hydrocarbons, including very low levels (less than 0.1 parts per million) of polyaromatic hydrocarbons.

The by-products of burning oil are similar to those from the burning of other products, such as firewood and fuel for cars, trucks, home furnaces, and factories. The main difference between ISB and other burns is that oil doesn't burn very efficiently during ISB, and produces particulates that give the smoke its dark color.

Q. What health standard do responders use when considering a burn?

A. Spill responders use an especially stringent outdoor air quality standard to guide their burning decisions. Fine-particle pollution is the major concern in evaluating health effects from smoke. These particles are defined as those less than 10 microns (thousandths of a millimeter) in diameter. (Fifty 10-micron particles would stretch across the period at the end of this sentence.) The current national and state health standard is a maximum concentration in a 24-hour period of 150-micrograms of fine particle per cubic meter of air.

Some health professionals do not believe that the current standard of 150 micrograms per cubic meter of air averaged over a 24-hour period adequately protects the health of sensitive individuals, such as children or those with existing heart or lung disease. New research has prompted a review of the existing standard that could lead to a more protective standard. Based on recommendations by the Centers for Disease and Prevention (CDC) and other federal agencies, the National Response Team has recommended to federal response officials that the level of concern be set at **150 micrograms per cubic meter of air averaged over one hour**, which is much more stringent than the 24-hour measurement.

Q. How much smoke should I expect from the burn? How long will it stay in the air?

A. Because of the intense heat, the smoke plume from an oil fire usually goes up into the atmosphere several hundred to several thousand feet. It then levels off and moves according to the weather conditions. How long the smoke stays in the air depends on the wind direction and weather conditions at the time of the burn. Some parts of the plume may dip back down toward the surface, but most of the smoke usually stays well up in the air and dissipates as it is carried away by the prevailing wind. Parts of the plume may stay in the general area of the burn for several hours after a burn is completed, but the thickest part of the plume usually dissipates within a short period of time.

Q. Shouldn't we be more worried about preventing spills, instead of burning them?

A. Absolutely! Preventing spills is our number one priority. The oil industry and certain state and federal agencies are working hard to find ways to prevent spills from happening. It is far less costly to prevent spills than to clean them up. There are both federal and state laws and regulations that address prevention. Despite everyone's efforts, however, spills happen, and the response community must be prepared to use all appropriate tools to respond effectively.

From:
Office of Response and Restoration, National Ocean Service, National Oceanic and Atmospheric Administration