

# *In Situ* Burning in Oil Spill Response

## General Spill Response Considerations

**W**hen prevention efforts fail and oil spills on the water, spill responders face a difficult battle against a dynamic and ever-changing opponent. *In situ* burning is one of several tools that may be employed, individually or in combination, to minimize consequences of the spill.

## What Is In-Situ Burning?

*In-situ* burning means the controlled burning of oil “in place.” On open water, burning requires specialized fire resistant boom because uncontained oil rapidly spreads too thin to sustain combustion. *In-situ* burning requires less labor than most other techniques and can be applied in areas where other methods can not be used because of limited access to the spill location or ice conditions. Fire-resistant booms are subject to some of the same wind and sea limitations as mechanical removal, since a fire boom behaves much like a standard containment boom. However, burning rapidly removes large quantities of oil and, minimizes the need for recovery and storage.



Newfoundland Offshore Burn Experiment, Canada 1993  
Photo: David Evans, NIST

## Where the Oil Goes

The primary products of *in-situ* burning of oil are carbon dioxide and water vapor. About 90% to 95% of the carbon product is released to the atmosphere as carbon dioxide, while particulates commonly account for only about 5% to 10% of the original volume burned. In addition, about half of the particulates are soot, which is responsible for the black appearance of the smoke plume.

Field experiments have shown that most air pollutants of concern produced by an *in-situ* burn are concentrated around the area of the fire. Only one pollutant, the fine particles in the smoke, is of concern beyond the immediate area of the fire. Although these small particles from an *in-situ* burn will typically remain suspended and dilute high above the human breathing zone, monitoring plans have been established so responders can monitor particulate levels to ensure the protection of public health.

## Effectiveness

During experiments and accidental burns of petroleum on water, *in-situ* burns have often removed over 90% of the contained oil. The small percentage of the original oil volume left unburned is typically a viscous, taffy-like material that floats for a long enough period of time to be manually removed.

## Approval of In-Situ Burning

Because of the tradeoff decisions involved, certain approvals must be obtained prior to use of *in-situ* burning. Use of burning agents to increase oil combustibility is regulated by Subpart J of the National Contingency Plan. The State Implementation Plans required by the Clean Air Act are the primary plans that regulate air quality and pollutant sources. Agreements between state and federal regulatory authorities establish areas and necessary conditions where rapid decisions on *in-situ* burning may be made by the Federal On-Scene Coordinator and/or the State On-Scene Coordinator(s).

## What Are the Potential Benefits?

- Reduces impact of oil on shorelines, sensitive habitats, birds, mammals, and other wildlife.
- Rapidly consumes oil in the burn.
- Reduces oil storage and disposal problems.
- Eliminates the air quality impacts of the volatile hydrocarbons that would otherwise evaporate.
- The products of combustion are diluted in the air above and downwind of the burn, dispersing rapidly at ground level to normal concentrations.

## What Are the Potential Tradeoffs?

- Air quality impacts limits use to certain locations and conditions to ensure protection of public health.
- Higher risks associated with sizeable fire.
- Application may be restricted by equipment availability and time window for effective use.