



ASTM Standards: Technical Resources for Oil Spill Response

For more than 35 years, ASTM International standards have served as proven technical resources in oil spill response and cleanup operations. The recent disaster in the Gulf of Mexico has highlighted the critical role that ASTM standards play in assisting stakeholders confronted with managing the environmental and economic consequences of a major oil spill.



ASTM COMMITTEE F20: EXPANSIVE AGENDA IN OIL SPILL CLEANUP AND RECOVERY

Since starting its work in 1975, ASTM International **Committee F20 on Hazardous Substances and Oil Spill Response** has developed an extensive portfolio of standards that addresses the performance, durability, strength of systems and techniques used for the control of oil and hazardous substances spills around the world. For 35 years, the oil producers, regulators, equipment manufacturers and environmental advocates who comprise the committee's membership have kept pace with the latest technologies and innovations designed to mitigate the impact of oil spills and speed recovery processes.

Today, oil spill related subjects covered in F20's 59 standards include containment booms and skimmers, dispersants, in-situ burning, surveillance and tracking, shoreline countermeasures, bioremediation, adsorbents and other topics. All of F20's standards are published in the third edition of the compilation, *ASTM Standards on Hazardous Substances and Oil Spill Response*.

F20 currently has nine technical subcommittees, including six that specifically address the development of standards used in oil spill response. Among these subcommittees is F20.11 on Control, which focuses on standards for oil spill containment booms. During the initial stages of an oil spill, it is critical to control slicks as quickly as possible to minimize potential damage to natural resources and property. The most commonly used containment devices are floating barriers called booms, which are used to control the spread of oil and to facilitate recovery and removal.

The interconnectibility of different booms is essential in order to optimize their effectiveness in oil spill applications.



Responders in the gulf, where more than 1 million feet (300 km) of boom has been deployed to support spill control activities, are benefiting from F20.11 boom connector standards such as F962, Specification for Oil Spill Response Boom Connection: Z-Connector. F962 facilitates the mating of booms of various sizes, strengths, design and manufacture. Another F20.11 standard providing similar utility is F2438, Specification for Oil Spill Response Boom Connection: Slide Connector, which defines the requirements to mate booms utilizing typical universal slide connectors.

OIL RECOVERY AIDED BY F20 SKIMMER STANDARDS

Committee F20 standards also play an important role in the selection and performance of skimmers, the wide-ranging group of brushes, pumps and other devices used to remove oil from the water's surface. Subcommittee F20.12 on Removal currently has seven standards relating to skimmers, including guides that assist in equipment selection; support the testing of skimmer effectiveness; and provide techniques for obtaining representative samples of oil and water mixtures. Newest among these is ASTM F2709, Test Method for Determining Nameplate Recovery Rate of Stationary Oil Skimmer Systems. This standard assists both producers and buyers by providing a methodology for verifying and accurately reporting skimmer system performance. Manufacturers can now better demonstrate that their systems will perform as specified while buyers gain valuable data to support the planning and selection of equipment.

FACILITATING SAFE AND EFFECTIVE APPLICATION OF OIL SPILL DISPERSANTS

Another tool available to oil spill responders is dispersants. These chemical surface washing agents act as detergents, breaking down slicks into smaller oil globules, which can be more readily carried away in the water. The main benefit of dispersants is their ability to dissolve a slick before it moves toward the shoreline, where it endangers birds and marine mammals, and leaves beaches unsafe for use. Industry experts emphasize that dispersants are most effective when they are used during the initial response phase — usually within the first 12 to 48 hours after a spill — when the oil is freshest and is more easily dispersed.

The use of chemical dispersants during oil spill response has been an area of debate concerning the potential impact on marine life. To assist local and regional response teams in assessing the ecological considerations of dispersant use, ASTM Subcommittee F20.13 on Treatment has developed a series of valuable guidelines. Among these standards is F1210, Guide for Ecological Considerations for the Use of Oil Spill Dispersants in Freshwater and Other Inland Environments, Lakes and Large Water Bodies. The subcommittee has also developed similar guides for the use of dispersants in ponds and sloughs (F1209), rivers and creeks (F1231), tropical environments (F2205) and other surfaces.

Another notable standard in this area is ASTM F2532, Guide for Determining Net Environmental Benefit of Dispersant Use. The standard assists responders in using net environmental benefit analysis (NEBA) in evaluating the advantages and disadvantages of dispersants. NEBA supports the development of a response strategy that results in the lowest overall environmental and socioeconomic impacts.

In the gulf, dispersants have been distributed on a large scale by aircraft flying over the spill. Providing valuable technical resources to optimize the effectiveness of dispersant applications are such F20 standards as F1738, Test Method for Determination of Deposition of Aerially Applied Oil Spill Dispersants; and F1413, Guide for Oil Spill Dispersant Application Equipment: Boom and Nozzle Systems. F1413 covers spray systems employing booms and nozzles for use on boats, ships, helicopters or airplanes.

F20.15 STANDARDS ADDRESS IN-SITU BURNING OPERATIONS

Another notable focus area for F20 standards development is the process of in-situ burning, which involves the controlled burning of oil on the water surface or in a marsh. When used early in a spill, before the oil becomes weathered and releases its volatile components, burning can remove oil from the water's surface very efficiently and at very high rates.

The U.S. Coast Guard has effectively deployed in-situ burning at the Deepwater Horizon spill in the gulf, corralling oil into fire-proof booms and igniting it. Supporting this effort are standards developed by ASTM Subcommittee F20.15 on In-Situ Burning, including F2152, Guide for In-Situ Burning of Spilled Oil: Fire-Resistant Boom. F2152, considered a landmark consensus standard, was developed through close cooperation between the U.S. Coast Guard, the U.S. Minerals Management Service, Environment Canada and other key stakeholders.

In-situ burning is also an effective method in the marsh environment, which poses unique challenges for oil spill responders. The soft, soggy soil, the presence of water and the potential for ecological damage may inhibit the deployment of conventional oil recovery equipment and personnel while the shallow water may not allow the deployment and operation of skimmers, booms and storage devices. F20.15 addressed the needs of responders with the 2010 release of a first-of-its-kind standard, F2823, Guide for In-Situ Burning of Oil Spills in Marshes.

OIL SPILL SURVEILLANCE AND TRACKING SUPPORTED BY ASTM STANDARDS

During large-scale incidents like the gulf oil spill, it is critical that all parties involved have an equal understanding of the scope of the disaster so that response scenarios can be properly coordinated. Standards developed by ASTM Subcommittee F20.16 on Surveillance and Tracking provide valuable technical resources to help solve the challenging task of spill tracking. F20.16 standards



address topics such as visual observation, remote sensing and monitoring, reporting and tactical guidance.

In the gulf, oil spill workers are relying on ASTM F2534, Guide for Visually Estimating Oil Spill Thickness on Water, to help calculate and report on the number of barrels emitted per day from the site of the Deepwater Horizon incident. F2534 offers valuable utility to surveillance personnel who are trying to estimate the amount of discharges at sea as well as to gauge oil thickness for countermeasures and other purposes.

New activities within F20.16 are focusing on the use of cutting-edge technology that will further enhance oil spill tracking operations. Under development is a proposed standard that will help ship crews design and use vessel mounted camera systems to investigate and respond to an oil spill.

SHORELINE CLEANUP STANDARDS HELP PROTECT HABITATS AND NATURAL RESOURCES

When oil reaches the shoreline, sound cleanup decisions depend on detailed information about the relative sensitivity of the impacted area. Some areas may be so sensitive that cleaning methods could cause more harm than benefit. In such cases, natural recovery will be the preferred approach. In other cases, depending on the type of oil, the amount of oil present may be so extensive that recovery will be significantly delayed or not occur at all unless active intervention is carried out.

Subcommittee F20.17 on Shoreline Countermeasures has developed a series of guides that help responders make informed decisions prior to undertaking cleaning operations. ASTM standards F1686, Guide for Surveys to Document and Assess Oiling Conditions on Shorelines, and F1687, Guide for Terminology and Indices to Describe Oiling Conditions on Shorelines, provide proper procedures for defining and documenting the extent and type of shoreline oiling.

Information garnered from these two F20 standards is used in conjunction with F2204, Guide for Describing Shoreline

Response Techniques, and F2464, Guide for Cleaning of Various Oiled Shorelines and Habitats, to plan the appropriate course of action for cleaning and restoration. F2464 presents summary information from the National Oceanic and Atmospheric Administration's Characteristic Coastal Habitats guide to the relative physical and biological sensitivities of shorelines and other marine habitats.



ASTM COMMITTEE E47: GUIDANCE ON ENVIRONMENTAL IMPACT

Helping scientists and responders assess and manage the effect of oil spills on natural resources and marine life is also a focus of standards developed by ASTM International **Committee E47 on Biological Effects and Environmental Fate**. Founded in 1980, Committee 47 has a membership of more than 200 professionals who are responsible for a portfolio of close to 90 standards. E47 test methods, practices, guides and terminology are used to garner data about the effects of physical and chemical stress on aquatic and terrestrial plants and animals (including humans) and those properties of materials that affect and determine their fate, distribution and persistence when introduced into the environment.

In the gulf disaster, E47 standards are providing guidance to help evaluate the impact of oil and dispersants on the species that live in marine waters, sediments and coastal wetlands.

Standards such as ASTM E1367, Test Method for Measuring the Toxicity of Sediment-Associated Contaminants with Estuarine and Marine Invertebrates, are helping to examine the toxicity to organisms as well as bioaccumulation. For impacted water assessment, scientists are relying on E1563, Guide for Conducting Static Acute Toxicity Tests with Echinoid Embryos (sea urchins and sand dollars).

Armed with the data garnered from these E47 test methods and others, gulf spill responders can better determine the overall degree of natural resource injury, evaluate food chain exposures, prioritize cleanup strategies and document the effectiveness of remediation.

Following the Exxon Valdez oil spill in 1989, E47 also released a publication providing the first definitive explanation of the effects of the spill. *Exxon Valdez Oil Spill: Fate and Effects in Alaskan Waters* (STP 1219), contains 25 peer-reviewed papers that cover key topics such as chemistry and fate of the spill, shoreline impacts of the spill, effects on fish and fisheries, effects on wildlife, and archaeological site impact.

COMMITTEE D19 SUPPORTS WATER ANALYSIS IN THE GULF

Complementing the efforts of Committee E47 in the area of impacted water assessment in the gulf is a notable standard from ASTM International **Committee D19 on Water**. To support in-field analysis of oil in water analysis, professionals involved in clean up operations are relying on ASTM D7575, Test Method for Solvent-Free Membrane Recoverable Oil and Grease by Infrared Determination. D7575 covers the determination of oil and grease in water extracted with an infrared-amenable membrane and measured by infrared transmission through the membrane. It was developed by Subcommittee D19.06 on Methods for Analysis for Organic Substances in Water.

Like other major oil spills that have come before it, the Deepwater Horizon incident has underscored the important role that ASTM standards play as technical resources throughout virtually every aspect of cleanup and recovery operations. As new challenges emerge in these operations, continued cooperation by technical experts under the ASTM umbrella will help produce new technical standards to enhance oil spill response and to minimize the impact on the earth's natural resources.

ASTM INTERNATIONAL TECHNICAL COMMITTEES FOR OIL SPILL RESPONSE

The ASTM technical committees highlighted in this piece include:

- ▶ D19 on Water
- ▶ E47 on Biological Effects and Environmental Fate
- ▶ F20 on Hazardous Substances and Oil Spill Response