by Jed Hellmich

Deepwater Horizon Oil Spill Response and Cleanup

Over 7 billion barrels of oil are consumed by the United States every year.[1] In order for oil to be processed for energy production, it must be extracted from the earth, and then transported to a refinery, which makes it into a useable fuel source. Most crude oil is drilled and extracted from the earth out at sea, and then transported to refineries via large tanker ships. During extraction and transportation of the oil, problems can arise which can lead to crude oil being leaked into marine and coastal environments. Depending on tides and currents, crude oil can spread rapidly and, if not properly contained, can make its way to coasts. Crude oil is toxic to most plants and animals, and due to the nature by which it is extracted and transported, plants and animals that depend on the ocean or coastal regions for survival are most negatively affected by oil spills.

The types of equipment used, and the response action taken after an oil spill, are dependent upon the properties of the oil. Oil properties can vary based on air and water temperature, the degree of refinement of the oil, the geographical location, and the length of time the oil was exposed to the water. According to the U.S. Environmental Protection Agency (EPA), crude oils can be broken into four classifications: light, volatile oils (Class A); non-sticky oils (Class B); heavy sticky oils (Class C); and non-fluid oils (Class D). The oil classifications are based on the viscosity characteristics of the oil, as well as its ability to adhere to and enter porous surfaces. Class A oils are highly fluid and often clear; most refined products and many of the highest quality light crudes can be included in this class. Class B crude oils are waxier and more adherent to surfaces than Class A oils. Class C is very viscous and has tar-like characteristics. Class D oils are non-liquid and are dark brown or black in color.[2]

Containing the Spill

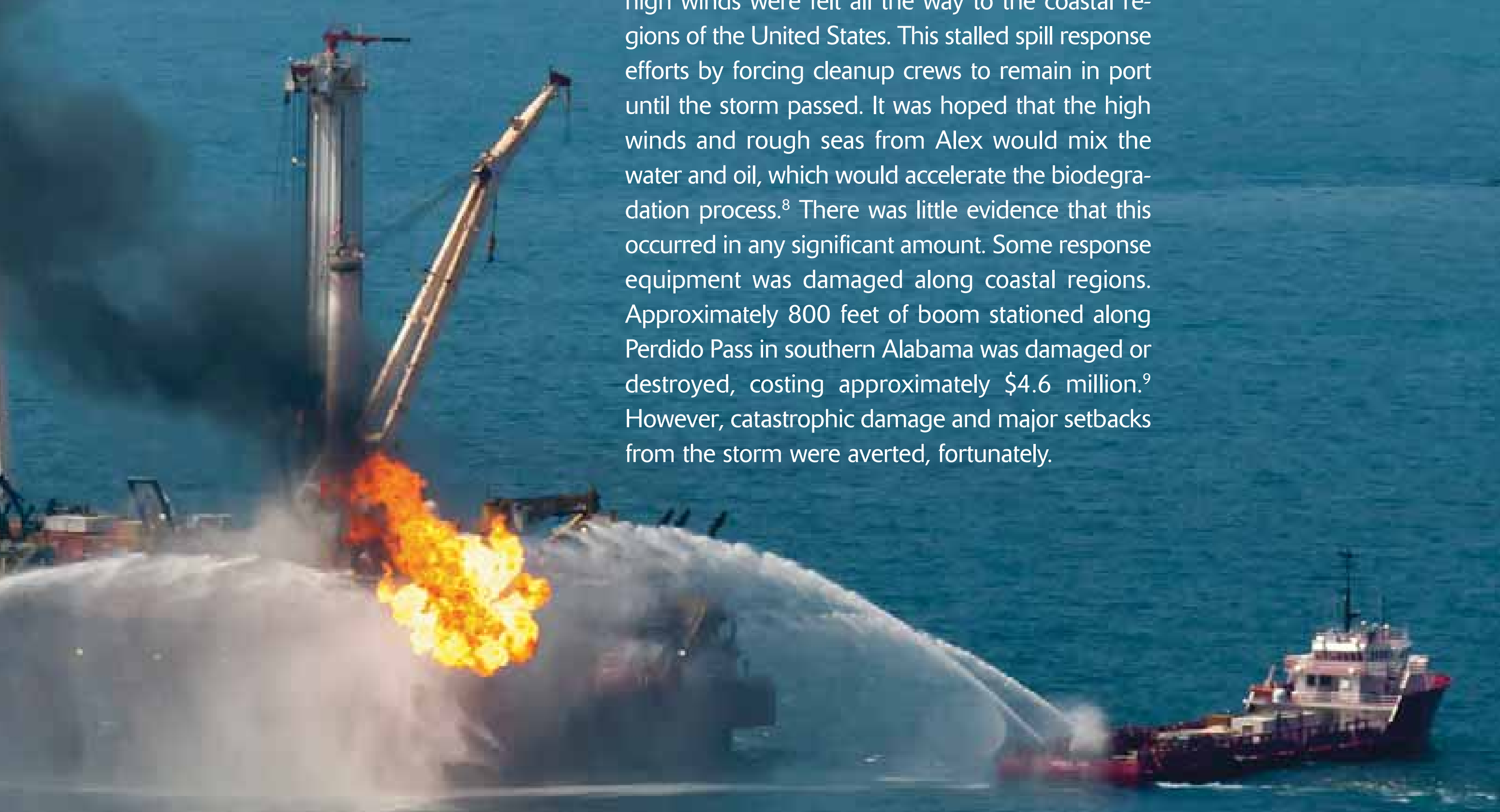
The most current major oil spill to date occurred on April 20, 2010.[3] It happened approximately 41 miles south of Louisiana at the site of the *Deepwater Horizon* oil rig platform. The spill was caused by a drilling explosion, and the subsequent sinking of the oil platform. Eleven workers were killed during the explosion, and approximately 190–200 million gallons of crude oil leaked into the Gulf of Mexico.[4] The well was finally capped on July 15, 2010.

Once it was realized that thousands of gallons of oil were leaking from the destroyed *Deepwater Horizon* oil platform, BP along with many government agencies began a massive effort to contain and remove the leaked oil from the Gulf of Mexico. The initial priority in any oil spill response operation should be to confine the spill to the smallest area possible. Oil spill containment equipment is used to prevent or slow the spread of oil from one area to another. Containment equipment can also be used to protect areas along the coast from incoming oil.

The primary types of oil containment equipment are booms. Booms are the most popular type of equipment used to contain and divert oil spills. They are typically used either for containment or deflection of an oil spill, and the method of use mainly depends on the size of the spill and/or how dispersed the oil has become. All booms consist of a flotation member, free board member, skirt, tension member, and ballast. The flotation member keeps the boom system buoyant while the free board member and skirt keep oil from overtopping or going underneath the boom. The tension member and ballast are there to keep the boom upright and also to provide additional bracing. Stationary booms are used to encircle small spills in order to prevent them from spreading, or to protect coastal habitats from approaching oil. Booms can also be towed behind vessels in order to corral oil into a more confined area, which enables it to be removed much more efficiently.[5] Over the course of the Gulf response effort, approximately 4 million feet of boom have been deployed.[6]

Boom technology is commonly used in oil spills, but is not failsafe even when used correctly. Failure usually occurs when wind or wave action becomes severe. Water can be pushed over the boom, or forced underneath the boom by high currents and waves. High winds and/or waves can cause the boom to be submerged or to flip over. Debris pushed into booms by currents can cause structural failure in the boom.[7] Structural failure is the worst type of boom failure. Structural failure typically results in the boom separating into discontinuous segments, thereby allowing large quantities of oil to pass.

Hurricane Alex posed a major threat to the cleanup operations in the Gulf. On June 1, 2010, the tropical storm was upgraded to hurricane status.[8] It made landfall in Mexico passing approximately 500 miles southeast of the spill site. Rough waters and high winds were felt all the way to the coastal regions of the United States. This stalled spill response efforts by forcing cleanup crews to remain in port until the storm passed. It was hoped that the high winds and rough seas from Alex would mix the water and oil, which would accelerate the biodegradation process.[8] There was little evidence that this occurred in any significant amount. Some response equipment was damaged along coastal regions. Approximately 800 feet of boom stationed along Perdido Pass in southern Alabama was damaged or destroyed, costing approximately $4.6 million.[9] However, catastrophic damage and major setbacks from the storm were averted, fortunately.



Boom technology is commonly used in oil spills, but is not failsafe even when used correctly.

Removing the Leaked Oil

Removal of the leaked oil from the environment is one of the primary goals in any spill response operation. The predominant types of equipment used for oil removal are skimmers. Skimmers are specially designed to remove oil from the water's surface. These contraptions are typically mounted on specialized seafaring vessels that contain large oil storage tanks.

The three main components that compose a skimmer are a pickup head, which removes oil from the water surface; a pump system, which is used to move oil from the oil/water separator to the storage tank; and an oil/water separator, which uses gravity to separate the oil.[10]

Skimmer performance and the type of skimmer used for specific applications depend on water conditions, viscosity of the oil, and thickness of the oil slick. Most skimmers do not perform well in high winds, rough seas, or when a large amount of debris is present. During the *Deepwater Horizon* response effort, more than 830 skimmer vessels were deployed to help combat the spill. Skimmers have so far been able to recover approximately 35 million gallons of oily water from the Gulf.[6]

Deepwater Horizon Cleanup Operations

Many of the methods used in the *Deepwater Horizon* cleanup operations were effective, but could have been better designed. Some deficiencies in the Gulf response operations are not related to the amount or type of equipment used. One of the main problems was lack of worker experience and insufficient training. Many of the contract workers that BP hired had no experience or background in oil spill response. This was especially prevalent along the coastal regions where many of the contracted workers had backgrounds in other areas ranging from local fishermen and shrimpers to teachers or waiters. Although workers were required to attend at least one mandatory training course, the workers described the courses as elementary. While it is understood that these training courses must be condensed in order to swiftly increase the amount of manpower in the spill response efforts, the necessary material must still be covered thoroughly and efficiently.

During cleanup operations, most activated contract workers were paid for the amount of time they worked (hourly or daily), and not by the amount of work that they had accomplished (i.e., the amount of oil removed, number of feet of boom deployed, etc.). Many of the workers also had very little, or no managerial supervision. This system provided very little incentive for the workers to perform their work in an effective and efficient manner. It has also been suggested that BP's pay-for-time-worked policy, and not pay-for-performance, is why only a limited number of new technologies were used by oil response contracting companies. According to Dan Parker, CEO and founder of C.I.A Agent Solutions, "a majority of response companies are only interested in billing for time (labor) and materials. They make a huge profit using 50-year-old technology."[11]

Besides technology used, there were other variables that factored into the cleanup processes from this spill. The size of the area in the Gulf that was encompassed by oil made containment and recovery operations all the more challenging, and the use of dispersants caused oil to break down and be easily carried away by ocean currents. BP's initial underestimation or downplay of the size of the leak also negatively affected the efficiency of the oil spill cleanup response.

Lessons from Deepwater Horizon

There are many lessons that can be learned from the *Deepwater Horizon* oil spill, but properly managing and training contract workers is of paramount importance. The following measures are the minimum that should be undertaken by response agencies to ensure that contract workers are being fully utilized:

- Develop an effective oil response-training program that can be implemented immediately after a spill occurs.
- Prepare an easy to understand guidebook that describes the proper ways to use oil response equipment. The book can be carried by contract workers to use as a reference when working in the field.
- Develop a management plan that describes how contract workers will be supervised when performing response operations.
- If a spill occurs, offer incentives to contractors that

use effective response technologies. This not only will increase the production rate of contractors, but it could also lead to the discovery of new, more efficient response technologies.

The *Deepwater Horizon* oil spill was the largest spill to occur in U.S. waters. Even if BP and/or the U.S. government had a perfect response plan, the results with today's technology would have only been marginally better. Too much oil leaked from the site, making substantial containment or recovery of the oil impossible. Obviously, the best way to avoid oil spills from wreaking havoc on the environment is to prevent them. Unfortunately, this is unlikely to happen in the near future due to the world's dependence on fossil fuels. Even with the best minds and the best equipment in the world, there is only so much that can be done once a large spill occurs. In the end, it is up to Mother Nature to remove most of the oil through biodegradation, evaporation, and photochemical breakdown. **em**

References

1. Churchill, J. *Oil Consumption in North America*, November 13, 2000; available at http://maps.unomaha.edu/peterson/funda/sidebar/oilconsumption.html (accessed April 2011).
2. *Emergency Management*; U.S. Environmental Protection Agency, 2009; available at http://epa.gov/oem/content/learning/crude.htm (accessed October 2010).
3. *Deepwater Horizon Timeline*; offshore-technology.com; available at www.offshore-technology.com/features/feature84446/ (accessed October 2010).
4. *The Deepwater Horizon Spill by the Numbers*; Popular Mechanics, August 10, 2010; available at www.popularmechanics.com/science/energy/coal-oil-gas/bp-oil-spill-statistics (accessed April 2011).
5. Fingas, M. *The Basics of Oil Spill Cleanup, 2nd Edition*; CRC Press, 2000.
6. Current Operations; RestoreTheGulf.Gov, November 21, 2010; available at www.restorethegulf.gov/response/current-operations.
7. *World Catalog of Oil Response, 9th Edition*; Potter, S.; Morrison, J. Eds. S.L. Ross Environmental Research Ltd.: Ottawa, Ontario, Canada, 2007.
8. White J. *Effect of Hurricane Alex on Gulf of Mexico Oil Spill Cleanup Assessed*; nola.com, July, 2, 2010; available at www.nola.com/news/gulf-oil-spill/index.ssf/2010/07/effect_of_hurricane_alex_on_gu.html (accessed April 2011).
9. *Hurricane Alex Damages Oil Barrier Erected at Perdido Pass*; Associated Press, July 1, 2010; available at www.nola.com/news/gulf-oil-spill/index.ssf/2010/07/hurricane_alex_damages_oil_spi.html (accessed April 2011).
10. Cormack, D. *Response to Marine Oil Pollution–Review and Assessment*; Kluwer Academic Publishers: Dordrecth, The Netherlands, 1999.
11. *Gulf Oil Spill: Did BP Choose Profits Over Modern Oil Spill cleanup Technology?*; All Voices, November 29, 2010; available at www.allvoices.com/contributed-news/7475570-gulf-oil-spill-did-bp-choose-profits-over-modern-oil-spill-cleanup-technology (accessed November 2010).