What Do You Think?

Ultradeep Drilling

The Deepwater Horizon, a floating drill rig that sank and spilled about 200 million gallons (nearly 800 million liters) of crude oil into the Gulf of Mexico, wasn’t by any means working on the deepest or most remote well in the world. For the Gulf, the record is currently held by the Perdido Spar rig, which is drilling wells in 9,627 ft (nearly 3,000 m) of water about 320 km east of Brownsville, Texas. The Perdido (which means “lost,” “missing,” or “damned” in Spanish) is a technological marvel. It’s a spar platform, meaning that the drill rig sits on top of a huge, hollow cylinder that’s nearly as tall as Paris’s Eiffel Tower. The spar is tethered to the ocean floor by nine thick cables, and supposedly withstand hurricane winds, fierce ocean currents, and giant waves. The rig can support 35 wells that go down as much as 6 km below the ocean floor and radiate out horizontally up to 16 km from the well head. It’s expected to produce about 130,000 barrels of oil plus 200 million ft³ (about 6 million m³) of natural gas per day.

A spar platform is one of several designs for underwater drilling. In shallow water, up to about 500 m, a fixed platform with very long legs that sit on the sea floor can be used. Beyond 500 m, floating or semi-submersible rigs are used. The Deepwater Horizon, which could drill in up to 2,000 m of water, was built on giant pontoons partially filled with seawater for ballast. All the drilling equipment and living quarters for hundreds of workers sat on decks built up by the pontoons. Like spar rigs, floating platforms are anchored for stability. Even greater depths are accessible from dynamically positioned drilling ships. For example, the Discover Clear Leader, owned and operated by Transocean, is capable of drilling in water nearly 4,000 m deep, and then punching down another 10,000 m through the seabed to ultradeep oil deposits.

Conditions at these depths are extreme. The oil can be 200°C, while water temperatures at the seafloor are just above freezing. Temperature shocks can rupture drill pipe. Oil deposits often accumulate beneath splinterly shale or thick layers of taffy-like salt. Corrosion from the salt or sulfur in sediments erodes metal while strong ocean currents sweep equipment away. These depths are too great for human divers to do repairs, so drill operators have to depend on remotely operated robots to do all their work. We think of the seafloor at great depths to be a featureless, lifeless, mud-covered abyssal plain, but in fact it’s often a jumble of deep canyons, sharp ridges, and huge piles of jumbled rocks with a rich, if largely unknown, community of life. All this makes drilling extremely difficult. Even under normal conditions, operating a drill rig, such as the Perdido, costs about $500,000 per day.

In spite of the disaster at the Deepwater Horizon, many countries are rushing to drill in harsh frontier environments. Before 1995 only about 10 percent of oil from the Gulf of Mexico came from deep water (more than 2,000 m), but now, as the shallow fields are being exhausted, about 70 percent does. The economic rewards of hitting a big find are enormous. The Bureau of Ocean Energy Management, Regulation and Enforcement (the successor to the disgraced Minerals Management Service) estimates that the U.S. outer continental shelf holds about 86 billion barrels of oil and 420 trillion cubic feet (12 trillion m³) of gas. This represents about 60 percent of the oil and 40 percent of the natural gas resources for the United States. Brazil has recently begun tapping an ultradeep oil field that could hold between 50 to 100 billion barrels of oil about 300 km offshore in the Atlantic Ocean. This find could be worth $10 trillion and make Brazil a major player in international oil.

And even after seeing crude oil seeping into the Gulf of Mexico, fish and shellfish wallowing in black sludge, and BP responsible for billions in damages, other nations are rushing to do their own ultradeep drilling. Ghana, Nigeria, Angola, Congo, Libya, Egypt, and Australia are among the countries offering deep-sea oil leases in their oceanic territories. If the agencies in the United States that are supposed to regulate offshore drilling are rife with cronyism, corruption, and incompetence, think what the oversight may be in some of these other places. America, Canada, and Russia also are exploring drilling in the Arctic Ocean (remember the Titanic?). All this is fueled, of course, by our insatiable appetite for oil. What do you think? What are the limits to the risks we are willing to take for the oil to which we’ve become accustomed?