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A Mud More Complex Than the Garden Variety

By HENRY FOUNTAIN

On the front lines in the battle to kill the out-of-control oil well in the Gulf of Mexico is a material with the consistency of a half-melted milkshake and a mundane name: mud.

But mud, more formally known as drilling fluid, is far from simple. It is designed and engineered to meet specific needs when drilling — or in this case, killing — a well. There are countless variations on the basic cocktail of clay and other minerals mixed with water or oil to make a slurry.

“The key property for well-control purposes is density,” said John Rogers Smith, a professor of petroleum engineering at Louisiana State University. Gallon for gallon, drilling mud can be two or more times denser, and thus heavier, than water.

Weight is what BP engineers are counting on as they perform a so-called top kill, in which they force-feed mud down the throat of the blown-out well 5,000 feet below the surface. If they can pump enough of it fast enough, at some point the column of mud will have enough downward force to keep the upward-flowing oil and gas at bay. While most muds used in offshore drilling have oil as the liquid, BP is using a water-based mud for its top-kill attempt, said an executive involved in the effort who spoke on the condition of anonymity because he was not authorized to discuss it publicly. During the operation, mud flows out of the well into the gulf, and water-based muds are environmentally safer, he said.

The executive said the mud has been “weighted up” by adding dense powdered minerals so that

it weighs 16.4 pounds per gallon. Additives have been mixed in to improve the flow and prevent the formation of icelike structures of gas and water called hydrates.

In the early days of oil drilling a century ago, actual mud was circulated down and back up the well hole as a coolant and to remove bits of drilled-out rock. But as holes went deeper and pressures increased, “just plain dirt and water wasn’t enough,” said Ryen Caenn, a mud consultant who works with drilling companies. So drillers started adding dense minerals and substituting oil for water.

A typical deep well might use around 100,000 gallons of mud, pumped constantly through the well. For the top kill, BP stockpiled more than two million gallons of mud on ships in the gulf.

“That’s a massive amount of mud,” said another person involved in the effort, who asked for anonymity because he was not authorized to discuss it. BP is getting the material from five companies, he added. “They’re supplying as much as they can get their hands on.”