Engineering an Environmentally Friendly Drilling Fluid

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Thousands of wells are drilled in shale reservoirs annually. The most common type of fluid used to drill horizontal wells in shale reservoirs is oil-based mud, using diesel and other components. One purpose of drilling mud is to remove cuttings, and typically hundreds of tons from each well are taken to landfills. This research focused on creating an oil-based mud where cuttings could be repurposed via land-farming. Salt was determined as the key component that prevents plants from growing in soils mixed with traditional oil-based mud. New oil-based drilling fluids designed to reduce toxicity to plants, while maintaining the properties necessary to drill were created using various oils and salt replacements. Each mud was combined with synthetic drill cuttings and soil to simulate if the mixture would be usable for land-farming. Olefin is an environmentally-approved oil used in oil-based muds to drill in the Gulf of Mexico, where cuttings are disposed of directly into the water. A unique olefin-based mud using propylene glycol as a salt replacement was engineered. This mud possessed the correct characteristics to successfully drill wells in shale reservoirs, and the cuttings contaminated with this fluid were mixed with soil that successfully grew plants. This more environmentally friendly mud system can replace traditional diesel based mud, and cuttings can be land-farmed. As a result, fewer landfills would be needed thus decreasing toxins released into the air, lowering the risk of groundwater contamination from fluids leaching into the ground, and saving land resources for more productive uses.

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