HDD Drilling Fluids: Mixed Metal Oxide (MMO)

The biggest difference between drilling fluids for vertical rotary mud drilling and horizontal directional drilling (HDD) applications is in the requirements for gel strength. In vertical rotary mud drilling, gravity is pulling the solids downward while the flow of drilling fluid is in the opposite direction. Therefore, if the annular ascending velocity of the drilling fluid is faster than the settling rate of the drill cuttings, the drill cuttings are carried out of the hole. Things become much more complex in the world of HDD. Where the flow is horizontal and the force of gravity is perpendicular to flow, annular flow rates are much lower, and drill cuttings have only inches to fall before they hit the bottom of the hole. While xanthan gum products are most commonly used to increase gel strength/suspension in bentonite HDD drilling fluids, while also keeping viscosity down, mixed metal oxide products are becoming increasingly popular in difficult drilling conditions such as gravel or cobble.

Mixed metal oxide (MMO), a mixture of magnesium/aluminum oxides and alkaline salts, has a layered crystal structure that closely resembles the platelet structure of Wyoming sodium bentonite. MMO is positively charged (cationic) while Wyoming sodium bentonite and most all of the polymers and additives used in bentonite drilling fluids are negatively charged (anionic). Bentonite/MMO drilling fluids can create tremendous gel strengths in order to suspend heavy drill cuttings. MMO drilling fluids provide second-to-none suspension/gel strength while minimizing annular pressures.

Extreme soil conditions such as gravel or cobble require extreme gel strength to suspend and carry out cuttings, especially in horizontal directional drilling applications, and that’s where MMO drilling fluids come into play. MMO drilling fluids are very different from conventional bentonite drilling fluids. Extreme soil conditions such as gravel or cobble require extreme gel strength to suspend and carry out cuttings, especially in horizontal directional drilling applications, and that’s where MMO drilling fluids come into play.