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Oil Drilling Equipment Manufacturer Reduces Thread Failures with *Molykote*® P-37 Anti-Seize Paste

Customer

Noble Drilling Corporation—A global leader in the development and implementation of drilling technologies for the oil industry.

Location

Headquarters in Sugar Land, Texas

Challenge

Find a high-performance lubricant that can withstand extremely high torque in stainless steel threaded connections to prevent cold welding or galling of the sealing surfaces and reduce an unacceptable failure rate.

Solution

Dow Corning's Molykote team met with Noble engineers and examined the failed connections, which displayed galling and thread defects. It was determined that the existing anti-seize compound was being squeezed out by the extremely high torque, so Dow Corning recommended *Molykote*® P-37 Anti-Seize Paste.

Results

Molykote® P-37 Anti-Seize Paste has proven its ability to form a durable lubricating film in threaded connections requiring 32,000 and 62,000 ft-lbs of torque. Drilling engineers have found that the lubricant adheres tenaciously to the stainless steel components, facilitating easy disassembly when required and helping to reduce failures by an estimated 50%.

When engineers at Noble Drilling Corporation started experiencing an unacceptable failure rate in stainless steel threaded connections on its massive oil drilling equipment, the situation created some serious problems. Each time the stainless drill components had to be removed from service for repair at a specialty machine shop offsite, the firm not only incurred the expense of extra labor, shipping and refacing the damaged threads, it also lost the critical sections for up to a week of field service.

"These steerable rotary drilling systems are comprised of multiple segments, with critical sections made of stainless steel," explained Chad Chichester from Dow Corning. "Each stainless component is secured with 4-1/2" or 6-5/8" API threaded connections, tightened to standard torque values of 32,000 and 62,000 ft-lbs, respectively."

As Noble moved toward commercializing its newest generation of rotary steerable drilling systems, one of its design teams consulted with Dow Corning to investigate a possible culprit for the thread damage: a traditional anti-seize paste that appeared to be failing under the immense torque required to assemble the components.

"From our investigation we learned that the traditional anti-seize paste being used contained a number of different solids, including chromium, copper, nickel and molybdenum," Chad Chichester continued. "The formulation created a very thin lubricating layer on the threads, and under the immense pressure, that layer was getting squeezed out. The result was cold welding on the flanks of the threads and subsequent damage when the parts were disassembled." According to Noble's records, failure rate was around 25%.

Finding a Solution

Dow Corning and Noble engineers worked together to develop a list of criteria for the application. They knew they would need an anti-seize compound with tenacious adhesion to the stainless steel connections, one that could create and maintain an effective lubricating film despite the extreme loads, contaminants and temperatures of an oil drilling environment. Further, the formulation should have a very low sulfur and halogen content, with a minimum of phosphorous, zinc, lead and other metals that can contribute to stress cracking or embrittlement.



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The replacement material selected was *Molykote*[®] P-37 Paste, an ultra-pure anti-seize compound designed specifically for austenite steel and steel alloy threaded connections. The high-viscosity paste forms a continuous lubricating film with very high contact adhesion that withstands the extreme forces of the drilling application, contributing to an excellent seal and facilitating disassembly without thread deformation. In fact, the formulation has proven so successful that Noble reports an immediate drop in thread-related failures of more than 50%.

“This material has a very high load-carrying capacity,” said Chad Chichester. “It contains a proprietary blend of solid lubricants that delivers outstanding seize protection, even under these severe operating conditions. The formulation has even been approved for use on threaded connections by several manufacturers of power plant turbines and steam valves, which are notoriously difficult applications for a lubricant,” he added. *Molykote* P-37 Paste has a service temperature range from -30°C to 1400°C (-22°F to 2552°F).



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Molykote P-37 Paste delivers outstanding purity for critical applications, containing less than 200 ppm of total halogen content (including chlorine, fluorine and bromine) and less than 250 ppm sulfur content. By eliminating elements that can contribute to stress cracking or become brittle at high temperatures, the material helps achieve true torque readings when tightening threaded connections, while contributing to non-destructive disassembly.

The odorless gray paste is extremely stable under difficult service conditions, giving it excellent durability. It is not classified as hazardous waste upon disposal, and poses no known health or environmental risks from transportation or use. Standard personal protection (safety glasses at minimum) and industrial housekeeping procedures are recommended.

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