



MOLYKOTE® specialty lubricant improves reliability of rotary steerable drilling equipment

Case study: MOLYKOTE® P-37 Anti-Seize Paste reduces thread failures



Customer

Noble Drilling Corporation in Sugar Land, Texas, USA, is a global leader in oil-drilling technologies.

Challenge

Prevent cold-welding, galling and failure of stainless steel threaded connections tightened to extremely high torque levels.

Solution

Replace a traditional anti-seize paste — which was being squeezed out of the high-torque connections and causing thread failures — with an ultrapure, metal-free and more durable solid-film lubricant.

Product

MOLYKOTE® P-37 Anti-Seize Paste

Noble Drilling Corporation had unacceptable failure rates in stainless steel threaded connections on its steerable rotary drilling equipment. Each time the failed drilling sections required removal for repair at a specialty machine shop, the firm incurred extra costs for labor, shipping and refacing the damaged threads; suffered production downtime; and also lost the critical sections for up to a week.

Each stainless steel section on Noble's rotary steerable drilling systems is secured with either 4-1/2 in (114 mm) or 6-5/8 in (168 mm) API threaded connections. These critical connections are tightened to standard torque values of 32,000 and 62,000 lbs-ft (43,400 and 84,400 Nm, respectively).

Identifying the problem's cause

As Noble Drilling prepared to commercialize its newest generation of rotary steerable drilling systems, one of its design teams worked with MOLYKOTE® lubricant specialists to identify possible causes for the thread damage and connection failures. At the time, the high-torque connections were being made using a traditional anti-seize paste, which aided assembly of many other threaded connections. That paste, however, apparently was being squeezed out under the extremely high tightening forces.

The problem seemed to center on the traditional anti-seize paste containing different metal-based lubricating solids, including chromium, copper, nickel and molybdenum. Stainless steel also contains molybdenum, chromium and nickel. These do not react well with oxygen, so only very thin metal-oxide layers were formed in the threaded connections. Once the oxide layer is damaged by abrasion — such as during tightening — abraded particles build up, and the oxide-free metal seizes under extreme pressure. The resulting clogged threads then prevent easy disassembly of the connections, and this was identified as the root cause of the bolt failures.

Another contributing cause was that many common anti-seize pastes contain sulfur, phosphorous, zinc and lead-based compounds. These can cause stress-corrosion cracking and thread embrittlement. Both conditions can lead to grain-boundary cracks in metal bolt and screw threads that propagate until bolt fracture occurs. According to Noble, its bolt failure rate was as high as 25%.

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Finding a solution

MOLYKOTE® lubricant specialists and Noble Drilling engineers worked together to develop the criteria needed for reducing the unacceptable bolt-failure rate. First of all, the anti-seize paste would need to provide superior adhesion to the stainless steel components. It also would need to maintain an effective lubricating film despite the severe loads, contaminants and temperatures of an oil-drilling environment. Further, the formulation should have low sulfur and halogen content, with a minimum of phosphorous, zinc, lead and other metals that could cause stress-cracking or embrittlement of the metal.

The solution selected was MOLYKOTE® P-37 Anti-Seize Paste, an ultrapure, metal-free lubricating compound that is especially designed for use on austenite steel and steel alloy threaded connections. The high-viscosity paste forms a continuous lubricating film with high-contact adhesion that withstands the extreme forces of drilling applications. It stays in place under extremely high tightening forces, provides excellent sealing and aids component disassembly without thread deformation.

Noble Drilling replaced its traditional anti-seize paste with MOLYKOTE® P-37 Paste on the critical stainless steel sections of its steerable rotary drilling equipment. This effective problem solution has made a major difference in boosting system reliability, cutting costs and maintaining production schedules. Noble reported an immediate drop in thread-related connection failures of more than 50%.

MOLYKOTE® P-37 Anti-Seize Paste

The paste selected to solve thread seizures achieves excellent load-carrying capacity over a wide range of temperatures from -40°C to 1,400°C (-40°F to 2,550°F). It has metal-free solid lubricants that provide outstanding seize protection, even under severe oilfield drilling conditions. MOLYKOTE® P-37 Paste also is used on threaded connections of power plant turbines and steam valves, which are difficult lubrication challenges.

MOLYKOTE® P-37 Paste has less than 200 ppm total halogen content (including chlorine, fluorine and bromine) and less than 250 ppm sulfur content. Its high-purity, metal-free solid lubricants protect against cold-welding, galling and embrittlement, allowing nondestructive disassembly.

The odorless gray paste is extremely stable with excellent durability. It is not classified as hazardous waste upon disposal, and it poses no known health or environmental risks from transportation or use.

Learn more about MOLYKOTE® Specialty Lubricants

MOLYKOTE® Specialty Lubricants are providing oil and gas solutions worldwide. The extensive product line and service and support capabilities can help you solve or prevent your toughest lubrication challenges. To learn more about our *Smart Lubrication*™ solutions, contact your MOLYKOTE® technical representative or visit molykote.com.



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