Vessel BBC Aramis Briese Shipping hatch coversystem

Project: Low-maintenance lubrication and lasting anti-corrosiveness

Situation:

As of August 2011 Briese Shipping starts to deploy Archoil AR8200 nano-borate Grease # 2 on one of its ships, the BBC Aramis. There are two reasons for this: The formation of rust on the axles of the (slide) bearing constructions in the hatch cover systems, and the formation of rust on the rolling tracks (rails) of this shallow-seagoing ship. The bearings mounted on these shafts become damaged by the oxidized metal particles (fly-rust) and rust on the axles. The paint or coating that is used to protect against corrosion offers insufficient protection. Furthermore, sub-zero ambient temperatures reduce performance of the current lubricating grease, whilst at higher temperatures the current grease begins to drip causing the cargo and the deck to become contaminated with grease.

It is expected that the effects of Archoil's AR8200 nano-borate grease will resolve both of these issues.

A brief explanation of the process:

At the beginning of the 90's it was discovered that boric lubricants were one of the most slippery in existence. Earlier tests showed that thin films or bulk powders of boric acid can provide friction coefficients as low as 0.02 to 0.05 — one-fourth to one-sixth the value of other, more expensive solid and liquid lubricants. Recently, Archoil's patented nanoboric liquid media additives containing special boron compounds proved to work even better. Particularly when used as solid dispersion or liquid media additives in lubricating mineral and synthetic base oils, they were able to reduce friction by 50% to 90% (depending on the concentration) under a wide range of boundary-lubricated sliding conditions. These additives were also able to enhance the lubricity of sulfur-free and ultra-low sulfur diesel fuels. They reduced wear-scar diameters by as much as 50% in high-frequency reciprocating and ball-on-three disk fuel lubricity tests.

The Archoil nanoborate formulation represents the 2nd generation in boron tribology. It has reduced the boron size down to the more efficient 'nano' level and deliver it in a naturally occurring fatty acid ester matrix carrier. This Archoil proprietary ester carrier is specially formulated to facilitate the migration of the protective boron nanoparticles to surface metal. The unusual mechanism of nanoboric lubrication in these fluids, oils and fuels is controlled by its chemical structure and its ability to form a strongly bonded protective boundary film on

surfaces. The compound is crystallized in layers in which the atoms are tightly bonded to each other. The layers themselves are weakly bonded; when stressed, they shear and slide over one another easily, so friction is low. The strong bonding between the layers prevents direct contact between sliding parts, minimizing wear.

The surface created also prevents oxidation. These bonds are so strong that pre-existing dirt, rust and carbon varnishes are displaced. These virtually indestructible bonds literally change the metal surface's characteristics and create a self-healing friction barrier. This translates to extremely low-friction coefficient (under 0.038) between the platelets and the metal surfaces they separate. This friction barrier is nearly permanent for the life of the metal treated.

The key ingredient is hydrated boron, a nonmetallic element also known as sassolite or borofax. Molecular hydrated boron is super slippery. Ultra fine particles are reduced to less than 1 micron (.000039 inches) by a revolutionary jet-milling process at sub-zero temperatures. The submicrometer hydrated boron particles can invade microscopic spaces and actually chemically BOND to metal surfaces.

The approach to the situation:

To handle the situation on board of the BBC Aramis, BLP International has chosen to use nano-borate lubricants. Archoil AR8200 Nano-borate Grease # 2 forms a molecular bond with the metal surface, developing a lattice structure with strong anti-corrosive properties and reducing the friction between metal surfaces significantly compared to conventional lubricants and greases. The bond eventually provides a dry surface, attracting no dust or dirt. Once in place, the lattice structure no longer depends on the carrier and remains in the metal, despite the grease slowly gets washed away. The metal now is protected for a long time from seizure (shearing), thread-welding (galling) or corrosion (pitting). Wear of the parts is reduced by the lattice structure that provides a coefficient of friction of <0.038 and can withstand pressures of up to 4000 kg per cm2.

The carrier of the chemical process is a calcium-sulphonate-based complex grease. Calcium sulfonate has a very good when it comes to anti-corrosion properties and is completely stable. There is no loss of viscosity. This provides much longer lubrication intervals, especially advantageous in bearings or where no change or re-treatment is possible.

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This Archoil base grease has an extremely high dropping point. In addition, it offers a water-wash-out of 0.05 and water-spray protection. It does not hold solids and in combination with the nano-borate formulation keeps the dirt and heat outside. Lastly, the calcium sulfonate is non toxic or acidic. This also is an advantage as today we see many EP-packages greases and oils, such as PTFE, molybdenum, sulfur, graphite, phosphorus, lead, antimony and phenols that are heavily contaminating the environment they work in.

Briese comments after 7 months of use:

The project at Briese Shipping on BBC Aramis is supervised by Geerlof Jukema, technical superintendent. The BBC Aramis is a general cargo coaster of 3500 DWT. The sailing area covers North Atlantic, Baltic, North Sea, Mediterranean Sea.

“After removal of previously used grease, paint and coating on the faces of the rollers and rails all bearings, shafts, rotating parts and threads and rails are greased with Archoil AR8200. Also, the deck cranes are treated with the Archoil grease at all lubrication points. After 7 months we see that the Archoil grease operating at very low ambient temperatures (-20° C) does not become solid, does not crumble or show other undesirable properties. At high ambient temperatures (40° C) the grease does not drip. This is very desirable as this increases security on deck and the cargo remains clean.

“It is noteworthy that the grease remains very firmly in place and in combination with the nano-borate formulation keeps the treated parts free of dirt and corrosion.” The grease and treated parts are subject to spray, waves, sun and wind. Comments here: "There are much reduced lubrication intervals and also there is much less grease needed." Because the moving parts remain well lubricated Jukema expects that the wear of these parts will be less. The grease has proven itself to be very water-resistant.

Now the first quantities are nearly exhausted, it is a positive sign that the captain of the BBC Aramis wishes to utilise more AR8200. Jukema also wants to expand the use of Archoil AR8200 on several more ships, developing a better view and insight of the capabilities and the advantages and disadvantages of the Archoil nanoborate grease.

"Overall, our findings so far have been largely positive. Although Archoil grease is more

expensive compared to conventional greases, the results relating to lubrication, corrosion and durability in all weathers and situations are all reasons to continue use of nanoborate grease. I guess you can say that nanoborate cannot be compared to conventional grease."

For further information please contact BLP International, +31 252-746011 and ask for Rob van Hoorn, Project Manager. Contact Briese Shipping on request.

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