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RELY ON EXCELLENCE

Durable seals for carbamate pumps in fertilizer production

Fruitful collaboration across borders and departments

Every day, the world's population grows by 200,000 people, and the same number migrates to the cities. According to the UN, there will be around ten billion people on earth by 2050. To feed them, agriculture will have to produce about 50% more food in 2050 compared to 2012, according to the FAO. In addition, climate change increases pest pressure and threatens yields. Compatible fertilizers are needed to decrease these crop losses in order for the world to face these food problems. EagleBurgmann supports a fertilizer manufacturer in Qatar with its special sealing technology to contribute to a safe and economical operation.

Seal failure after very short operating times

The fertilizer manufacturer was faced with the problem that the seals in the pumps, which were used to convey carbamates, failed after a very short operating period of only two weeks to three months.
"The original mechanical seals weren't suitable for this application", Gabriela Lopez Martinez, application engineer for the oil and gas industry at EagleBurgmann, explains. The seals showed high leakage rates and were failing very quickly. "The problem was that they used ultra pure water as a barrier fluid. This high-purity water has a very low electrical conductivity, which is why electro-corrosion on the seal faces occurred. Other main problems with the seals were SiC chipping and carbon softening. As the pumps were still under warranty and the original seal vendor was unable to solve the problem after several attempts, the pump manufacturer contacted EagleBurgmann to provide a solution for the continuous seal failures", clarifies Lopez.

What is Carbamate?
Carbamates are salts and esters of carbamic acid with a high boiling temperature. They are more commonly referred to as urethanes. Urethanes are mostly solids that crystalize well, and their persistence in the environment is 1 to 12 weeks. Carbamates are partially solid but sometimes also liquid and mostly colorless. Ammonium carbamate is important as an intermediate in the technical production of urea.

EagleBurgmann SHI seals with DiamondFace® technology:

- **Sealing ultra pure water without electro corrosion on the seal faces**
- **Prolonged operating period: From weeks to over 5 years**
- **Reduced OPEX**
- **Safe and reliable solution for an environmental-friendly production**

Alternative to failing seals

The OEM approached EagleBurgmann due to a long-lasting business relationship. "The application was challenging. We had to come up with a solution that would prevent chemical damage by oxidation while keeping low leakage rates", Lopez states. "We chose EagleBurgmann SHI mechanical seals." These are specially designed for very high pressures, high sliding speeds and high temperature ranges due to a loosely inserted sliding ring and other design features.
The selection of materials for the sliding surfaces posed a particular challenge. "Our first approach was to go with DiamondFace® technology for both the sliding ring and the seat. This is a very common and well-established solution within the oil and gas industry", Lopez explains. But typically, hard/hard sliding materials present increased leakage rates that were not desirable for this application.

Finding a solution through knowledge transfer from different industries

A big advantage of EagleBurgmann is the strong collaboration between the different departments. The business unit 'Technical Sales Support' unites experts from different industries and markets under one director. "We have regular team meetings to ensure that the knowledge between different industries is transferred", Lopez mentions. During these meetings, challenging applications can be discussed. "As the preliminary calculation of a hard/hard combination did not show the desired leakage rates, I presented the problem to my colleagues during our 'team table'", Lopez remembers. A solution was provided by the power plant unit.

"Sealing ultra pure water is typical for the power plant industry and not common in the oil and gas industry", Maximillian Huber from the power plant group explains. "Due to the fact that the water has a very low electrical conductivity, the tribological electrical charging produced by the surface friction cannot be grounded by the insolating water. That is why corrosion on the sliding surfaces occurs."

The power plant department knew from several applications that this problem could be reliably solved by using a seal face combination of DiamondFace® versus Buka 30 (Carbon Silicon impregnated). "This combination is a well-proven solution for mechanical seals operating with Ultra-Pure water in high-speed applications, increasing equipment reliability and availability while reducing the operating costs", Huber explains. "It has a lower leakage rate than hard/hard sliding materials. The technology has been used in power applications by EagleBurgmann for over 10 years.

A proven solution

One advantage of this solution was that it had already undergone rigorous testing by EagleBurgmann. "In extensive laboratory tests and field installations, it has been proven that DiamondFace® is resistant against electrical currents and hence resistant to electro corrosion", clarifies Lopez. EagleBurgmann identified the root of the failures and designed a solution that could deal with the demanding requirements of this application, which included a very high sliding velocity (>31 m/s) and the Carbamate process fluid with its tendency to crystalize quickly. The SHI mechanical seal is dual pressurized with Plan 54 (already provided with the original seal) and Plan 32 (external flushing); both operate with de-ionized water. Plan 32 is recommended to avoid Carbamate accessing the dead-end areas of the mechanical seal, where it could crystalize, hence causing a hang-up of faces and premature seal failure. "With Plan 54 you can ensure that your process media will not leak to the atmosphere, so that the environment does not suffer any damage", expresses Huber.

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The result: years of maintenance free operation

The solution has a good impact on OPEX due to the longer life of the seals. The lifetime of the seals was extended to more than five years without the need for changing them. "During the test period of six months, no adjustments had to be done. Meanwhile, the seals have been in use for over 5 years without failures. Furthermore, the application has a lower leakage rate, fostering a cleaner way of producing", confirms Lopez.

Harnessing global and cross-departmental collaboration for intelligent solutions

"This project is a very good example for our claim 'innovating together'", Huber states. This sometimes means innovating together with the customer or within the teams inside EagleBurgmann's business rooms. This way, more people are available to discuss a certain topic and find a solution. "The collaboration that we have being together in the same department, having the same director and having meetings where we talk about difficult applications helps us a lot to grow our knowledge and our capabilities", Lopez points out. EagleBurgmann's global presence also contributed to the successful project. EagleBurgmann Japan handled all the communication with the customer due to their strong relationship with the pump OEM while EagleBurgmann Germany worked on the seal solution and performed the necessary tests.

EagleBurgmann – Leading Innovation in Sustainable Sealing Solutions

We are your leading international specialist in industrial sealing technology. We combine innovative technologies, digital solutions and our passion and enthusiasm to create sophisticated and reliable sealing systems. Our products help make entire industries safer and more sustainable. 6,000 employees create added value for our customers around the world with their enthusiasm and competence. EagleBurgmann is a joint venture between the German Freudenberg Group and the Japanese Eagle Industry Group. **Rely on excellence.**

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