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RELY ON EXCELLENCE

Sealing technology 4.0

EagleBurgmann equips first pipeline with new Smart Seal Solution for digital condition monitoring

The current geopolitical developments are leading to a massive strain on the global energy supply. Despite political efforts to transition to renewable energy, 80% of the global energy consumption is still generated from fossil fuels, such as coal, oil and natural gas . Hence, a functioning and reliable infrastructure for the transportation of primary energy sources is still of major importance. The main premises are maximizing the availability of oil and gas pipelines and minimizing their downtimes. For decades, EagleBurgmann has been a partner of the oil and gas industry and contributes to the reliability of the transportation process by providing innovative sealing solutions. With the introduction of a new smart technology for digital condition monitoring of seals, a further future-oriented step has been taken.

Energy sources such as oil and gas are transported for hundreds or even thousands of kilometers through pipelines and numerous pump stations that enable the movement of raw materials. For this to function consistently and reliably, regular service and maintenance of the systems are essential. However, in practice, this is a challenge. The great distances between the pump stations that are mostly unmanned and also difficult to access lead to substantial effort for performing service works on site. The idea of monitoring plants remotely, predicting service needs on time as well as planning and bundling deployments is hence obvious. Whereas the digital and location-independent monitoring of pumps has been possible for some years now, the control of the seals still required cumbersome and regular tests on site. In an increasingly digitalized world, this approach is no longer up-to-date, concludes EagleBurgmann. In a pilot project with one of the leading North American energy infrastructure companies, the first EB Smart Seal Solution was put into operation, thereby creating the successful start for the use of digital sealing technologies.

Aim of the customer was to optimize operations in the unmanned pump stations of a pipeline for diluted crude oil as much as possible and to largely prevent unforeseen failures. For this, the operating conditions of the used mechanical seals were to be measured and analyzed continuously via sensors in order to be able to prematurely detect and rectify potential error sources.

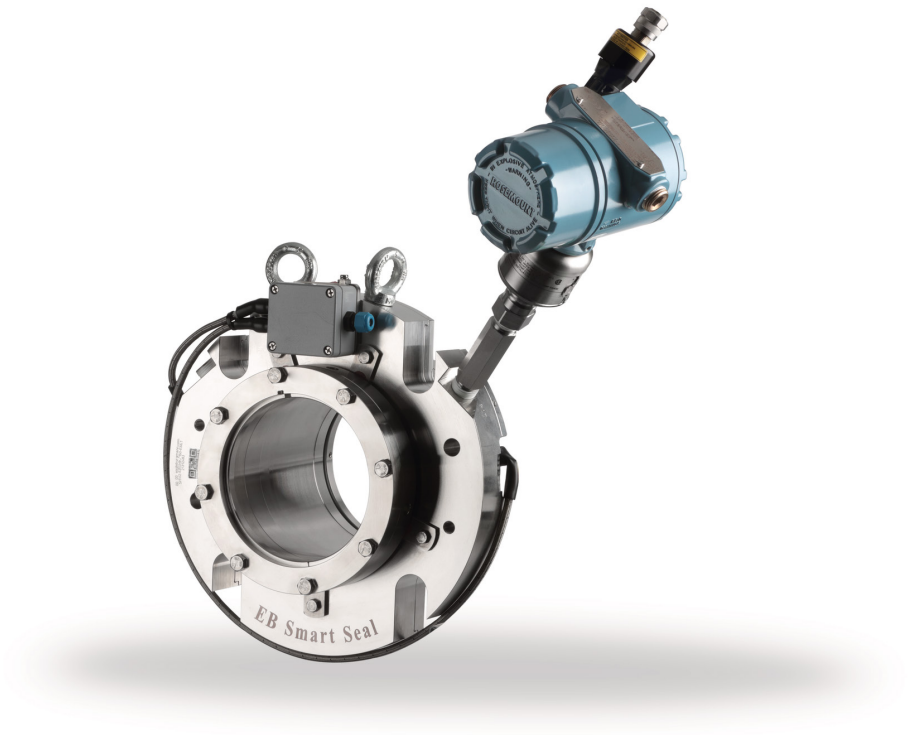
Remotely monitoring power plants, predicting service needs, and bundling and planning service calls - our increasingly digitalized world offers a wide range of new possibilities. The first deployment of the EB Smart Seal marked a successful entry into the world of digital sealing solutions.

Advantages of the EagleBurgmann Smart Seal Solution:

- Consistent, reliable data basis that can be utilized for optimizing process conditions, which may contribute to an extended MTBR (Mean Time Between Repair) and an increased lifetime of the seal
- Increased predictability of operation thanks to improved scheduling of downtimes
- Reduction of service calls

Especially the temperatures of the sliding parts and the pressure in the seal chamber were to be monitored continuously to identify optimization potential for preventing damage to the seals and increasing the MTBR (Mean Time Between Repair) of the products. To reduce efforts, the possibility of a location-independent monitoring should be provided, thereby getting access to the measurement data from any place and reducing potential on-site maintenance to a minimum. Apart from all the requests regarding monitoring and digitalization, fulfilling the high operating requirements by means of the seal design was the fundamental stipulation. Seals and sensors must be able to unconditionally withstand the extreme operating conditions caused by the application as well as the ambient conditions. Ideally, existing sensors are retrofittable with the sensor measurement solution, and the data transmission can function regardless of the seal.

The customer was already convinced of the quality and reliability of EagleBurgmann seals through earlier projects. Once again, the experts in sealing technology were able to completely satisfy the requirements with the newly developed EB Smart Seal Solution.



The EB Smart Seal: Wireless and battery-operated sensors transmit data to the gateway.

Operating conditions
Shaft diameter: d = 140 ... 155 mm (5.51" ... 6.10")
Pressure: p = 2.5 ... 100 bar (36 ... 1.450 PSI)
Operating temperature: t = +10 °C ... +110 °C (+50 °F ... +230 °F)
Medium: Crude oil with diluted bitumen
Special equipment: EB Smart Seal Monitoring Kit

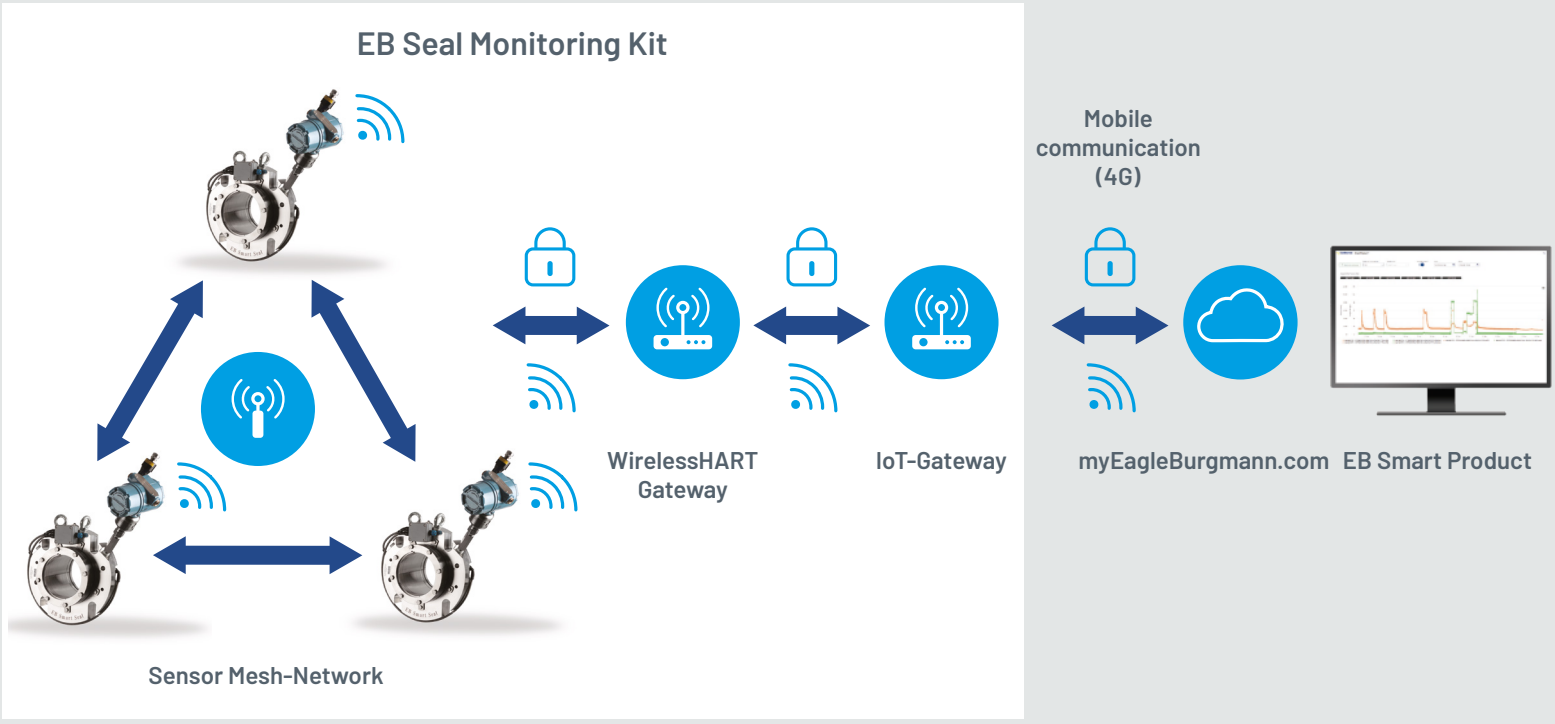
In order to perform a test run, the customer installed four single high pressure seals with the corresponding EB Smart Seal Monitoring Kit expansion.

The seals are engineered seals based on the SH series, which is designed for extreme requirements and has proven itself in numerous pipeline applications. The customer-specific sealing solution is designed for shaft diameters from 140 mm to 155 mm and, if necessary, is capable of withstanding a pressure of up to 100 bar dynamic.

The expansion by means of the EB Smart Seal Monitoring Kit as a digital solution for condition monitoring enables the reliable, continuous collection and transmission of seal data to an online application that can be called up anytime and anywhere, thereby laying the foundation for an intelligent condition monitoring and service concept.

Pressure and temperature sensors installed in the seals record the data and transfer it to an external transmitter. From there, the data is sent wirelessly to a gateway. The system architecture is implemented by means of the wireless sensor network technology WirelessHART and represents the current IT industry standard. It is available with all explosion protection certifications (e.g., ATEX, CSA, UL, IECEx). The Edge accommodates the required hardware for the necessary IoT gateway, via which the data is transmitted to the myEagleBurgmann cloud by means of the mobile radio standard LTE. The data can be accessed in the EB Smart Product Application. Here, measurement values and analyses are visualized graphically as well as clearly structured and made available in an appealing graphical user interface. Thanks to the cloud-based data storage, access is possible at any time and from anywhere as long as there is an existing mobile connection. The cloud solution follows the ISO 27001 and fulfills all requirements for data protection and data security.

WirelessHART is a wireless sensor network technology developed specifically for industrial applications in process automation. It is based on a meshed, self-organized network in which each sensor can simultaneously act as a signal source as well as a repeater. The transmitting sensor sends the corresponding data wirelessly to the closest neighboring sensor, which then again sends it to the next neighboring sensor – so long until the message reaches the actual receiver. The mesh-like network topology allows for the coverage of a large area as well as a high transmission security.



The recorded data is stored in the myEagleBurgmann cloud for up to a year. This results in a comprehensive data history that allows comparative analyses from which detailed findings regarding the effects of different operating conditions on the seal performance can be derived. The download function offers the possibility of locally storing the data available at that time.

An additional application, called myProducts is provided to the cloud-based solution myEagleBurgmann. Here drawings, operating instructions, certificates, service reports and other documents of the corresponding seal can be filed. This constant availability of all relevant documents offers the customer an easy overview and supports with maintenance management.

Installation and commissioning of the first EB Smart Seal Solution in the pilot project were successful. "The installation of the new digitalized seal took place during a regular and scheduled seal exchange in one of the pump stations of the pipeline", explains Florian Wasensteiner, Service Engineer IoT at EagleBurgmann. "In a first installation, the infrastructure for the sensor technology and the gateway communication must be newly established, something for which our support is perfectly trained. Necessary seal exchanges at a later point in time can still be done without increased effort either by our customer or one of our service engineers."

The integrated sensors reliably transmit high-quality data to the cloud. This data is regularly evaluated by the EB Support together with the customer. In the future, customers can also perform these evaluations on their own upon request.

Despite the fact that a retrofit with the EB Smart Seal Monitoring Kit is generally possible for many models, it is still always a special production that includes a corresponding engineering effort. Therefore, a new independent seal series is already being developed for future applications that will enable access to digital monitoring solutions on a large scale. "Further developments are planned beyond that", reveals Wasensteiner. "For example, we are utilizing our years of experience with regard to seal construction, design and verification to develop algorithms that will generate the state of the seal and findings regarding its behavior in an automated process in the future."

The pipeline operator is highly content with the first results of the pilot project and is already contemplating equipping further seals of the same pipeline as well as those of other pipelines with the EagleBurgmann Smart Seal Solution.

EagleBurgmann – at the leading edge of industrial sealing technology

Our products are used wherever safety and reliability count: in the industries of oil & gas, refineries, petrochemicals, chemicals, pharmaceuticals, food, power, water and many more. About 6,000 employees contribute their ideas, solutions and dedication every day to ensure that customers around the globe can rely on our seals. With our modular TotalSealCare Service, we emphasize our strong customer orientation and offer custom-tailored services for every need. **Rely on excellence.**

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