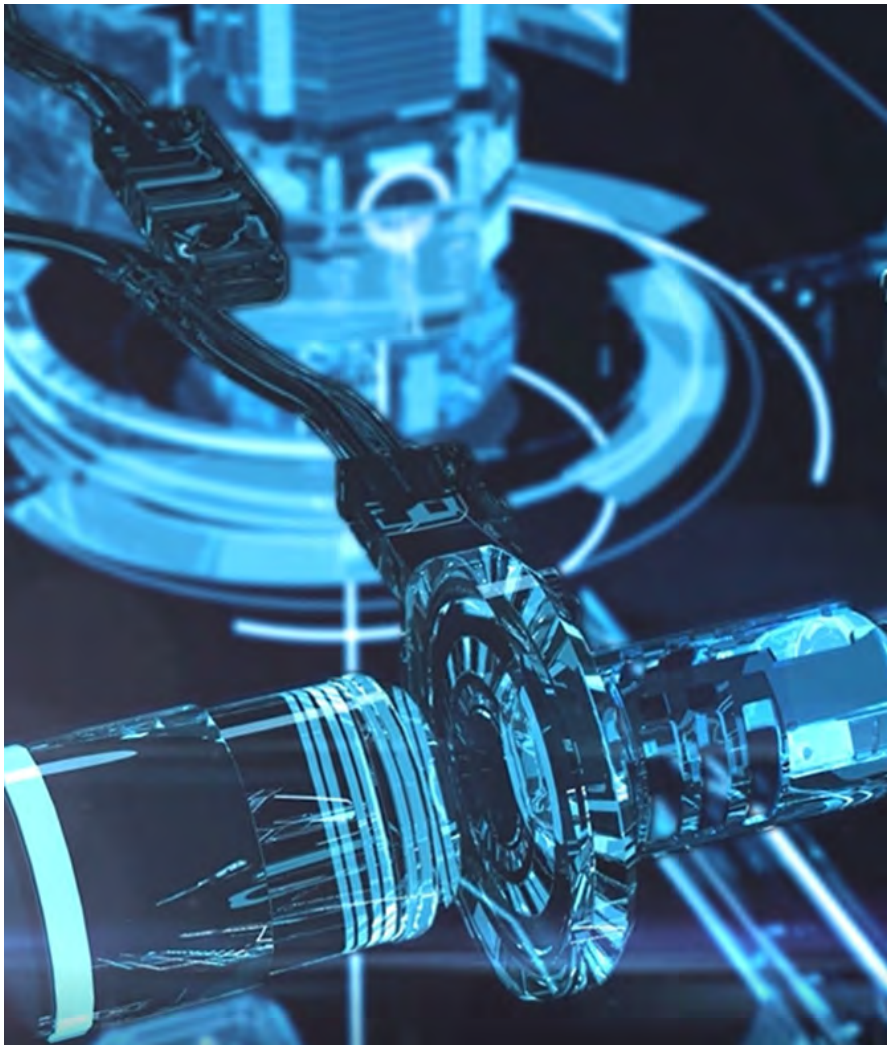
CASE STUDY

Precision matters: core sensing relies on HBK expertise for the smart sensory drive shaft

Core sensing GmbH has found an experienced partner in HBK. Specifically, the HBK OEM Sensor team has decades of expertise in the field of measurement and sensor technology has contributed to the successful development of the smart sensory drive shaft.



CHALLENGE

The maintenance of machinery, equipment and commercial vehicles is often carried out regardless of whether the equipment requires maintenance work. Problems are often detected too late or not at all. This can lead to costly downtime and lost profit.

SOLUTION

Core sensing thoroughly integrates HBK's reliable OEM sensors based on reliable strain gauge technology, into the drive shaft that is to be monitored. From there, they provide valuable data in real time, allowing accurate predictions regarding the condition of the shaft and its adjacent components. This then helps predict proper maintenance schedules and timely repairs.

RESULT

Core sensing's sensors, integrated into the smart sensory drive shaft, enable the ideal times for maintenance to be identified and costly failures to be avoided with the help of predictive maintenance. The company relies on a close partnership with HBK to implement these smart sensors.

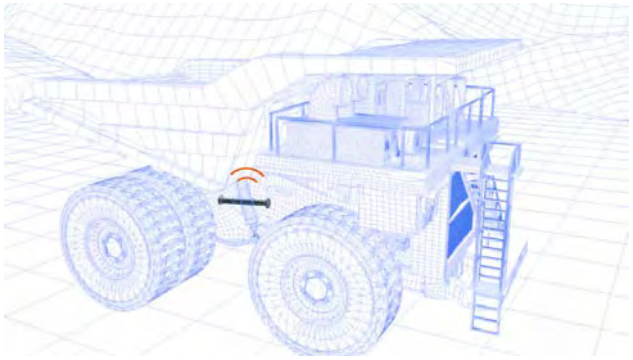
Moving components in machinery and commercial vehicles are subjected to heavy loads every day. They also often operate under harsh conditions. The negative effects include wear and tear and resulting defects, which can lead to costly downtime. In the context of the Industrial Internet of Things (Industry 4.0), predictive maintenance can help minimize these failures because the strategy of preventive maintenance relies on condition-oriented maintenance work based on forecasts.core sensing solutions provide the real-time machine and plant health data needed to predict the correct time for maintenance. This is achieved with particularly high reliability from inside of the respective component due to innovative measuring technology.

EXPENSIVE FAILURES DESPITE REGULAR MAINTENANCE

Plants, machinery and commercial vehicles are subjected to great stress every day. To ensure that they are operational, companies perform regular maintenance. The current state of the devices that require maintenance and, thus, their actual need for maintenance are often unknown. Also, potential wear points of components often remain undetected, which can cause problems between maintenance intervals.

Despite careful maintenance, problems with plants, machines and commercial vehicles occur time and again, leading to failure and costly downtime. As a rule, only in the event of a failure is its cause investigated and only then is the required spare part ordered. This often results in unnecessary waiting times and expensive production losses.

However, in the context of digitalization and Industry 4.0, this can be effectively remedied. By making key machine components, such as drive shafts, couplings or handles, smart and regularly giving users feedback on their current state – such as the Elbe Group's smart sensory drive shaft with core sensing's smart sensors.



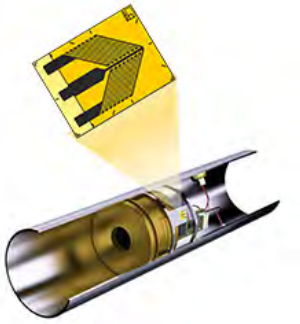
The smart sensory drive shaft provides regular feedback on its current state.

INNOVATIVE SENSORY COMPONENTS AS GAME CHANGERS

In the many machines and commercial vehicles, the universal joint shaft is subjected to high loads, especially when used in harsh environments. Over time, defects in the drive shaft and thus costly machine downtimes are more likely to occur due to material fatigue and wear. However, real-time information on the current state of the component helps identify potential problems and enable actional responses preventing costly failures.

The market leader, Elbe Group, in cooperation with core sensing, has developed an innovative product family of sensory drive shafts. The smart components continuously provide data about their condition. Potential problems can be detected and corrected promptly. Cost-intensive downtime is significantly reduced. The wish of many plant and vehicle manufacturers finally becomes reality.

The smart sensors are based on customized strain gauges and are integrated in the cavity already present in the component.



MEASURING TECHNOLOGY WITH BRAINS AT THE HEART OF THE DRIVE SHAFT

The intelligence of the next-generation drive shaft is located inside a standard drive shaft. To achieve this, core sensing integrated its smart sensors and their measuring electronics in the cavity already present in the component providing the best possible protection. The structurally integrated sensor provides precise real-time torque measurement directly from the drive shaft. The data enables reliable conclusions to be drawn about the condition of the shaft and the surrounding components.

The torsional and force strain gauges installed in the drive shaft for measuring the torque and axial force were customized and provided by HBK. For this purpose, the strain gauges were optimally adapted to the environmental conditions of the application in terms of geometry, size, material and temperature compensation. Users can rely on precise torque and axial-force data, which are supplemented with a variety of additional measured variables for the entire measurement chain using the smart solutions from core sensing. The data is wirelessly transmitted from the sensors to the gateway or the Core Viewer app using a standardized 2.4 GHz connection. The energy-efficient measuring technology at the heart of the drive shaft is supplied by a battery that provides energy for several months.

SMART AND EFFECTIVE TO REDUCE COSTS

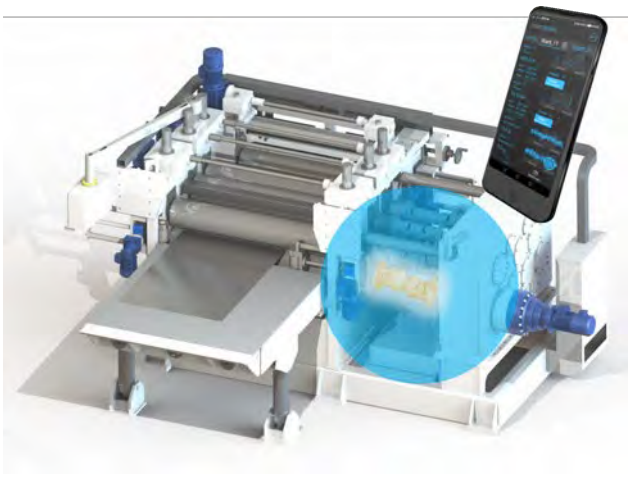
The use of the smart sensory drive shaft of the Elbe Group with the smart inner workings provided by core sensing and HBK provides numerous benefits because the smart component helps reduce costs.

For predictive maintenance, the sensory drive shaft can be integrated directly into the load path of a drive train to measure, the actual load variables that occur during operation. These real-world values are then compared to previously set reference values. This enables reliable monitoring of the drive shaft.

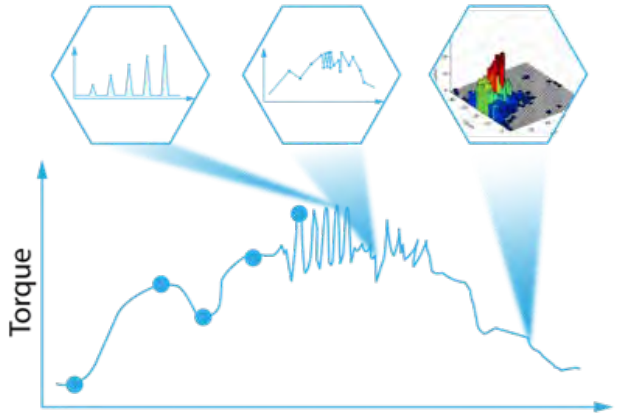
Also, a sensor component positioned in the drive train provides reliable insights into the entire machine. If the measuring point is accurately selected, the loads acting on other components can be recorded and their degree of damage determined.

With the help of the actual load variables, both the remaining service life of the drive shaft and surrounding components and the perfect time for predictive maintenance can be determined with just one sensor. Furthermore, possible failures can be reliably predicted due to smart algorithms based on Machine Learning. In this way, expensive downtime can be avoided and costs can be substantially reduced.

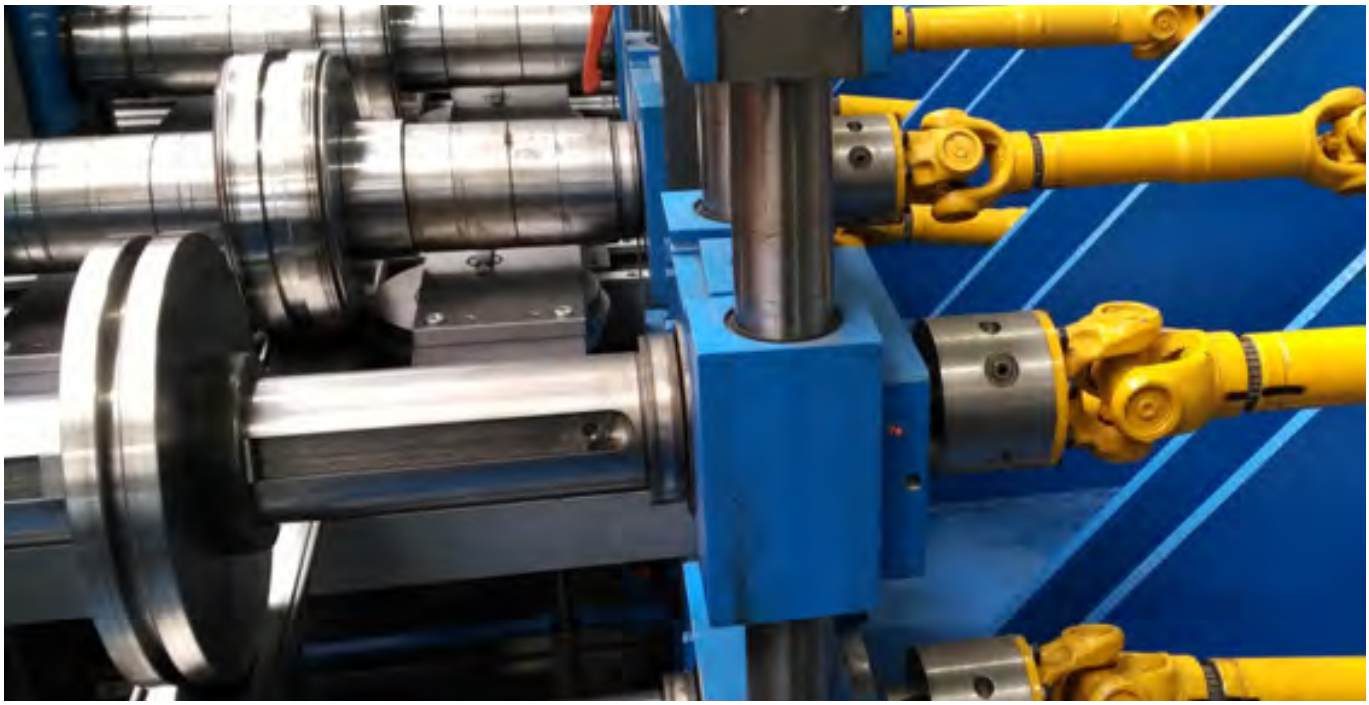
A significant cost reduction can also be achieved through sensor data-based condition monitoring. This ensures safe operation and provides meaningful information on machine efficiency. Based on this knowledge, the use of valuable energy can be optimized without reducing the performance of the machine.



A sensor component positioned in the drive train provides reliable insights into the entire machine.



Real-world values and smart algorithms help the prediction of possible failures.



With an accurately selected measuring point (e.g. the yellow drive shafts), the surrounding parts (bearings, shafts and roller) can also be monitored.

HBK INVESTS ACTIVELY IN GOOD IDEAS

core sensing was looking for a partner who was ready to supply the young company with their comprehensive expertise, resources and highly precise, tailored measurement OEM sensors to help implement their drive shaft with integrated sensor technology.

As part of the joint project, HBK provided core sensing with an experienced team. The team has accompanied the development of innovative smart sensors from the start through to serial production. Project meetings were held regularly to discuss designs and evaluate the project progress, to review insights from simulations and implement required modifications. This close cooperation resulted in the specifically-designed shaft sensor elements.

HBK distinguished itself in the project not only by their concentrated expertise, which helped to significantly shorten the development time, but also by the precise measuring technology provided. The cooperation and partnership was crucial to the project, which started with the delivery of prototype strain gauge-based sensors individually manufactured according to core sensing's specifications.

Based on the positive experience, quality and precision of the sensors and cooperation , core sensing has opted to continue its partnership with the HBK OEM Sensors team.

core sensing has truly appreciated the partnership with HBK including the flexible and scalable production of tailor-made OEM sensors at different locations, which reduces the risk of production downtime, excellent quality assurance, HBK's unique expertise and high customer value, which is characterized by, among other things, transparent communication enabling core sensing's success.

ABOUT CORE SENSING GMBH

core sensing GmbH was founded in 2019 as a spin-off of TU Darmstadt. The company implements the individual integration of sensors into products and processes for the Industrial Internet of Things. core sensing's smart solutions for predictive maintenance and condition monitoring enable companies to use their plants, machines and commercial vehicles more efficiently and cost-effectively.

CORE SENSING
connecting mechanical components

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