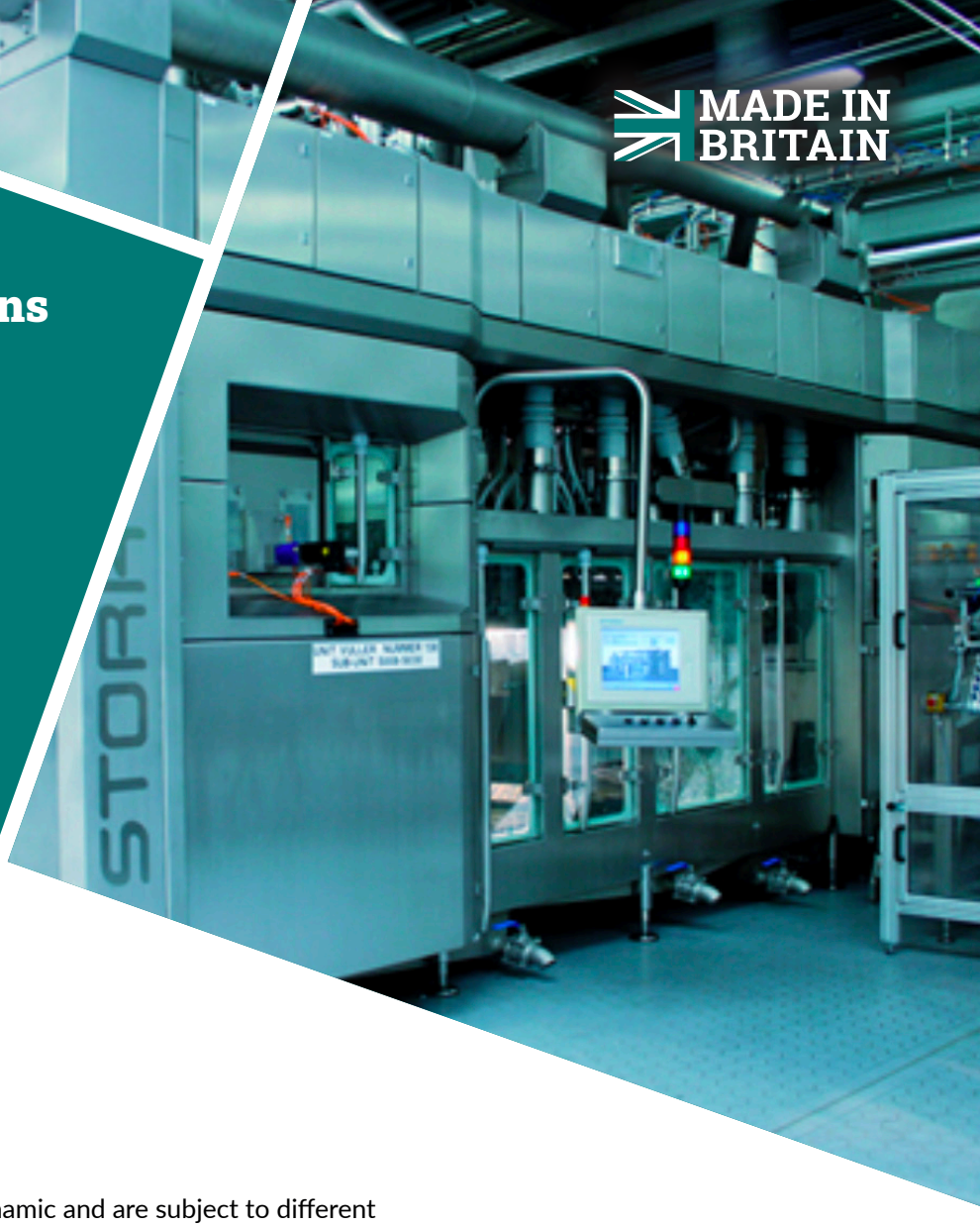
Preventing Breakdowns By Using A Bespoke Torque Sensor



Background

Manufacturing environments are highly dynamic and are subject to different disruptions such as breakdowns, cancelled and rushed orders that affect the overall performance of industrial equipment. There is little spare capacity, so unscheduled maintenance and failures must be avoided as they can create a logistical and financial nightmare.

Meeting deadlines is vital for every manufacturer. In the dairy industry, in particular, high-product volume and machine efficiency are of paramount importance and sometimes requires production lines to work consistently, 24/7/365.

The challenge was to prevent unscheduled breakdowns and maintenance by developing a system able to accurately detect faults in real time and suggest the best course of action.

Contact our technical sales team or sales team to discuss:
web@datum-electronics.co.uk / +44(0)1983 282834
datum-electronics.co.uk

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The new CBPM system will help to streamline the work of our engineers, allowing them to undertake more site visits and to keep more machines running, saving companies money and preventing further waste in this global food crisis.

Stork Dairy Systems

The Client

Our client Stork Dairy Systems isn't an exception to these demands. The company was established in 1915 in Amsterdam and was focusing on general equipment engineering and the manufacturing of machines for the chocolate industry. Interrupted by the First and the Second World war, Stork continued the development of systems for the dairy and food industry, providing the industry with constantly better, more effective and efficient solutions for processing and filling a wide array of products in attractive consumer packages such as glass or plastic bottles, jars, jugs, pouches and metal (steel or aluminium) cans.

The Challenge

Stork Food and Dairy Systems have little room for mistakes. In order to prevent unscheduled breakdowns and maintenance, they needed to develop a condition monitoring system for one of their critical production lines, namely bottle filling machines, that could accurately detect faults in real-time and suggest the best course of action for engineers on site. As the project promised to be quite complex and extensive, Datum has chosen along with several other partners including the University of Portsmouth, Britpip, Prosig, the University of Nottingham and Dairy Crest, to be involved in designing and developing a Condition Based Predictive Maintenance (CBPM) strategy for Stork.

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The newly developed CBPM system successfully predicted 24 significant breakdowns, providing savings for Stork's customers in excess of £33million.

Solution

The solution was to design and develop a Condition Based Predictive Maintenance (CBPM) system with real-time feedback for engineers on site.

To prevent breakdowns and stop vibrations, several partners, including the University of Portsmouth, Prosig and Datum, worked on the creation and development of a CBPM system with real-time feedback.

The SBPM system developed for Stork consists of 4 main sections:

- Bespoke Torque Sensor
- Customer Interface
- Fault Detection
- Decision Making

Datum Electronics Ltd was contracted to design a bespoke torque sensor able to feed data into the system in a simple format. Given that a production line cannot be stopped for a long time due to deadlines and existing orders, the installation process had to be very quick and with minimal intrusion to the working driveline. Also, the existing limited space was too small to fit a conventional shaft power measurement system and the torque transducer had to be a custom-designed. After a thorough site inspection and expert consultation with the Datum team, the partners decided on customisation features the bespoke torque sensor required.

Given demanding time constraints, it was agreed on Datum designing a bespoke torque sensor that could be installed on site on the existing shaft in less than two hours. Moreover, the stata of the Datum torque transducer had to be specifically manufactured so it could be removed without removing the shaft (see the drawing above in the slider).

In addition, due to the nature of Stork's business, the sensor had to be environmentally protected from caustic soda and other cleaning agents.

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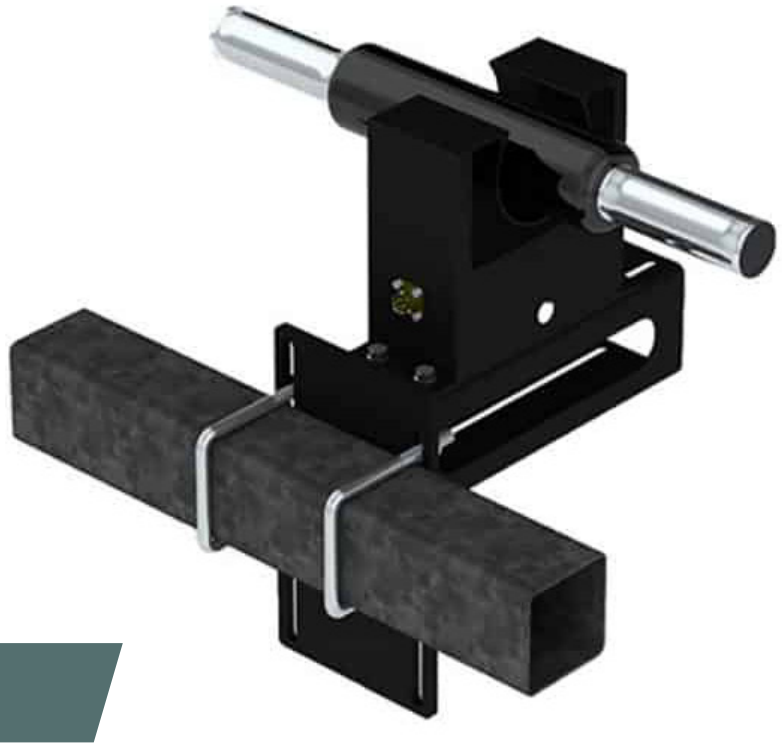

Impact

Due to global competitiveness, continuously changing technologies and emerging safety and environment regulations, product quality and ability to meet customer demands are considered the main reason for a company's long-term profitability. It is also proven by research that maintaining the availability of production equipment and ensuring production efficiency are crucial factors affecting profitability.

With that in mind, the new preventative maintenance system was designed to monitor machine performance, machine operational lifecycle and its impact on the surrounding environment and of course, safety, providing onsite staff with real-time feedback and possible plans of action.

Over the course of the KTP and the Collaborative R&D, a 36- month period, the developed CBPM strategy has successfully predicted and prevented 24 significant breakdowns. This number may not seem like a lot, but taking into account that breakdowns of filling drivelines typically takes 3-5 days to repair, causing a loss of production cost of £350K a day, the system provided savings for Stork's customers in excess of £33 million.

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Alongside the commercial impact, the new CBPM strategy, based on measuring driveshaft torque, had a significant impact on Stork's business making the Service Contracts arm of their business more streamlined and significantly more profitable, as well as contributing to an increase in sales and helping secure the future of UK engineering jobs.

The newly developed system was also instrumental in a change in culture within the company. Equipping engineers with the correct real-time tools and information, the CBMP system enabled engineers to see remote monitoring not as a threat but as a vital tool that enhances their performance and presents opportunities to enhance their skillsets.

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