From condition monitoring to predictive maintenance: turning data to real customer value

Today's industry is marked by a steady buzz about connectivity and the Internet of Things, frequently summarized as Industry 4.0. New solutions appear all the time, offering a seemingly endless range of technical possibilities. However, it's not as simple as that to find examples of how these are being implemented.

For many businesses, the greatest potential in Industry 4.0 lies in condition monitoring. Yet even here, customers have generally been slow to act. As with any data-driven service, condition monitoring is only attractive if it offers both security and value. But the real value is created when condition monitoring becomes predictive maintenance.

Condition monitoring is where it begins

In simple condition monitoring, sensors are used to watch over equipment and alert the owner to any changes in operating parameters, such as RPMs, temperature and pressure. A solution can be created with relatively few
sensors and a minimal amount of standalone hardware, at a cost far less than that of a production stop.

The data the sensors provide, however, can be used for much more than alerts. Analyzed properly, it can help determine when a machine is at risk of breaking down – so that corrective maintenance can be planned in advance. Predictive maintenance has many advantages: reduced need for on-site spare parts, fewer demands on service personnel, lower energy consumption and far more reliable production. So why aren’t we seeing more of it?

Customer concerns about data security

For many customers, the main obstacle on the path to these benefits is the security of the data and the way in which it will be used. Customers worry that sensitive information might be lost or find its way inadvertently into the wrong hands.

These are valid concerns that should be taken seriously. Naturally, the data’s use should be regulated in a non-disclosure agreement, signed between customer and supplier. But the supplier must also take responsibility for having sufficient technical safeguards in place – and be able to explain exactly how those safeguards protect the customer.

Even so, it is important to remember that the situation is generally similar to a manufacturer or workshop accessing a car’s stored driving data. If no data is shared, the possibilities for service – and the potential benefits for the owner – are more limited.

Delivering data or delivering value?

While security issues can be solved by suppliers who take the responsibility, it is more complex to actually bring value to the customer. Sensors are inexpensive and simple to install. But the difficulty lies in turning the gathered data into useful information.

In itself, condition monitoring does little more than supply customers with data, which is often difficult to interpret. This is not a solution, but rather an additional headache. For customers to get the reliability and predictability they seek, the data must first be filtered and analyzed by experts. Instead of data, customers
Press Release

should receive regular reports and clear insights that help them take the service actions needed.

This is the key behind those solutions that have been successful on the market. Achieving predictive maintenance requires an integration of technology and human expertise, where algorithms supply the basis for smarter decisions.

Creating a machine health index

One of the suppliers who has been successful in this regard is Bosch Rexroth, whose predictive maintenance solution for Hägglunds direct drive systems, Hägglunds CMp, supports a rapidly expanding group of customers worldwide.

Hägglunds CMp establishes a secure link to the customer’s drive system, where sensors are installed throughout. Bosch Rexroth’s internal firewalls protect all information that connects transmitted data with the customer, who has access via a gated cloud interface. While in transit, the data itself is meaningless, since the raw numbers cannot be paired with a sensor’s location.

Evaluation is created by an analysis tool called ODiN, which Hägglunds CMp uses to interpret the sensor readings. During an initial machine learning phase, ODiN creates a health index that provides an accurate picture of the drive system’s normal state. It is this health index – not the individual sensor signals – that makes the difference for customers when combined with Bosch Rexroth expertise.

Pairing health index with human insight

The health index is used to assess and regularly report on the condition of the customer’s drive system. When a divergence from the health index is spotted in the drive’s operation, Bosch Rexroth experts interpret the cause and determine what service actions might be needed to keep the system running.

Instead of simply receiving an alarm, the customer gets a concrete recommendation for actions to be taken. The information provided is not abstract data, but rather clear information that the customer can put into use.

“It’s the combination of health index and expert analysis that makes our solution work for the customer,” says Mattias Ljungdahl, Application Manager,
Hägglunds Inside Intelligence at Bosch Rexroth. “With the health index, our analysts can not only see the trends, but also understand and predict the drive behavior for the customer. And because our algorithm is constantly learning, the solution gets better the more it works with an application.”

Integration that strengthens service

A clear advantage of Hägglunds CMp is its integration with Bosch Rexroth’s total service offering. This aspect is emphasized by Wolfram Ulrich, Vice President Sales & Service, Hägglunds Products at Bosch Rexroth who says customers buy not just knowledge, but also the ability to act.

“There are phone apps that can inform you of a fire alarm in your house, but what you really want is to check if there is a fire, and in that case to put the fire out,” Ulrich explains. “The connectivity Bosch Rexroth offers is paired with fast, professional reaction by technicians with deep knowledge.”

Mattias Ljungdahl takes this idea a step further, pointing out that service becomes faster, simpler and more effective when the supplier has detailed knowledge of the customer’s drive system. It is not only the alarms that make a difference, but also the regular reports that form a long-term basis for understanding.

“The solution increases the efficiency of our own service organization,” Ljungdahl explains. “When our service technicians go to a customer with Hägglunds CMp, it’s not just the problem they know before they get there. They’re familiar with the machine and how the application works normally, which makes it easier for them to get things working properly.”

From observation to optimization

Efficiency, of course, is also the deeper goal of many customers, who are increasingly focused on lifecycle costs and productivity. Being able to plan and take corrective actions in time is one aspect, because it means that maintenance can be budgeted more effectively. But another is achieving more with the existing drive equipment.

“Besides helping customers predict and avoid unplanned operating stops, we can use Hägglunds CMp to help them optimize their systems for better
efficiency,” says Ljungdahl. In other words, Bosch Rexroth experts can use the health index to see not only potential failures, but also potential improvements. As Ljungdahl explains, “The high flexibility within Hägglunds hydraulic drive systems lets us adjust the motors and pumps to better match their actual use, or even reconfigure the drive for new power, torque or speed characteristics.”

For Wolfram Ulrich, such optimization is in clear focus as the service moves forward. “The Hägglunds CMp technology gives us an opportunity to go beyond predictive maintenance, to actually optimize the operation of the installed system within its application,” he says. “The more we can understand how a system is operated, the more we can suggest in terms of energy-saving and productivity improvements, for example.”

A solid foundation for tomorrow’s solutions

In a more distant future, Ulrich sees the possibility of an entirely different business model for Hägglunds drive systems. “Today we use Hägglunds CMp mainly to secure reliability and lower the operating costs of our drives,” he explains. “But as our connectivity and analyses become more refined, we may be able to shift our focus further. Instead of hardware, our customers might buy performance in terms of torque and speed.”

Whatever direction the service takes, however, its core will remain unchanged. The success of Hägglunds CMp will remain rooted in its integration of technical and human components.

“The value is not the data, but in the ability to interpret the data and use it to act,” says Mattias Ljungdahl. “Predictive maintenance is not about sensors or even algorithms. It’s about boosting the customer’s reliability and profitability through insights and expertise.”

About Bosch Rexroth

Economical, precise, safe, and energy efficient: drive and control technology from Bosch Rexroth moves machines and systems of any size. The company bundles global application experience in the market segments of Mobile Applications, Machinery Applications and Engineering, and Factory Automation to develop innovative components as well as tailored system solutions and services. Bosch Rexroth offers its customers hydraulics, electric drives and controls, gear technology, and linear motion and assembly technology all from one source. With locations in over 80 countries, more than 29,500 associates generated sales revenue of approximately 5
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-billion euros ($5.5 billion) in 2016.
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About Bosch
Having established a regional presence in 1906 in North America, the Bosch Group employs nearly 32,800 associates in more than 100 locations, as of December 31, 2016. In 2016 Bosch generated consolidated sales of $13.7 billion in the U.S., Canada and Mexico. For more information, visit www.boschusa.com, www.bosch.com.mx and www.bosch.ca.

The Bosch Group is a leading global supplier of technology and services. The company employs roughly 390,000 associates worldwide (as of December 31, 2016) and generated sales of 73.1 billion euros ($80.9 billion) in 2016. Its operations are divided into four business sectors: Mobility Solutions, Industrial Technology, Consumer Goods, and Energy and Building Technology. As a leading IoT company, Bosch offers innovative solutions for smart homes, smart cities, connected mobility, and connected industry. It uses its expertise in sensor technology, software, and services, as well as its own IoT cloud, to offer its customers connected, cross-domain solutions from a single source. The Bosch Group’s strategic objective is to create solutions for a connected life, and to improve quality of life worldwide with products and services that are innovative and spark enthusiasm. In short, Bosch creates technology that is “Invented for life.” The Bosch Group comprises Robert Bosch GmbH and its roughly 440 subsidiaries and regional companies in some 60 countries. Including sales and service partners, Bosch’s global manufacturing, engineering, and sales network covers nearly every country in the world. The basis for the company’s future growth is its innovative strength. At 120 locations across the globe, Bosch employs 59,000 associates in research and development.


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Contact for Journalists:
Bosch Rexroth Corporation
Susan Strauss
2315 City Line Road
Bethlehem, PA 18017
Telephone (610) 694-8352
susan.strauss@boschrexroth-us.com

Phase 3 Marketing & Communications
John Agresti
Laura Craft
1435 West Morehead St., Suite 200
Charlotte, NC 28208
Telephone (704) 729-0146
John.Agresti@phase3mc.com
Laura.Craft@phase3mc.com

Bosch Rexroth Corporation, Corporate Communications
14001 South Lakes Drive, Charlotte, NC 28273, www.boschrexroth-us.com