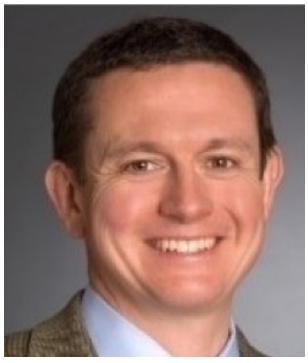
The Power of IoT in Preventing Costly Production Failures



Dr. Michael Watson
Partner at Opex Analytics,
Adjunct Professor at
Northwestern University

Dr. Watson is one of the industry's foremost experts on supply chain analytics who, in addition to his role at Opex Analytics, also serves as a professor on optimization and analytics at Northwestern University. He is also the lead author on texts including Managerial Analytics and Supply Chain Network Design.

Unexpected failure or performance erosion of production equipment can significantly impact productivity, product quality and maintenance expenses within any manufacturing organization. It's also difficult to get operations "back on track" after these failures occur. The good news is that, via the Internet of Things, intelligent use of sensor data, machine learning and optimization can help companies take a proactive approach to predicting failures and re-optimizing processes around them.

The application of sensor technology has been on the rise in manufacturing plants. "There is tremendous value in sensor data," says Dr. Michael Watson from Opex Analytics. "Manufacturing firms are really just starting to take advantage of this." Using this data to detect key indicators or patterns of performance can help identify these issues before they take place. Identification then allows companies to utilize powerful optimization platforms to re-optimize both production and maintenance schedules.

Q: Mike, sensors in manufacturing plants have been around for a long time. What has been the evolution of their use?

A: Most manufacturing plants often start using sensors to help improve Overall Equipment Effectiveness (OEE), which is a measure of how well you are using your machines. These efforts typically help manufacturers understand key indicators of big failures; perhaps, more importantly, they sometimes also uncover hundreds of "micro" failures. This may include ongoing adjustments performed manually throughout each day, the loss of productivity before and after breaks and shift changes, and the long adjustment period after change-overs — all of which can result in significant slowdowns in production in general.

Over time, sensors quickly started to monitor other important measures such as temperature, vibration, settings, fault codes and other measures. Collectively, analyzing all of this data drove a better understanding of failure root causes, and even predicting when you need to perform maintenance.

Most recently, sensors have become advanced enough to take pictures that can be used to inspect for quality or look for buildup on machines.

Q: Where are manufacturing plants in their use of sensors?

A: Firms are all over the place. Some manufacturing plants — especially within the auto industry and other very capital-intensive plants — are very advanced and have been doing this for a long time. But many plants are just getting started. Some have equipment with sensors but they can't actually pull the sensor data into a database, or the volume of data itself simply paralyzes their ability to find meaning, while others are still tracking production manually.

Q: Are there some manufacturing industries that may find this more valuable than others?

A: The firms with the most expensive manufacturing equipment are usually the first to move on sensor data. But, with the cost of sensors coming down, it can be strategically important for more firms to get as much value from their machines as possible.

Q: How has predictive maintenance evolved in the last few years?

A: First, we have more methods to use to predict problems. Statistical methods for predicting failures have been around for ages. In the recent past, however, there has been a substantial rise in the use of machine learning algorithms for finding patterns within data. Companies such as Amazon, Netflix and Google built substantial portions of their business from being able to predict users' wants and needs. This same type of analysis is now being turned into predictive maintenance solutions as well.

Second, companies are getting more creative with the use of data. As the price of sensors has fallen and as machines have become increasingly "powered" by electronics, you can gather more and different types of data. This data would include factors such as speed, precise timing of certain actions, fault codes, vibrations and temperature readings. In addition, analysts also realize the value of deriving data. For example, the rate of change in the temperature may have more predictive power than just the temperature.

Third, companies are leveraging open source software to better analyze sensor data and report potential failures in real time.

Finally, predictive maintenance is also moving to consumer products and products in the field. You can see this in products such as cars and some electronics. In the industrial community, you can see this in mining and farming equipment. This trend will help the manufacturing companies provide better service to their end customers.

Q: How does optimization fit into sensor analytics?

A: Optimization helps manufacturing managers make good decisions with the predictive data they are getting. Even with predictive maintenance algorithms doing their job, you still have tough trade-offs to make. While the algorithms help you understand the probability of a failure, you must also consider the costs to fix that failure and the limited availability of your maintenance crew. Optimization helps you determine which problems you should actually fix today while also considering factors and constraints such as schedules, skill sets, priorities and more. Considering the trade-offs all these factors create ensures that maintenance schedules are consistently being optimized given all available data.

What's even more interesting is when you have complex flows through your factory, the sensors can give you a "real-time" view on what is likely to be late and which pieces of equipment are causing the most problems. If you combine these sensor readings with re-optimizing the schedule, you can better recover and get your plant back on track.

There is consistent pressure for manufacturers to become more "automated." To survive, they must cut costs while also improving efficiency. Implementing spot analytic solutions will only get them so far. The next generation in production operations will not only need to predict when failures will take place but react in an optimal way. The use of powerful and customizable platform environments offer the ability to quickly implement and to control the evolution of these capabilities for years to come.

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www.fico.com
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NORTH AMERICA
+1 888 342 6336
info@fico.com

LATIN AMERICA & CARIBBEAN
+55 11 5189 8267
LAC_info@fico.com

EUROPE, MIDDLE EAST & AFRICA
+44 (0) 207 940 8718
emeainfo@fico.com

ASIA PACIFIC
+65 6422 7700
infoasia@fico.com

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