



CASE STUDY

Smart eMeter Manufacturer Improves Operational Equipment Effectiveness by 40 Percent

Completing a design and prepping it for manufacturing is a victorious moment for most design teams. But design and test challenges don't end when the product moves into manufacturing. Small variations in component quality, assembly technique, or manufacturing process can have a dramatic impact on product yield. Instrumenting your manufacturing process with the right IoT sensors and data analysis tools can ensure you maximize yield and meet demand for your newly created technology.

A large, global Internet of Things (IoT) manufacturer based in Europe, develops smart electricity meters (eMeters) for energy suppliers. The eMeters serve as a critical component in smart grids throughout Europe and across Asia-Pacific. The eMeters must operate on a single battery for at least 15 years, and provide consistently accurate and reliable readings, regardless of any environmental fluctuation. Any shortcoming in product quality can result in overbilling, impacting the consumer's ability to make more efficient energy choices, and preventing energy suppliers from properly managing energy usage.

Initially, the manufacturer delivered its eMeters with the high level of performance and quality its customers required. But as volumes ramped up, the number of false failures due to component, process, and test variability started to rise, and product quality began to suffer. Overall equipment effectiveness (OEE), the industry standard measure for manufacturing productivity, also suffered. The manufacturer experienced

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Company:

- Smart eMeter Manufacturer

Key Issues:

- Identify and resolve product quality issues
- Eliminate false failures and unplanned downtime

Solution:

- PathWave Manufacturing Analytics

Results:

- Improved OEE by 40%
- Increased manufacturing productivity by 30%
- Improved production throughput by 35%

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low first-pass yield, unplanned downtime, and inconsistent test times. The net result was lower efficiency and significant revenue loss.

To isolate the root cause of these issues, the manufacturer knew it had to dig deep into its process, test, and equipment data. The prospect was daunting. Analyzing years of data across its global operations was a time consuming and complex undertaking. The ongoing issue threatened to take an even greater toll on the manufacturer's productivity and throughput. Isolating it using traditional methods would have required significantly more testing, driving up the manufacturer's overall test time and cost.

Leveraging Big Data

The answer to the manufacturer's dilemma came in the form of Keysight Technologies' PathWave Manufacturing Analytics, a software solution that performs advanced analytics using data from process, test and equipment to drive manufacturing improvements and efficiencies (Figure 1).

PathWave Manufacturing Analytics collects data from multiple sources to monitor OEE. An OEE score of 100% means that manufacturing is only producing good parts, as fast as possible, and without any stop time.

To understand how to improve its OEE, the manufacturer needed to understand its product health, manufacturing health, and machine health. Only by determining where issues might occur, could it begin to work to eliminate them. Typically, the priority is to make the manufacturing process stable, before working to optimize it.

As an example, measurement data from every test in every step executed by in-circuit testers (ICTs) can be collected and analyzed to understand a manufacturer's product and manufacturing health. IoT sensors installed on the machines monitor parameters such as temperature, air flow, and vacuum pressure within each machine. This information is used to determine a machine's health without disrupting its functions.

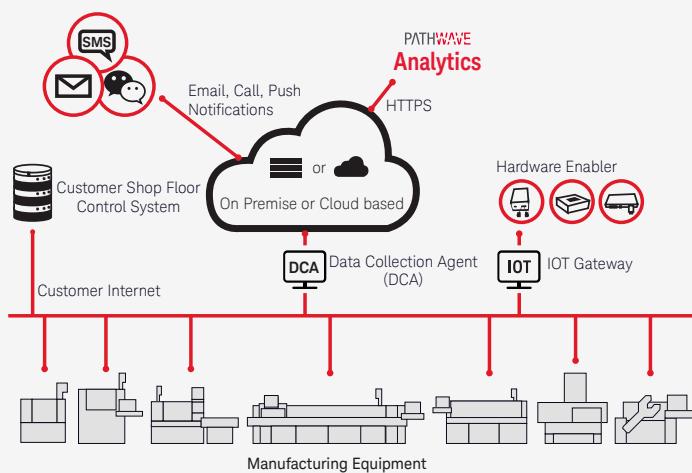


Figure 1: Seamless integration of PathWave Manufacturing Analytics into existing equipment or databases

In the case of the eMeter manufacturer, PathWave Manufacturing Analytics was used to collect data from all these sources. The software's powerful trend detection and anomaly detection algorithms were applied on the data to identify and isolate anomalies. Through software and the power of cloud computing, multi-dimensional analysis was quickly performed to identify the root cause of these anomalies (Figure 2). Alerts were then sent to the appropriate engineers, notifying them about the detected anomalies, so that actions could be taken to rectify them. This not only eliminated the manufacturer's future problems, but improved its process stability as well.

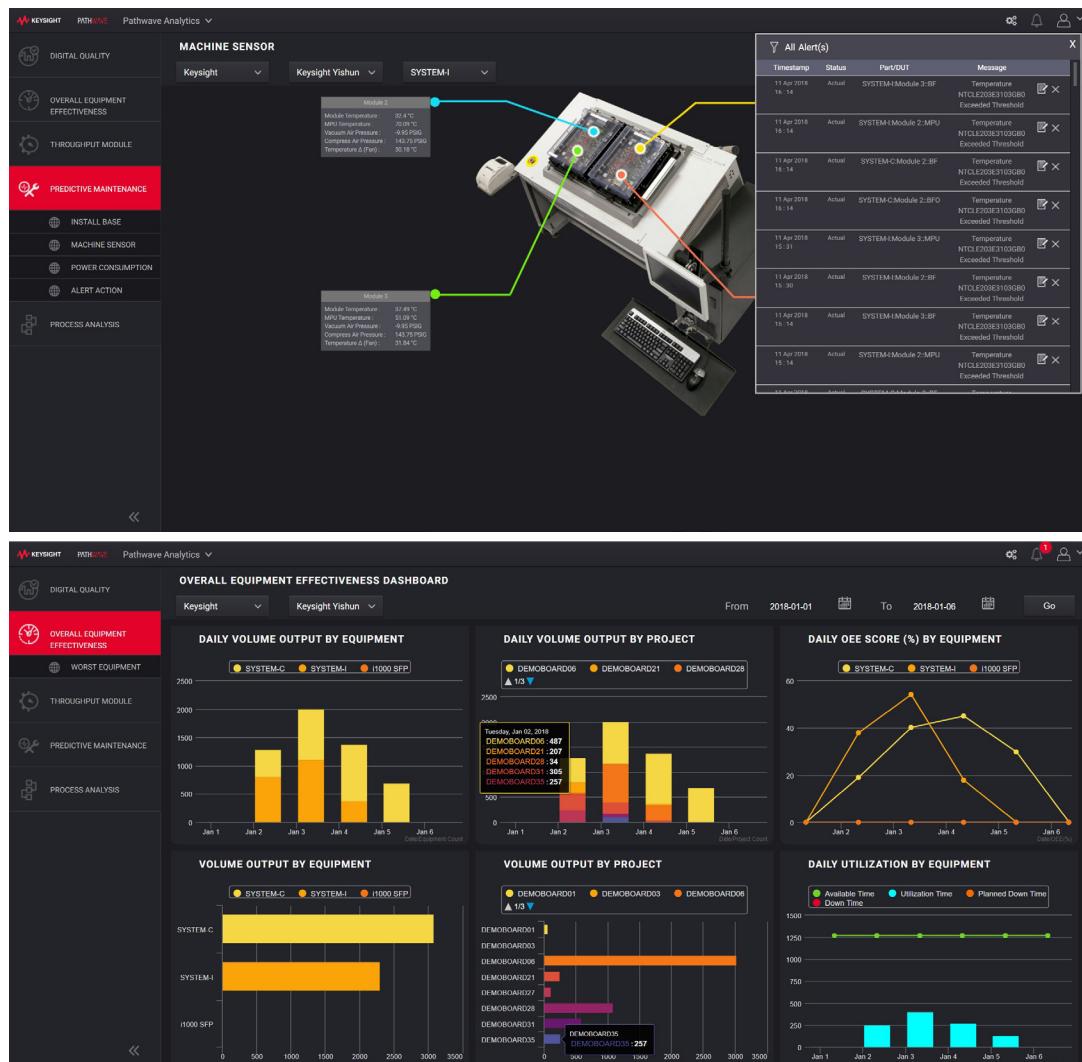


Figure 2: Different data views available with PathWave Manufacturing Analytics

The manufacturer was able to use the analysis from PathWave Manufacturing Analytics to predict potential failures before they could occur. With the analysis in hand, the manufacturer was able to make informed decisions on how to mitigate these risks, preventing future downtime. Additionally, since PathWave Manufacturing Analytics collected data from multiple sites and regions, the manufacturer was able to perform yield and throughput analysis across its regions in real time (Figure 3). By doing so, it became aware of variability in both its yield and test times at its different locations. It took prompt action to investigate the variability and rectify the issues found in its assembly process.

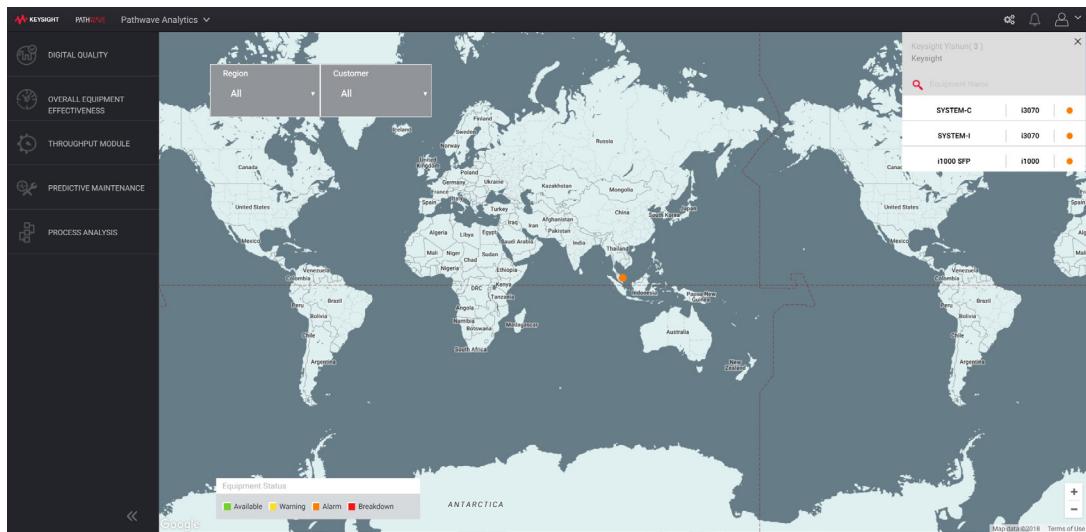


Figure 3: Monitoring processes at manufacturing sites around the world



Better Product Quality, Optimized Manufacturing Efficiencies

Using Keysight's PathWave Manufacturing Analytics solution, the eMeter manufacturer quickly identified and fixed the root cause of its quality issue. It also identified process variations that were driving down yield and throughput. The variations were isolated, and changes were made to optimize the processes. The manufacturer quickly realized a 30% increase in productivity and a 35% improvement in throughput. By making data-based decisions that led to better asset utilization, it also realized a 40% improvement in OEE. The manufacturer was able to deliver its eMeters with optimal product quality, while keeping its revenues high. It now has an optimized process it can confidently adapt for future customers and products.

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Reliable product quality is a key requirement for our customers. Improved manufacturing productivity and throughput are required to increase our revenue. Keysight's solution allowed us to fully exploit the value of our data to quickly resolve our quality issue, optimize our manufacturing processes, and improve our overall efficiency.

Senior Manufacturing Test Engineer

Learn more at: www.keysight.com

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