IBM Predictive Maintenance and Quality for electronics

Reduce operational costs, increase component quality and boost manufacturing productivity

Highlights

- Use sophisticated analytics to systematically enhance product quality and reliability
- Help increase yield and reduce scrap rates through early fault detection
- Accelerate root cause analysis for increased equipment uptime and sustained product quality
- Control maintenance costs by predicting and preempting production line failures

Front-loaded product launches, high-volume supply chains, shorter product lifecycles, tighter design tolerances and relentless cost pressures in today's electronics industry are challenging the assumption that current practices and technologies are adequate to sustain product quality. Electronic component and product manufacturers need new ways to gain insights from the massive volume of data streaming in from their systems, sensors, production equipment, business partners and the manufacturing environment.

In this highly competitive industry, companies must take full advantage of all available information resources by analyzing data and applying insights to critical business and manufacturing processes. Early warnings on product quality and reliability issues help minimize disruption, waste and reputational damage. Smarter, just-in-time maintenance strategies based on predictive analysis can save money and boost operational efficiencies.

IBM® Predictive Maintenance and Quality offers a pre-configured solution with data management and analytic capabilities that help you realize these benefits. Technological advances in monitoring sensors and device communication, along with IBM enhancements in data management, data integration and predictive analytics, combine to help you make more informed, proactive decisions regarding component quality, manufacturing processes and maintenance practices for critical production assets.

Leveraging real-time data to predict and avoid problems

IBM Predictive Maintenance and Quality accesses relevant data sources in real time to help predict asset failure or product quality issues so your organization can reduce reject rates, improve yield and maximize equipment uptime. Driven by predictive analytics, this solution can accurately detect even minor production anomalies and failure patterns to determine the assets and operational processes that are at the greatest risk of failure and identify problems before they occur.

Results by the numbers

An Aberdeen Group study[1] found that the best-in-class organizations (top 20 percent aggregate of performance scorers) employing predictive analytics for asset management attained:

- 3.5% unscheduled downtime
- 89% overall equipment effectiveness (OEE)
- +24% return on assets (ROA) vs. corporate plan
- -13% reduction in maintenance costs

IBM Quality Early Warning System (QEWS) technology, part of the Predictive Maintenance and Quality solution, can detect and prioritize quality problems and parametric shifts earlier and more definitively than can be done using traditional techniques of statistical process control. By detecting problems earlier, you can make appropriate modifications to the production line or eliminate substandard components from the manufacturing process—avoiding wasted production cycles spent making faulty products that ultimately must be discarded. This early identification of potential concerns helps reduce unit costs, maintain product quality, improve margins and increase customer satisfaction.

Finding patterns in the data

With IBM Predictive Maintenance and Quality, organizations can use sophisticated data mining techniques to identify electronic faults without costly lab work. For example, when quality control systems on the production line detect problems, does it mean there is an issue only with the specific items tested, or with the whole batch? It can be difficult for technicians to make this determination. Errors can occur at any of the various stages of the production process and can be caused by a number of factors, from loose soldering to adverse environmental conditions.

Rather than commissioning time-consuming, expensive lab tests to answer this question, electronics manufacturers can use analytics to identify fault patterns and predict outcomes. The solution can gather data from testing systems on the production line and match it against the results of previous laboratory tests, classifying faults into categories according to their most likely root causes. Quality control technicians can quickly decide whether the analysis indicates isolated faults or a systemic problem that may lead to more failures in the future.

For example, at an IBM semiconductor packaging plant in Canada, 97 percent of fault patterns can now be identified automatically, eliminating hundreds of thousands of dollars per year in scrap costs. Furthermore, what-if analysis showed that controlling humidity at a critical point on the plant's manufacturing line would improve product quality and deliver a 160 percent return on investment.[2]

Enabling comprehensive capabilities

The IBM Predictive Maintenance and Quality solution can equip your organization to:

- Determine the predictors of faulty components
- Estimate and extend equipment life
- Assess the health of production line assets
- Deploy maintenance and repair resources proactively through integration with enterprise asset management (EAM) systems
- Identify quality issues sooner
- Lower downstream costs related to lost productivity or poor quality
- Reduce warranty costs and improve customer service

Connecting relevant sources of data such as production equipment, plant maintenance logs, supply chain data and surrounding environmental data contributes to the development of predictive models that enable faster, more informed decisions.

Making better decisions, with confidence

By taking advantage of capabilities for master data management, advanced analytics, business intelligence, dashboards and visualization, IBM Predictive Maintenance and Quality offers comprehensive analysis to improve decision-making confidence. It also helps reduce the expenses of unplanned downtime and assure consistent product quality. And due to its open architecture, the solution works with a wide range of data sources and data types: structured and unstructured, real-time or batch, streaming or at rest.

Case in point: Detecting quality problems weeks earlier

A manufacturer of precision electronic equipment faced several potentially crippling issues:

- Expensive procured components and assemblies that magnified the impact of any supply-chain quality deviations
- Long manufacturing cycle times that delayed identification of quality problems and the ability to take corrective actions
- Low manufacturing volumes for very-high-value products, which constrained traditional statistical quality-control methodologies

IBM helped the company implement a methodology for monitoring production data at selected test points and tailored the analytics model to their specific requirements. The manufacturer was able to improve production yields by detecting manufacturing quality problems sooner and gaining a clear understanding of root causes.

Compared to standard statistical process control (SPC) methodology, the sophisticated algorithms of IBM QEWS consistently provide earlier and more definitive detection—up to six weeks earlier in some cases (see Figure 1).[3]

IBM QEWS case study results: Early detection

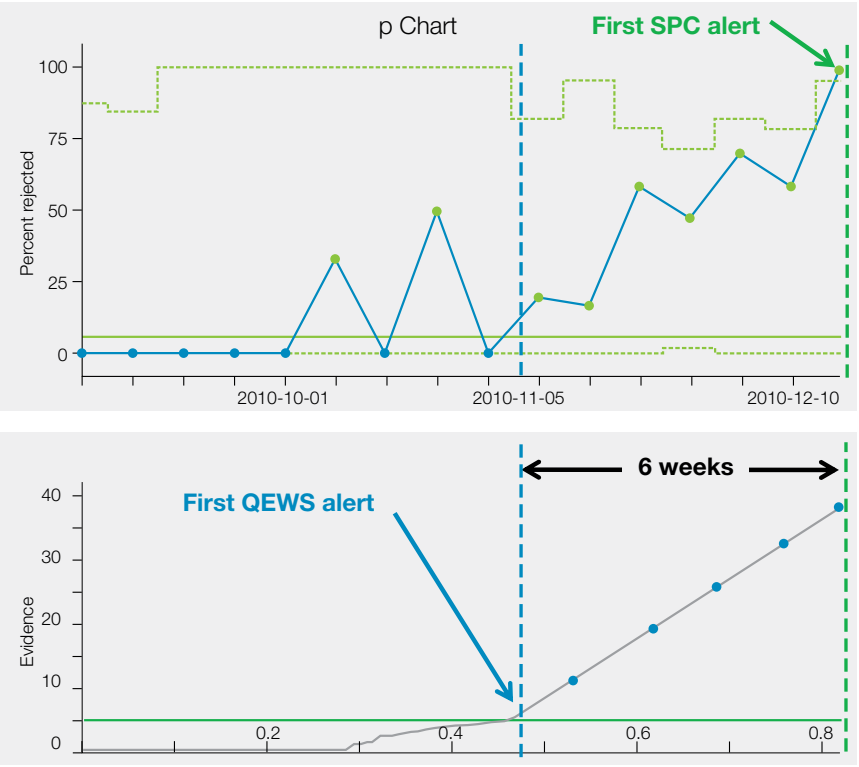

Chart One shows SPC analysis results for a set of quality data. The X axis is aligned in time to Chart Two below. SPC alerted when a point fell outside the control limits at the extreme right side of the chart.

Chart Two shows QEWS analysis results for the same set of quality data. QEWS alerted when the cumulative evidence crossed the horizontal threshold line (in green).

In this case, QEWS alerted six weeks earlier than SPC.

Figure 1. Results from IBM Quality Early Warning System proof of concept at an electronics manufacturing facility.

Whether you manufacture consumer electronics, network equipment, medical devices, semiconductors, automation equipment or office products, you can benefit by deploying IBM Predictive Maintenance and Quality. The industry-specific customization and adaptability of IBM predictive models—plus pre-configured dashboards and visualization templates, and an analytics data store through a service-oriented architecture—can be tailored to help improve the unique manufacturing productivity and product quality challenges of the electronics industry.

Why IBM?

IBM has established a deep, comprehensive portfolio of analytics solutions. It deploys 9,000 business analytics consultants and 400 researchers, and has acquired more than 30 companies since 2005 to build targeted expertise in business analytics. IBM secures hundreds of patents a year in big data and analytics, and converts this deep intellectual capital into breakthrough capabilities, including cognitive systems such as IBM Watson™. The company has established a global network of nine analytics solutions centers and has more than 27,000 IBM Business Partners.

For more information

To learn more about IBM Predictive Maintenance and Quality solutions, please contact your IBM representative or IBM Business Partner, or visit: **ibm.com**/software/products/en/predictive-maintenance-quality

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[1] Paquin, Reid. "Asset Management: The Changing Landscape of Predictive Maintenance." Aberdeen Group. March 2014. http://public.dhe.ibm.com/common/ssi/ecm/en/ytl03210usen/YTL03210USEN.PDF?ce=ISM0055&ct=is&cmp=ibmsocial&cm=h&cr=sb&ccy=us

[2] "IBM Bromont gains huge ROI through smarter quality management." May 2014. **ibm.com**/software/businesscasestudies/us/en/spss?synkey=P287493K09164R00

[3] Dietrich, Brenda L.; Plachy, Emily C.; Norton, Maureen F. "Analytics Across the Enterprise." IBM Press. May 2014. **ibm.com**/analytics/us/en/analytics-across-the-enterprise.html

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