

IBM Bromont gains huge ROI through smarter quality management

Predictive analytics enables instant root-cause analysis and supports better investment decisions



Smart is...

Using sophisticated data-mining techniques to identify electronic faults without costly lab-work.

When quality control systems on the production line detect problems, does it just mean that the specific items that failed the test are faulty, or could there be a problem with the whole batch? Rather than commissioning time-consuming and expensive lab tests to answer this question, IBM Bromont is using analytics to identify fault patterns and predict outcomes – saving inspection costs and getting production back online again much more quickly.

In the microelectronics industry, precision is everything.

IBM's facility in Bromont, Quebec, assembles CPU modules that power servers in banks, hospitals and other organizations around the globe. Each module can contain as many as 19,000 electrical connections, and a fault in just one of these connections could cause a client's business-critical systems to fail. Every single one needs to be perfect.

Any module that doesn't pass the production line's rigorous electrical tests is removed and scrapped. But the question for Bromont's engineers is whether such modules represent isolated failures, or if they might indicate a wider problem with the batch.

The engineering team decided to harness the power of analytics to identify failure patterns and instantly decide how serious the problem is. The results? A predicted 150 percent return on investment in year one: problems are resolved more quickly, lab costs are significantly reduced, and production flows more smoothly, with fewer interruptions.

Highly sophisticated manufacturing

IBM Bromont assembles 200 different types of products for its customers using 800 manufacturing processes. Producing microelectronic assemblies is an extremely delicate task, involving components that are often too tiny to be seen by the naked eye.

In the past, when the plant found problems in the modules it assembles, it was extremely difficult for staff to identify the root cause of the fault. Errors can occur at any of the 30 or more stages of the production process, and can be caused by a huge range of factors – from loose soldering to adverse environmental conditions.



Business benefits

- For one specific operation, 97 percent of fault patterns can now be identified automatically, potentially avoiding hundreds of thousands of dollars per year in total costs
 - Fault pattern recognition analytics should deliver a 150 percent return on investment
 - “What if?” analysis shows that controlling humidity at one point on the manufacturing line will improve product quality and deliver a 160 percent return on investment
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IBM Bromont inspects the modules using sonograms and x-rays to help understand failure modes and detect deviations in assembly – but in some cases, more sophisticated lab tests are required to characterize the failing parts into known root causes.

Eric Paradis, who is responsible for IT strategy at IBM Bromont, explains: “Whenever a significant number of components in a batch showed open contacts during the electrical tests, we sent the faulty items to the lab for examination. This process required a lot of time and resources, and we needed to wait for the results of the tests before we could decide whether the whole batch might be affected by the same problem. There was an opportunity to find a better way, given the right data.”

Finding patterns in the data

In a project called MAP-O (Modèle d’Analyse Prédictive d’Opens), the Bromont team used IBM SPSS Modeler, a component of the IBM Watson™ Foundations platform, to find out whether the electrical test data could help identify the root causes of failures.

The electrical test system provides x and y co-ordinates that pinpoint the location of any failed connections on a module. By comparing this data with the outcomes of each module’s subsequent lab tests, IBM Bromont was able to identify categories of defects that correspond to specific patterns of faulty connections.

For example, if pressure is inadvertently put on the corners of the microchips, it can create hairline cracks in the chips. These cracks may be invisible to the naked eye, but they could cause connections to fail in the surrounding area of the module. If this kind of defect is found in a small number of modules, it may indicate potential future problems with the whole batch.

Matthieu Lirette-Gelinas, Business Analytics Junior Engineer, explains: “Insight into fault patterns enables us to identify the underlying defects without having to send so many modules to the laboratory

Smarter Manufacturing **Faster fault identification with predictive analytics**



Instrumented

The solution gathers data from electrical testing systems within the production line, and sends information about faulty products to a central analytics platform



Interconnected

The electrical test data is matched against the results of previous laboratory tests, which enables faults to be classified into categories according to their most likely root causes.



Intelligent

The plant can quickly decide whether the analysis indicates isolated faults, or a systemic problem that may lead to more failures in the future. This improves overall quality, reduces test cycle time, and cuts laboratory costs.

Solution components

Software

- IBM® DB2®
 - IBM Predictive Maintenance and Quality
 - IBM SPSS® Modeler
 - IBM SPSS Statistics
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“Scenario modeling has helped us assess the economic impact of managing humidity more actively. We expect to achieve a return on investment of 160 percent in the first year – an excellent example of how analytics helps us make better business decisions.”

— Matthieu Lirette-Gelinas, Business Analytics
Junior Engineer, IBM Bromont

for inspection. This helps us to keep costs down and get high-quality products out to our customers faster. This is a huge win for us – in fact, by the end of this year, we are expecting to see a 150 percent return on our investment in purchasing the infrastructure that supports SPSS Modeler, configuring the models and designing the dashboards.”

Moving from reactive to proactive problem-solving

IBM Bromont has also used analytics to assess the impact of environmental factors on product quality. For example, engineers had long believed that high levels of humidity increased the overall rate of failures. However, they had never been able to quantify the relationship because humidity data is not linked to production data, and there are so many other factors at play.

“Multivariate analysis techniques have finally enabled us to determine the conditions under which humidity can affect product quality,” says Matthieu Lirette-Gelinas. “And scenario modeling has helped us assess the economic impact of managing humidity more actively. We discovered that the cost of improving our industrial dehumidifiers would be more than offset by the savings from reducing quality issues on this portion of the line.

“We now have the equipment in place to keep our production line at a lower maximum humidity level, and we expect to achieve a return on investment of 160 percent in the first year – an excellent example of how analytics helps us make better business decisions.”

Seeing without sensors

As well as justifying investment where it is necessary, the solution is helping Bromont to avoid purchasing unnecessary production-line equipment.

Matthieu Lirette-Gelinas comments: “There are all kinds of sophisticated sensors that can be fitted to our fabrication tools – but in many cases, the sensors are more expensive than the machines themselves! Analytics gives us a method of assessing impact of factors that we may not be able to measure directly – so we can do more with the data we already have, instead of making big investments in high-tech equipment.”

Looking to the future

In the future, IBM Bromont plans to extend its investment in analytics by introducing the IBM Predictive Maintenance and Quality solution, which will turn analysis into a fully integrated end-to-end process – seamlessly extracting data from sensors and systems, analyzing it, and then integrating the results data into production and asset management systems. This will empower users and decision-makers to act upon the findings and optimize their decisions.

Eric Paradis concludes: “We have already made huge progress in improving root cause identification, optimizing operating conditions and reducing operational costs in specific processes. We need to press on and leverage even more data to extend these accomplishments to the whole value chain. We know that will help us better comprehend deviations and maintain efficiency with a more stable line. As we say here: ‘Data is Opportunity, Information is Power, Analytics is Money’. Ultimately, this philosophy helps us ensure that our products maintain the reputation for quality and reliability that our clients expect from their IBM systems.”

About IBM Bromont

The IBM facility in Bromont, Quebec, produces state-of-the-art microelectronic components that are used in IBM hardware and a wide range of third-party devices. Founded in 1972, the plant employs more than 2,800 people and exports around USD700 million worth of products each year.

For more information about IBM Bromont, please visit:
ibm.com/employment/ca/en/br_intro.shtml

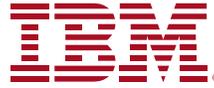
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IBM Business Analytics software delivers data-driven insights that help organizations work smarter and outperform their peers. This comprehensive portfolio includes solutions for business intelligence, predictive analytics and decision management, performance management, and risk management.

Business Analytics solutions enable companies to identify and visualize trends and patterns in areas, such as customer analytics, that can have a profound effect on business performance. They can compare scenarios, anticipate potential threats and opportunities, better plan, budget and forecast resources, balance risks against expected returns and work to meet regulatory requirements. By making analytics widely available, organizations can align tactical and strategic decision-making to achieve business goals.

For more information

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