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HOW ANALYTICS AND BUSINESS INTELLIGENCE CAN HELP YOU EXCEL AT MANUFACTURING

Whitepaper

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HOW ANALYTICS AND BUSINESS INTELLIGENCE CAN HELP YOU EXCEL AT MANUFACTURING

Improving Production Runs with Better Data

Whether seeking to improve production efficiency, gain greater visibility and control over costs, strengthen supplier performance, or deliver customer orders on time, the path to improving manufacturing is paved with solid data. In the past, manual systems for capturing and analyzing data were functional, if not ideal. However, with today's unpredictable and rapidly changing market conditions, the only way to make timely decisions is through automation. For this reason, more manufacturers than ever are turning to analytics, business intelligence (BI), and manufacturing intelligence (MI).

Through BI, MI and analytics, manufacturers can gain both the real-time and historical insights to, for example, understand how decisions made on the shop floor impact their financial performance or forecast how changes in a supplier's pricing will affect standard costs, cost variances, and margins. In this way, these solutions serve as the fuel that transforms enterprise resource planning (ERP) systems into flexible production systems that enable manufacturers to adapt to change and scale in response to customers' needs.

Of course, any analysis is only as complete as the data on which it is based. BI, MI and analytics solutions work best when they share a single database that spans every phase of production and relies on real-time monitoring to capture data from the shop floor. This enables a 360-degree view of manufacturing operations that is difficult to achieve when data remains distributed in different systems.

The goal of this white paper is to provide insights into how combining analytics with a 360-degree view of manufacturing can increase production efficiency and streamline manufacturing operations by providing greater visibility and control.



HOW BI HELPS TO IMPROVE MANUFACTURING PERFORMANCE

BI, prescriptive analytics, and predictive analytics are redefining manufacturing today by providing insights, intelligence, and knowledge that were previously inaccessible. Manufacturing is the most data-intensive industry there is. Mining the massive amounts of data a manufacturing operation generates daily by using industry-standard metrics and key performance indicators (KPIs) opens up new opportunities to compete and win more business. Analytics and BI tools are reducing uncertainty across manufacturing by enabling the following:

Know How Shop Floor Decisions Impact Financial Performance

Including lower-cost suppliers' materials in a new product's production runs can reduce standard costs and have a positive impact on cost variances. By turning to analytics and BI, manufacturers can understand if and how much margin is being gained by bringing in the new supplier while measuring the impact on margins, indexed by production yields. Moreover, when manufacturing, accounting and financial systems are all based on a single, unified database, manufacturers can make trade-offs on the shop floor and seeing their impact on schedules, costs, margins and financial performance – all in real-time.

Excel at Shop Floor Analytics, Including OEE

Many manufacturers globally consider overall equipment effectiveness (OEE) to be one of the core set of metrics and key performance indicators (KPIs) they rely on to run their operations. OEE measures the performance of a given machine, product line, work team or entire production center. OEE is most often tracked at the machine level to capture each production asset's utilization rate, performance levels, and quality. It is calculated using the formula of Availability x Performance x Quality. DELMIAWorks provides OEE Business Intelligence templates that enable manufacturers to get up and running quickly and gain insights on equipment and shop floor performance.

Attain Higher Levels of Product Quality

Knowing why product quality varies by machine, process, and workflow is invaluable in reducing scrap rates and increasing yields. Manufacturing intelligence is created when sensors attached to machines capture data in real time, entering it into a historian database. Real-time production and process monitoring provides an invaluable glimpse into how every phase and process are performing across manufacturing operations. MI based on real-time monitoring makes it possible to fine-tune statistical process control (SPC) and catch potential trouble areas before they impact production.



HOW BUSINESS INTELLIGENCE IMPROVES COMPETITIVENESS

Real-time production and process monitoring to the machine level provides a consistent, high-quality stream of data to analytics, BI and manufacturing intelligence applications. Manufacturers are creating entirely new metrics and KPIs based on the combination of real-time data and MI apps based on BI technologies. The reduction of delays in getting data analyzed is leading to entirely new areas where manufacturing intelligence is making an impact today. Following are ten areas where integrating advanced analytics or MI, ERP systems, and specific production processes are delivering solid results:

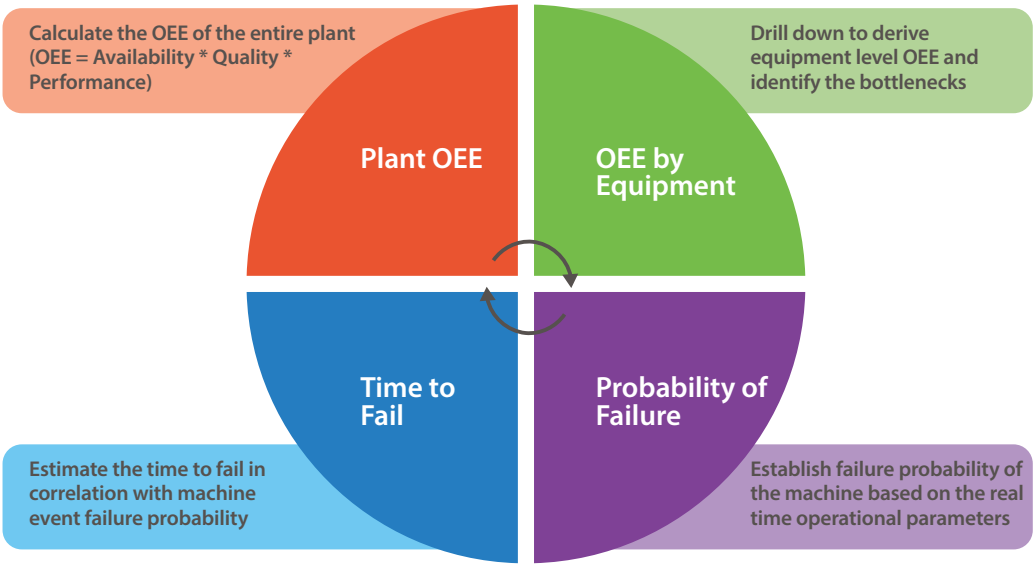
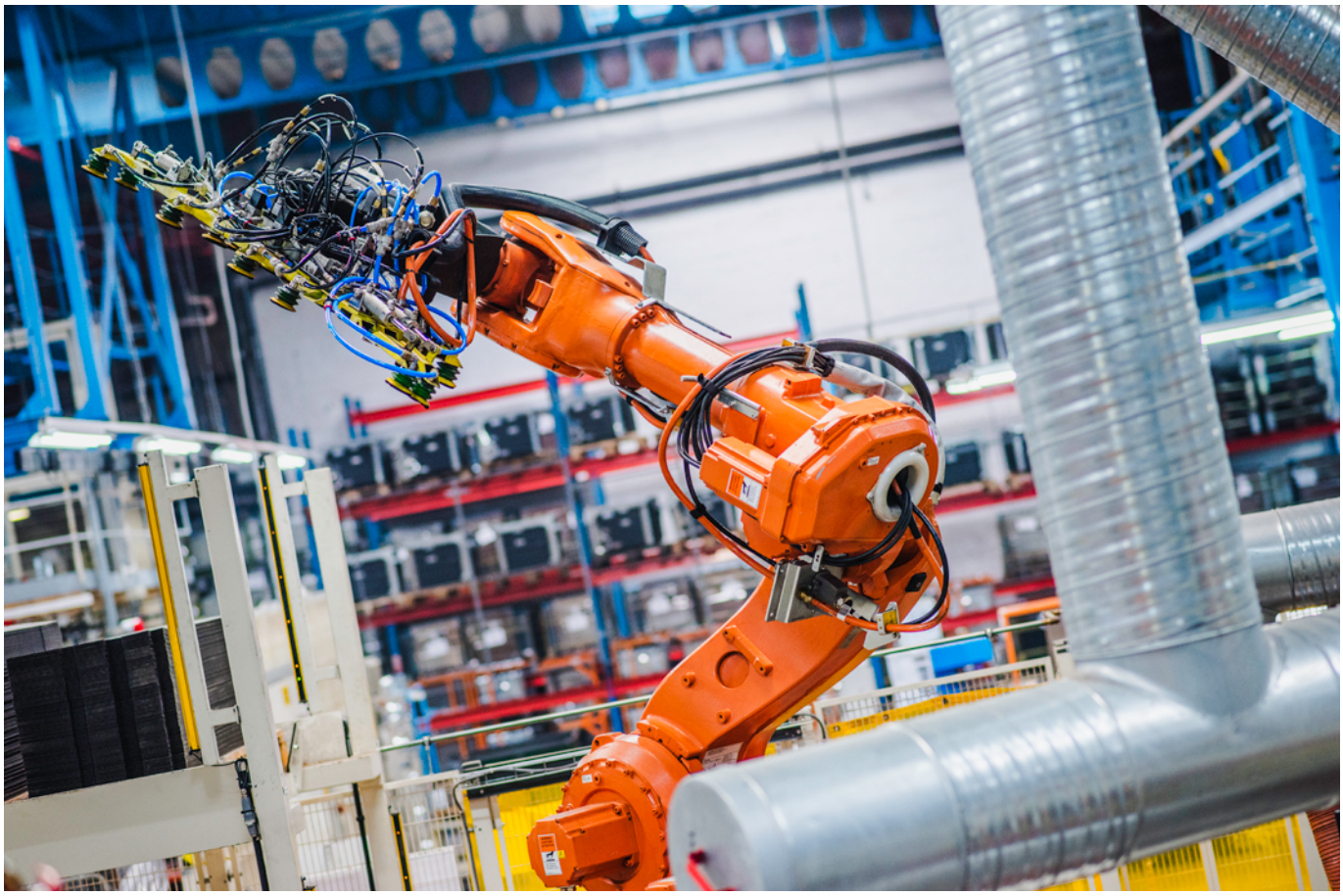
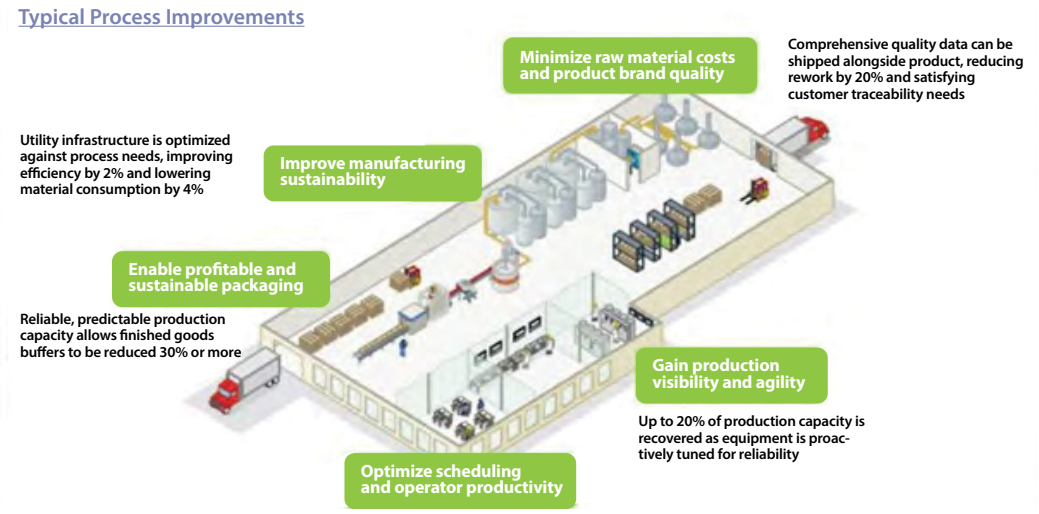


Figure 4: The Predictive Maintenance Solution for the OEM Plant



It's possible to increase production capacity up to 20% while lowering material consumption rates by 4% when ERP apps and manufacturing intelligence operate on the same database. Current and future manufacturing systems are being designed to capitalize on predictive data analytics, and MI has the potential to improve yield rates at the machine, production cell, and plant levels. The following graphic from General Electric and cited in a National Institute of Standards (NIST) report provides a summary of benefits that are being gained using predictive analytics and MI in a typical production operation today.



MI provides the data manufacturers need to the machine and process level to make the best possible decisions of how they can improve quality and compliance. Product quality is the one product differentiator you can't buy; no amount of advertising or promotional spending can hide a badly made product. By using MI-based insights from the shop floor and translated into financial metrics, manufacturing management teams can now see how their decisions to double-down on product quality are paying off. Additionally, the 360-degree view of manufacturing operations provided by a unified database that includes financial data makes it possible to calculate the cost of quality over time. This provides invaluable insights into the cost of good quality versus bad and how decisions made on the shop floor can improve it.

Using manufacturing intelligence to predicting cost increases and decreases can drive greater gross margins and revenue growth. The combination of analytics, BI and financial data provides the visibility and control manufacturers need to stay on top of pricing when market conditions change. By monitoring, managing, and optimizing pricing across all product lines using the combination of analytics, BI and financial analysis, manufacturers can steering clear of negative cost variances and protecting margins.

The real-time insights from manufacturing intelligence enable manufacturers to optimize operations and improve production yields. Manufacturers are turning to more complex, customized products to use more of their production capacity, and manufacturing intelligence can help to optimize the best possible selection of machines, trained staffs, and suppliers. How? MI provides new insights into how yields by machine and production processes can be optimized for any given product being produced.



Combining real-time data from the shop floor, ERP-based product histories, and quality management data, lets manufacturers rank supplier quality and improve yields in real time. Manufacturing intelligence is improving product and service quality by determining which internal processes, workflows, and factors contribute most and least to quality goals. Using MI, manufacturers are gaining greater levels of precision in how the trade-offs they make on the shop floor impact yields, scrap rates, and the cost of quality.

Greater insights from MI help to accelerate manufacturing cycle times. By definition, manufacturing cycle time quantifies the amount of elapsed time from when an order is taken until the product is produced and entered into finished goods inventory. Cycle times vary by a segment of the manufacturing industry, size of manufacturing operation, global location and relative stability for supply chains supporting operations. The greater the level of insight into how cycle times can be improved, the more competitive any manufacturer is.

Tracking perfect order performance across multiple production centers globally provides insights into why they vary. Perfect order performance measures how effective a manufacturer is at delivering complete, accurate, damage-free orders to customers on time. The more complex the product lines and configuration options are including build-to-order, configure-to-order and engineer-to-order workflows the more challenging it is to attain a high, perfect order level. Greater analytics and insights gained from real-time integration and monitoring help complex manufacturers attained higher perfect order levels over time.

Manufacturing intelligence provides the data manufacturers need to keep improving MRO performance. Predictive analytics is the cornerstone of any effective maintenance, repair and overhaul (MRO) program. MI provides the data that predictive analytics applications need to forecast when a given machine or asset will need maintenance and repair, helping prevent expensive line shutdowns and lost productivity.

Understanding why the RMA Rate and % of manufacturing returns fluctuates and what can be done helps to improve quality. Return material authorization (RMA) is by definition the percentage of products shipped to customers that are returned due to defective parts or do not otherwise meet their requirements. RMAs are a good leading indicator of potential quality problems. Manufacturing intelligence is helping to create new KPIs and metrics that define and quantify the factors that most often lead to RMAs happening in the first place. Best of all, ERP systems combined with MI predict which suppliers need to improve and their quality levels, production processes, and quality metrics to reduce RMAs.

How Real-Time Data Fuels Greater Manufacturing Intelligence

Manufacturers are competing against time, competitors, and customers' continually increasing expectations of consistent manufacturing quality. Winning new opportunities and growing faster than competitors requires real-time data and the insights that analytics, BI and machine intelligence provide.

Programmable logic controllers (PLCs), which are now commonplace across many manufacturing operations, provide real-time data on machine quality, reliability, and performance. As a result, PLCs along with sensors serve as the cornerstones of manufacturing intelligence, enabling real-time data streams to be interpreted by analytics and BI applications.

Machine-to-machine (M2M) technology is also bringing real-time data to SPC applications capable of providing real-time alerts, graphs, and reports. And the potential for Internet of Things (IoT) to capture data that has eluded manufacturers for many years is now reality.



Conclusion

Knowing how and by how much a decision made on the shop floor impacts the financial performance of a given plant or entire manufacturing business has eluded company leaders for years. Now with analytics, BI and machine intelligence all included with a single, unified database, manufacturers have the 360-degree view they need to understand how every decision on the shop floor affects their financials and business performance.

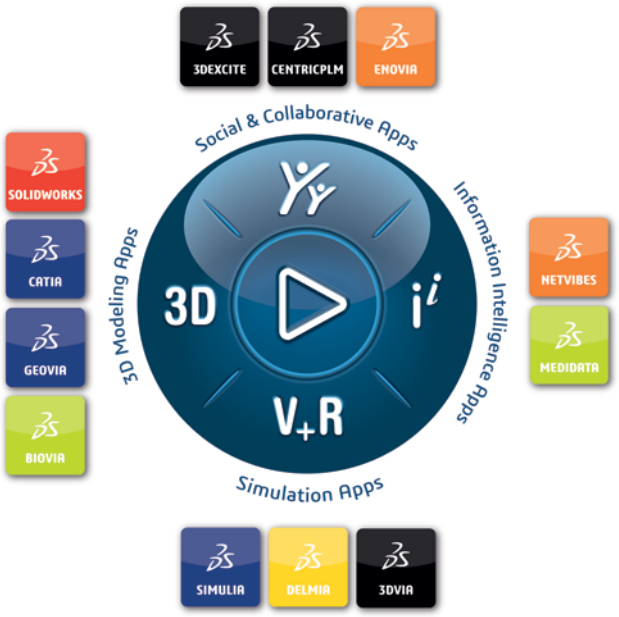
At the same time, manufacturers need to keep production runs on track by removing roadblocks and knowing how quickly changing supplier, customer, market and service costs might help or harm production goals. Increasingly, they are turning to advanced analytics and BI applications to discover new ways to improve production efficiency, gain greater visibility and control over costs, and deliver customer orders on time. When analytics, BI, and manufacturing intelligence combine insights from the shop floor with integrated data all on the same federated database, manufacturers can make the data-driven decisions that deliver results.

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