USING DATA-DRIVEN DECISIONS TO IMPROVE OPERATIONS

A well-thought-out plan for collecting, integrating and presenting manufacturing data can help drive business improvements.

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Manufacturing Intelligence (MI) projects are initiated to improve manufacturing operations by turning data into actionable information that drives business results. The latest technology now provides unparalleled insight into manufacturing systems.

This in turn entices manufacturers to want to use this insight to drive improvements in line performance, line availability, overall quality, waste reduction, inventory management,changeovers, reduced impact of recalls, etc.

This approach improves preventive and corrective action decision-making because it's based on data instead of perception or "gut feel." Yet many MI projects fall short of meeting expectations. These projects have to deliver the promised business improvements if they're to have long-term support within an organization. Often, however, MI projects provide manufacturers with reams of unusable data and little else.

This reality prompts the question: What can these manufacturers do to extract maximum value out of their manufacturing data?

Sort All That Data

Technological advances in automation, instrumentation and networking over the past several decades has resulted in a tremendous amount of diagnostic data being available for consumption. A typical manufacturing system easily can contain millions of data points.

Sorting through this data to determine how to best use it creates unique challenges, including:

Data Overload. With the massive amount of data available, having the time to sort through it to find what you need, when you need it, becomes a frustrating exercise that often results in abandoning the search and making a decision based on the limited information available.

Untimely Data. Looking at yesterday's data is not always conducive to improving today's operations. Historical data is useful for certain analysis and comparison of metrics, but real-time data that manufacturers can act upon when variances occur is more important.

Lack of User-Based Data. A manufacturing enterprise contains various users who want to extract value from this data, including production, engineering, plant management, quality control, purchasing,corporate management, etc. And each user requires a unique view of the data.

A well-thought-out plan should focus on how to convert manufacturing data into useful information.

For example, a plant manager might want to know the average cost per case being produced in near real time, while a maintenance manager might only want to look at one of the variables making up the cost per case Key Performance Indicator (KPI), such as machine downtime.

Lack of Context-Based Data. Information with no context is just data that is interesting, but not useful. Visualizing related information provides understanding—a basis to make wiser decisions. For the above cost-per-case example, it would be beneficial to see this KPI trended along with other variables that might affect it, but that aren't part of the KPI calculation. These can include product being run, shift, amount of overtime required and total energy usage in the plant.

Inaccurate Data. An additional challenge is reporting inaccurate data that typically leads to lack of user confidence in the data.

If the data can't be trusted, then there's no point in spending the time to look at it. Bad data is worse than no data.

Several potential causes for this exist, including manual data collection, poor configuration, mislabeling of data points and not understanding what makes up each data point.

The Plan to Address Challenges

A well-thought-out plan to address such challenges is essential for delivering expected business results. The plan should focus on how to convert the data into useful information. But who determines what information is useful?

This in turn leads us to ask each manufacturer what information they require to enable better decision making. This approach focuses the effort on the users' needs, not the endless data points available. A typical plan might consist of the following steps:

1. Identify users and requirements for each user role.
2. Identify how each user will use the requested data to improve operations.
3. Identify KPIs required and standardize for apples-to-apples comparisons.
4. Identify data sources (PLCs,HMIs, Historians, ERP, CRM, WMS, LIM, etc.) to access.
5. Identify data presentation interfaces, such as dashboards, Web pages, HMIs and smartphones, that best suit each user.
6. Select software solutions to collect, integrate and present the information.
7. Identify gaps in infrastructure and technology for achieving project goals.
8. Identify and execute pilots to test any areas of concern and provide users with a test drive.
9. Roll out across all manufacturing systems and sites.

User Requirements. Representatives from each user group (i.e. operators, maintenance, quality, safety, plant management, corporate, IT, etc.) should be interviewed to determine what data can enable them to make better decisions in their day-to-day functions.

How Data Will Be Used. During the discovery period to determine user requirements, the focus is on how each information requirement will translate to improving the business. This ensures that everyone keeps this goal in mind at all times. Once manufacturers understand and document each user requirement and improvement opportunity, they have a framework for what success means for their projects.

Standardized KPIs. KPIs provide a common benchmark for the plant's metrics and allow meaningful comparison of data. For example, having a different cost-per-case metric for each manufacturing system or plant causes confusion and doesn't allow effective comparison.

Getting everyone to speak a common language allows for better understanding and provides the framework for improvement. KPIs also provide a leaner, more targeted view of the data. Drilling into each KPI then can provide detail that supports that particular KPI calculation,with additional drill-down providing even more detail. This hierarchical organization of data allows easy access to the level of detail required, without losing sight of the bigger picture.

Data Sources. Context-based information might require data to be pulled from various sources to provide comparative analysis. For instance, energy usage data is meaningful when compared to production information such as production counts and products run.

In addition, a cost-per-case metric, for example, might require data labor costs from the ERP system, production counts from the historian, parts costs from asset management and energy costs from a utility management system.

Key Performance Indicators provide a leaner, more targeted view of manufacturing data.

Data Presentation. Technology now allows the same information to be presented easily in a variety of interfaces, including Web pages, smartphones and large LCD displays. Manufacturers should evaluate selected technologies for each data requirement and user group based on how each one consumes the information and reacts to it. Here are some examples:

- An IT manager might need text and e-mail alerts sent to their smartphone whenever a manufacturing server develops a critical error.
- Production personnel might prefer an overhead, large LCD display that provides a manufacturing system overview with color-coded downtime blocks to indicate equipment status, or progress against a work order.
- A corporate manager could use a smartphone that displays the day's planned versus actual production counts for each plant. Color-coded indicators show status with drill-down capability to access more granular information that shows each production line's performance.

Software Solutions. MI software provides functionality that allows manufacturers to bring live data from multiple disparate sources to integrate and present data in meaningful ways.

The software provides a common interface to view and analyze the data without having to access different software interfaces separately for KPIs, such as cost per case that requires data from multiple systems.

In addition, many software offerings integrate with Microsoft SharePoint allowing for even greater access to business intelligence data and leveraging SharePoint's core capabilities of collaboration, information sharing, content management, search, blogs, wikis and security.

Gap Analysis. Once the future state is identified, the present state should be evaluated to determine what infrastructure and technology gaps need to be addressed to access the desired data and present it as planned.

Proof of Concept. Prior to rolling out a full-scale deployment, test any areas of concern that could affect functionality delivered by the MI project. A pilot test typically is a small-scale implementation for this purpose. In addition, a pilot provides manufacturers with a system test drive so they can obtain better feedback before rolling out the complete system.

This phased approach allows early adopters to understand the value that the system can deliver. Therefore, requirements that can provide the highest value typically are targeted for a pilot.

A continuous improvement plan should be part of the rollout.

Rollout. Once pilots are complete and lessons learned are incorporated, a rollout strategy can be developed to deliver project requirements to all identified users. A continuous improvement plan should be part of the rollout to ensure the system continues to be optimized based on user feedback and as needs change. Ideally, the manufacturer assigns a champion to lead this effort.

Driving Value

MI is a valuable tool for driving operational improvements. Understanding best practices, avoiding status-quo pitfalls, obtaining alignment from all stakeholders early in the project, and committing to a disciplined plan for executing these projects will help ensure success and deliver the promised results to the business. Transforming manufacturing data into actionable information provides a platform for continued improvement.

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