



Manufacturing Intelligence brings transparency to enterprise processes

Clear criteria for planning and production

Disparate reporting systems, numerous media fragmentations and diverse performance indicators are all obstacles to the exchange of data between Production and Planning in manufacturing enterprises. This is where the latest IT can provide a remedy. By automating the flow of information between production control systems and Enterprise Resource Planning (ERP) it can help to prepare critical, enterprise-strategic data quickly, reliably and objectively. With its Manufacturing Intelligence (MI) portfolio, Siemens IT Solutions and Services is there to support companies as they introduce such solutions.

What is needed on the factory floor is much more intelligent IT – this was the recent diagnosis by analysts from the Aberdeen Group. One of the conclusions of their benchmark report "Event Driven Manufacturing Intelligence 2008" was that just randomly collecting data in enterprise planning and production was more likely to hinder effective cooperation between areas rather than encourage it. The data logjam can be broken, however, by inserting an intermediate IT level where information from enterprise planning and operational workflows is aggregated, aligned and prepared.

Manufacturing Intelligence (MI) derives from the known concept of Business Intelligence (BI). BI focuses on acquiring data and keeping it available for Management. MI, by contrast, links the various data sources including proprietary data providers and BI systems in order to extract the requisite information from them. Ideally, this enables MI to realize synergies between the top-down approach of Enterprise Resource Planning (ERP) and the bottom-up approach of Manufacturing Execution Systems (MES). This involves aggregating business management, production engineering and technical product data in order to derive important performance indicators such as cycle times, order levels and utilization rates.

In situations where material requirements vary greatly, in electronics or component manufacture, for instance, or where sudden capacity bottlenecks occur as a result of machine failure, material planners and Procurement can use MI to run through such scenarios predictively and semi-automatically. Based on the results, it is then possible to optimize a factory's machine utilization or overall capacity utilization and match individual resources quickly and as required by the situation.

Fast, accurate and comparable

The MI concept is not entirely new, given that companies today already regularly align data from various areas of the business. Often, however, media fragmentations mean that the information is collated manually or, at best, semi-automatically. MI differs in that it enables performance indicators to be generated across all areas, using an automated platform. This ensures that effective data is prepared quickly, reliably and objectively.

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“Key performance indicators (KPI) are used routinely in companies today. Their effectiveness is often limited, however, if they are provided too late, contain transmission errors or are not comparable because of different definitions,” explains Michael Mohr, Head of Supply Chain Management Discrete Manufacturing at Siemens IT Solutions and Services. “The ability to obtain business management, production engineering and product performance indicators automatically using MI, means that the number of KPIs required can be reduced and their effectiveness can be significantly improved.”

Companies can then use MI to optimize operational workflows in Production, Procurement and Management. The automatically generated indicators make it possible to map operational processes in real time and help bring greater transparency to long-term improvement measures and leveraged gains. The transparency achieved also makes it easier to implement selective individual measures, to react to events and to make soundly-based forecasts. As a result, MI allows companies to match their planning and resource management more closely to actual needs and so significantly reduce ongoing operating costs.

Analysts confirm MI trend

In their study "Bridging the ERP and Shop Floor Divide" analysts from the Aberdeen Group conducted research across 440 companies, asking what their priorities were when introducing MI solutions. More than one in two (55 percent) cited the ability in future to take data directly from the factory floor and make it available to the ERP system and other applications. The aim of reducing quality variability came a close second. Companies would also like to use MI to take information about works orders or inventory levels from the ERP system and pass it automatically to the shop floor.

Forrester Research, in its "Tech Radar - The Extended Supply Chain Application Ecosystem Q2 2008", confirms that the coming years will see a trend toward the introduction of MI in companies. Gartner too identifies a trend toward MI in its "Hype Cycle for Supply Chain Management and Procurement 2007". Here, one of the aims is to make data available in real time. However, the data must be prepared in such a way that the right conclusions for improving enterprise workflows can be drawn from it. Also, the automated collection of data ensures that data from repeat measurements is more comparable.

Sound basis for process improvements

Looking beyond the manufacturing industry, MI is highly relevant for other sectors too. In the present world economic situation, companies of all kinds are increasingly aware of the need to monitor their workflows more closely and to leverage potential for improvement. If they are to make sound decisions, however, they need a robust, reliable basis. An important element is a well developed, unified data framework that provides a full overview of operational processes at all times. Mohr explains: “This means that you are able to evaluate not just individual KPIs, but also the effectiveness of measures that led to these being changed. Under certain circumstances, these measures can be retained and transferred to other areas of activity.” One customer of Siemens IT Solutions and Services, for instance, reduced work-in-progress (WiP) inventories by

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around 25 percent. The measures used to achieve this were then transferred virtually unchanged to other product lines.

MI can be used for example to monitor the cycle times of workflows. If these change, it takes just a few clicks to access indicators from the relevant process level – warehouse inventory or personnel deployment, or instance – and identify the reason for the change. If it is found, for example, that having a larger intermediate warehouse significantly speeds production of enclosure panels in a mechanical engineering plant, this same fact may help reduce cycle times in the hinge manufacturing plant too.

A point to remember is that the KPIs to be measured differ from industry to industry. In the pharmaceutical and automotive sectors, for example, product traceability is particularly important. Achieving traceability requires data that is product-specific, production-specific and order-specific. What was manufactured when? What were the prevailing production conditions at the time? Which batches found their way into which product? Questions such as these can be answered quickly and automatically using MI. This is done by pulling together, quickly and with minimal effort, the machine and business data relating to the orders in question. Classic KPIs can also be obtained accurately and simply using MI. These include, for example, the overall equipment effectiveness (OEE) indicator, which measures availability, performance and quality of equipment, and statistical process control (SPC), which manages processes according to defined metrics.

The user is central

With its current MI portfolio, Siemens IT Solutions and Services can cover the entire service spectrum from initial evaluation of requirements, through rollout and implementation all the way to operation of an MI solution. The Siemens expert sums it up as follows: “We have developed what we call an innovation radar. This allows us to observe and analyze developments from our customer projects, but we can also incorporate current studies by analysts such as Gartner and Forrester Research. In this way, we are able to develop a succession of different MI models, which we then evaluate on the ground, with our customers, to meet their particular needs.”

MI can also be introduced at the operational data level in order to improve communication between the machine operator and the control console in a mechanical engineering plant, for instance. It is also possible to link ERP and MES systems so as to reduce response times to planning and production processes.

Progressing to a better overview

The first step in an MI project is to find the right approach for a company's particular requirements. To do this, Siemens IT Solutions and Services developed a modular method which is a compact, customer-centric and cost-efficient way of finding a solution. The service provider demonstrates the basic MI capabilities in a detailed showcase: “We generally always take a practical approach to the subject. Once we have presented our showcase, customers are usually quick to come up with a host of detailed questions, on

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everything from the finer technical points to basic KPI definitions,” says Mohr, describing the initial steps toward MI.

This user-oriented approach means that the mix of individuals involved will vary depending on the particular MI target group. For instance, when creating a machine-specific metrics cockpit – an integrated overview of operational data – the IT experts work with representatives from Production and Logistics. For a cockpit with cross-enterprise data, it is primarily Management who will be involved.

It is generally true that when developing an enterprise-specific solution, it is not so much a case of developing new indicators but more a case of linking existing indicators to good effect. “The end product should be a clear set of relevant statements,” explains Mohr. “The requirements should therefore be structured into clusters and levels, from the outset, so that essential KPIs can be derived from the large number of available options.” The level of difficulty will vary depending on the application scenario. At the top management level, there is often a clear idea of the statements needed, as a result only a few KPIs are required. The production level, by contrast, brings together more than one hundred indicators, including for example inventories, asset utilization and maintenance intervals. Mohr acknowledges that “Here, distinguishing between what is needed and what is possible, is an incredible challenge.”

For selecting and weighting various indicators, Siemens IT Solutions uses a special pyramid model consisting of four levels. This enables MI solutions to be developed simply and integrated totally, from the machine level up the management level. This division into levels helps to develop solution scenarios progressively and to accommodate existing IT architectures. To do this, the IT experts use an additional tool, a special MI platform which integrates the various production and logistics systems and links them with the higher-level ERP and BI systems.

The modular nature of the Siemens approach allows the solution to be introduced progressively, step by step. The result is that the solution remains visible at all times and smooth operation is assured. Individual functionalities can also be added later, enabling IT staff and users to exploit new capabilities as and when the need arises. Even the web-based analysis layer – a browser interface for graphics and statistics – can be optimized and upgraded specifically for individual users.

The right factors at the right time

MI enables enterprises to identify, record and monitor performance indicators in a systematic matter – at all times and across all areas of the business. As a result, performance assessments can be supported by solid indicators. In addition, permanent comparison of target and actual values is possible and deviations between the two can be used as a basis for continuous learning and improvement processes. This means that production monitoring no longer has to rely solely on cost-oriented reporting, instead it can include all relevant performance factors.

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Sales staff are ready to respond to customers and orders with up-to-date information from Production and Logistics while Production staff can react immediately to fault reports. The improved quality of information also enables companies themselves to measure and monitor their own success. Overall then, an automated performance management system increases the reliability of information for decision-making processes and reduces time spent on data preparation.

MI framework based on cooperation

The Siemens portfolio includes a special framework into which even the smallest proprietary solutions, developed by customers themselves, can be incorporated. "For our MI solution, we work closely with SAP and systematically use its solutions, SAP Manufacturing Integration and Intelligence (MII) and SAP Netweaver," says Mohr. In addition, the IT experts developed various MI scenarios to ease the transition to automated data preparation for new adopters. "This approach has made us pioneers. We are in fact implementing many projects today, that have not yet made it past the training stage in other companies."

Siemens IT Solutions and Services is also working closely with Siemens Industry Solutions on MI. Together, these two areas of Siemens developed a showcase containing a performance monitor and a cockpit. The Industry experts dealt with integration of the in-house warehouse management solution, Siemens Logistic Components (SILOC). This includes technical issues such as access times for rack serving equipment and warehouse inventories. As the SAP specialist, Siemens IT Solutions and Services integrates the data into MII and presents it in appropriate dashboards.

Better indicators for gas centrifuge manufacturer

Siemens IT Solutions and Services is in the process of implementing a modular MI project for Enrichment Technology Company Limited (ETC), a UK-based developer and manufacturer of gas centrifuges. Mohr explains the approach taken as follows: "As the first step, we mapped the SAP-MI platform to the customer's own IT infrastructure. Then, in the next step, we implemented the MI solution that we had developed upfront. We are now in the process of customizing the system to the specific requirements of our customer, ETC, so that effective KPIs can be obtained from it. Using our pyramid model, the emphasis is on the KPIs for top management and the operational management level."

Start boxes

Manufacturing Intelligence portfolio from Siemens IT Solutions and Services

Assessment Workshop: 'as is' audit of requirements and identification of scope for optimization in Production and Logistics

KPI: definition of performance indicators relevant to the enterprise, along the value chain and development of an enterprise-wide performance management methodology supported by an industry-specific catalog of performance metrics

Development of a solution scenario: taking account of the existing IT architectures at the various levels of the enterprise

Integration of different production and logistics systems: by means of a unified integration platform and linking with the higher-level ERP and BI systems

Implementation of web-based and role-specific scorecards and dashboards: for the various target groups in the enterprise

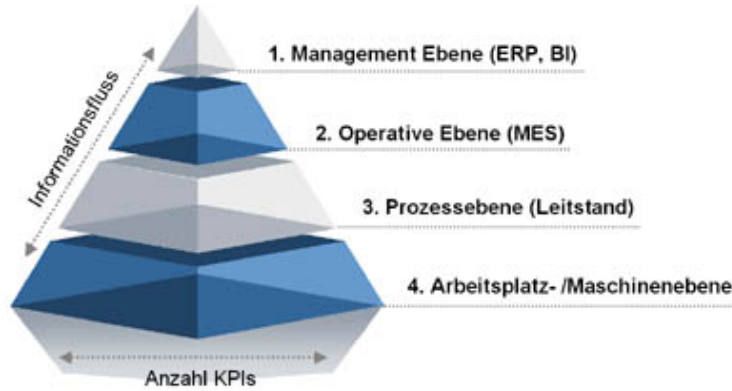
Implementation of preconfigured application templates: SAP-based, for example Siemens operational data acquisition using SAP MII

Proposed photos and graphics:



Caption: Michael Mohr, Head of Supply Chain Management in the Discrete Manufacturing Segment, Siemens IT Solutions and Services (Source: Siemens IT Solutions and Services 2009)

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Caption: A pyramid model simplifies the development of Manufacturing Intelligence modules and enables total integration of the solution (Source: Siemens IT Solutions and Services 2009)



Caption: Using web-based dashboards, key performance indicators (KPIs) can be presented in a role-based and target group specific manner (Source: Siemens IT Solutions and Services 2009)

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Caption: In the MI solutions, the web-based analysis layer – a browser interface for graphics and statistics – can be customized for individual users. (Source: Siemens IT Solutions and Services 2009)