SAP Solution in Detail
SAP Manufacturing

INTEGRATE MANUFACTURING OPERATIONS

USE ENTERPRISE INTELLIGENCE FROM SHOP FLOOR TO TOP FLOOR

The SAP® Manufacturing Integration and Intelligence (SAP MII) application provides the direct connection between business operations and shop floor systems. It helps ensure that all data that affects manufacturing is visible in real time, from a single source – including information about orders, materials, equipment status, costs, and product quality. The application also delivers a rich set of manufacturing visualization and analytic tools.

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REPLACE MANUFACTURING DISPARITY WITH INTELLIGENT FRAMEWORK

ENTERPRISE APPLICATION INTEGRATION FOR YOUR PLANT ENVIRONMENT

The Challenge: Manufacturing Disparity

Over the years, manufacturing companies have invested in a diverse set of software applications to manage plant floor controls and operations. At the lowest level are sensors and controls, including programmable logic controllers and distributed control systems. However, companies' infrastructures often lack standardization due to changes in technology, price points, competition, and growth through acquisition.

A typical manufacturing plant can have a dozen or more shop floor automation systems, while a multisite manufacturer can have hundreds of such systems across its enterprise (see Figure 1). These systems are most likely from different vendors with different architecture and connectivity mechanisms.

At the next level, we find applications that orchestrate and manage plant floor operations. This includes production operations, manufacturing execution, data collection, asset management, scheduling, inventory management, quality analysis, and process optimization. Some of these systems can be provided by software and automation vendors while others are developed in-house, based on SQL databases with custom front ends.

Each application has its own data structures (tag, time series, text, SQL, XML, and so on), schemas, interfaces, and graphical user interfaces (GUIs). Additionally, these applications define and support specific processes that shop floor workers are accustomed to.

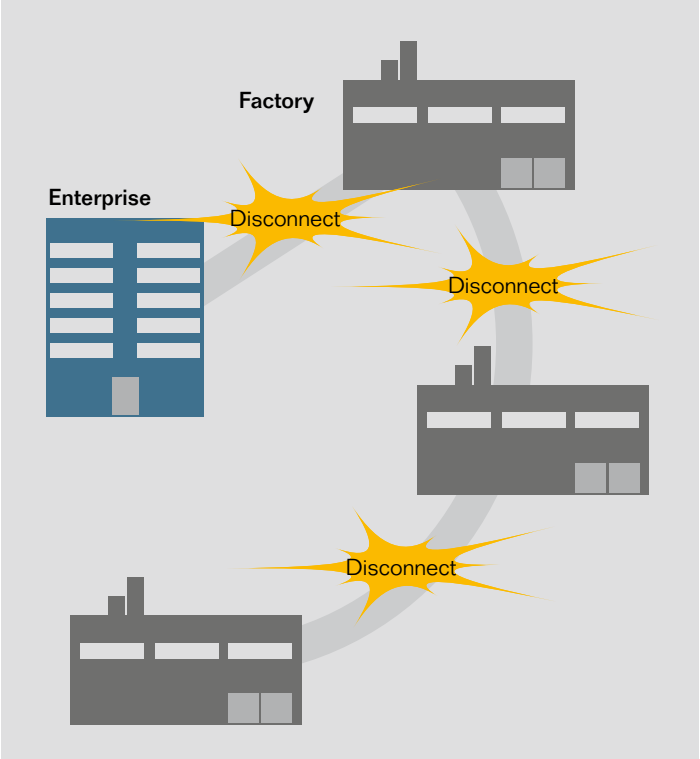
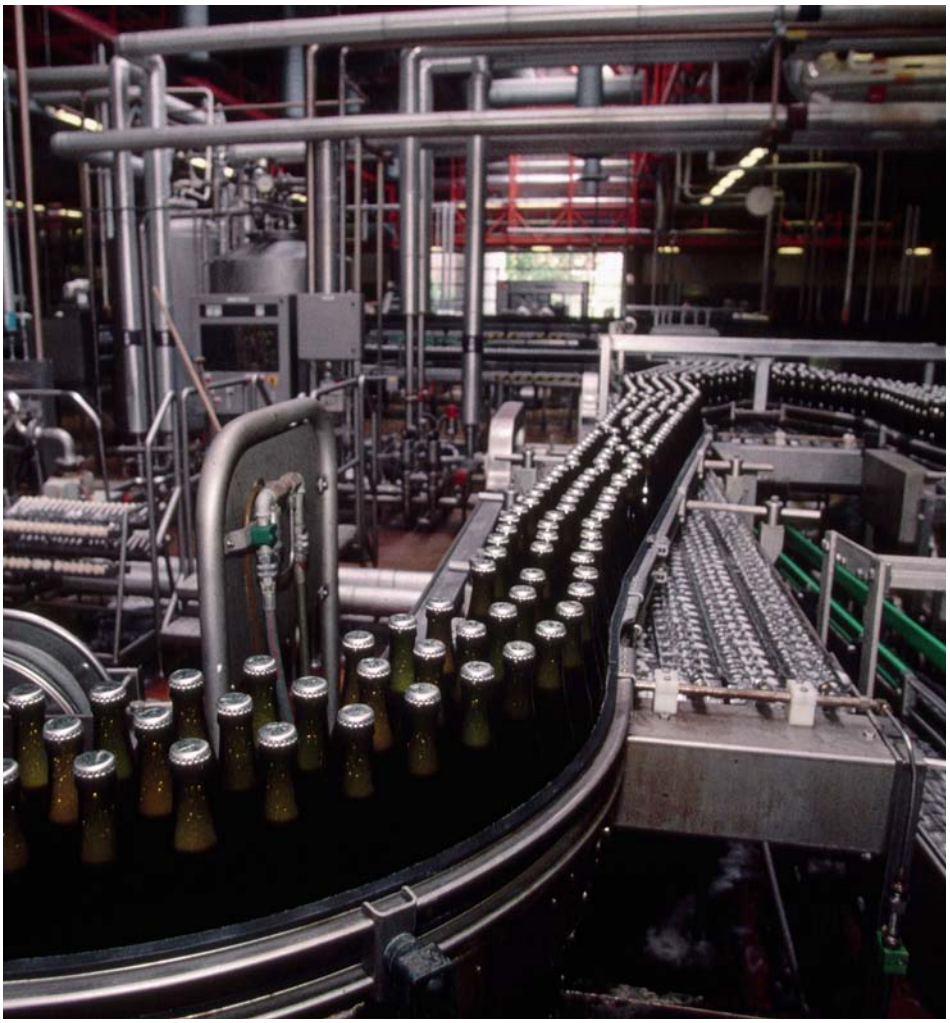


Figure 1: Disconnects and Data Disparity Delay Ability to Respond Effectively

This situation has created significant disparity and islands of information within plant walls. The problem of disparity on the shop floor expands tremendously for a multisite manufacturer. While companies have attempted to standardize on a common set of vendors for these solutions, the evolution of manufacturers and the impact of mergers and acquisitions have created a very complex matrix of applications.

An additional source of disparity in the manufacturing information puzzle is the gap between the shop floor and the enterprise. Linking the shop floor to enterprise applications for synchronizing activities and assuring accurate real-time views of the supply chain presents other significant opportunities to manufacturers.

This system disparity creates the fundamental problem facing manufacturers today: lack of both visibility to information and synchronization across their manufacturing operations. Very few manufacturers integrate their plant data automatically into their enterprise resource planning (ERP) system. As a result, plant floor workers usually are not engaged with ERP data and business processes. This disconnect between the shop floor and the enterprise can cost millions of dollars through lost productivity, waste, rejects, and reorders.



SAP MII provides a framework for the rapid delivery of composite applications for manufacturing. This unique product leverages an enterprise's investment in shop floor applications. SAP MII takes advantage of a service-oriented architecture, streamlining application integration and speeding deployment.

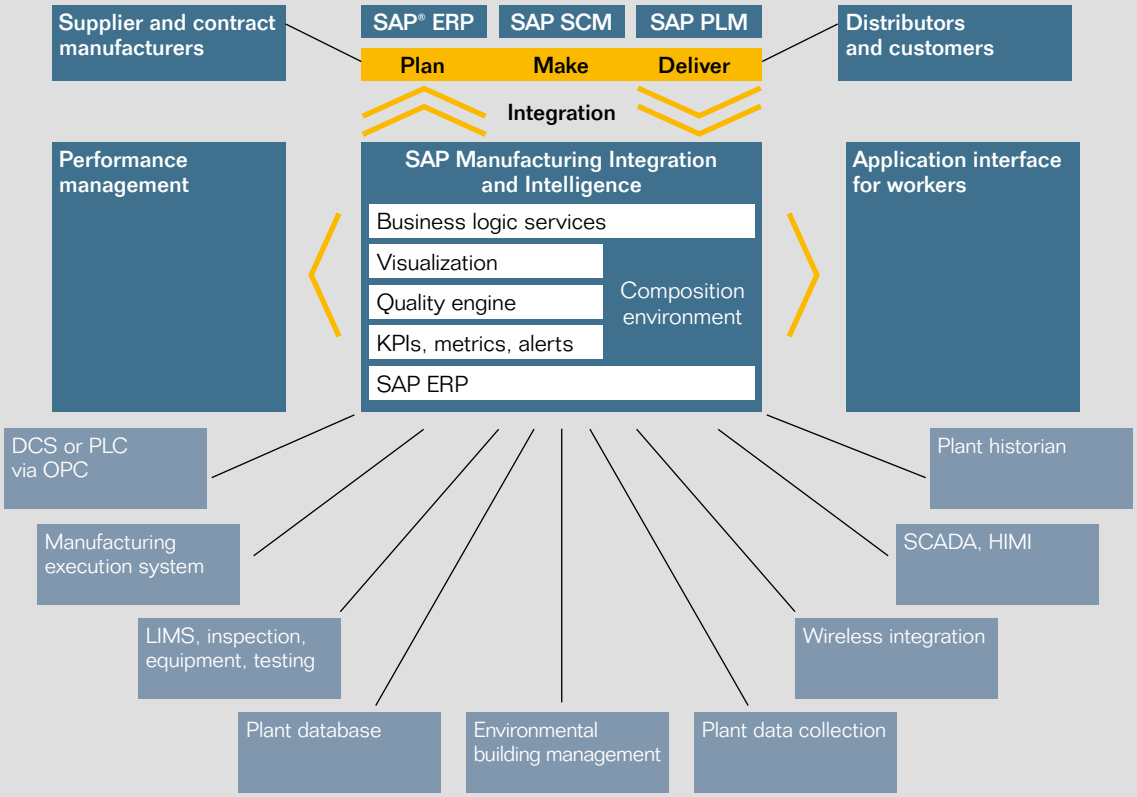
If these disparate applications, which act as silos of rich information, could be brought together as high-value composite applications, they could provide tremendous value to manufacturers. Composite applications – "apps on apps" – leverage investments in software to rapidly create new applications with extraordinary value.

The Solution: An Application Framework for Manufacturing

The SAP® Manufacturing Integration and Intelligence (SAP MII) application provides a framework for the rapid delivery of composite applications for manufacturing (see Figure 2). This unique product leverages an enterprise's investment in shop floor applications. It also takes advantage of a service-oriented architecture (SOA), streamlining application integration and speeding deployment.

SAP MII is a Web server–based application with a zero-client design. This means that no application software needs to be installed on the client machine. Clients should use a Web browser with the appropriate version of the Java Runtime Environment (JRE). While Microsoft Internet Explorer is recommended for the client machine, SAP MII can deliver content to non-Java browsers if the content is prepared properly.

Mobile or handheld devices are supported with SAP MII as well. Presentation of real-time plant information to pocket PC wireless devices, Internet phones, and ruggedized handheld devices and scanners drives efficiencies throughout your mobile workforce.



SAP SCM = SAP Supply Chain Management
SAP PLM = SAP Product Lifecycle Management
KPI = key performance indicator
DCS = distributed control system, PLC = programmable logic controller
OPC = object linking and embedding (OLE) for process control
LIMS = laboratory information management system
SCADA = supervisory control and data acquisition
HMI = human-machine interface

Figure 2: A Framework for Manufacturing Integration and Intelligence

Mobile data consumption and data entry are supported by SAP MII.

SAP MII runs on the SAP NetWeaver® technology platform, leveraging the SAP NetWeaver Application Server (SAP NetWeaver AS) component, the Java stack, and the database. Optionally, SAP MII can be run with the ABAP™ programming language stack as well as other SAP NetWeaver components, such as the SAP NetWeaver Portal component or SAP NetWeaver Process Integration (SAP NetWeaver PI) technology.

A significant benefit of running on SAP NetWeaver is platform independence: SAP MII can be hosted on a variety of operating systems and run with a number of different databases. The SAP NetWeaver technology platform provides enhanced supportability through a component content management system (CCMS) for remote troubleshooting and software management delivered in the SAP Solution Manager application management solution. SAP MII also leverages the development infrastructure in SAP NetWeaver for project management and the change and transport system (CTS+) for transport. Projects can be catalogued, version controlled, and deployed from a central point through SAP NetWeaver.

Plant Connectivity: Instant Data Access Without Replication

SAP MII enables fast connectivity to plant floor systems through a set of connectors that are delivered with the product (see Figure 2). These provide instant access to data from other applications – without any requirement for data replication into another data store. Integrating to databases or systems using open database connectivity (ODBC) or Web services is very easy.

SAP Plant Connectivity software provides the intelligence to integrate with plant floor solutions using Microsoft .NET technology that operates close to proprietary systems running operations. SAP Plant Connectivity is enabled through a set of agents that manage the interface and protocols to these systems.

Agents include industry-standard protocols for integrating to any shop floor system using object linking and embedding (OLE) for process control (OPC). OPC protocol specifications supported by SAP Plant Connectivity include:

- OPC-DA for real-time access
- OPC-HDA for historical data access
- OPC-UA for alarms and events

For integration to data structures that can leverage OLE-DB (for database) connectivity, SAP Plant Connectivity includes an agent for these systems. Acting as a bridge for these systems, the OLE-DB agent enables communication to Microsoft Access, Microsoft Excel workbooks, shop floor applications, and other systems.

The socket-based agent provides integration to programmable logic controller (PLC) networks and other shop floor machines. Additionally, application programming interface (API)-based agents are available for many commonly found plant floor applications including vendor-specific APIs for supervisory control and data acquisition (SCADA) and related human-machine interface (HMI) services and process historians.

A software development toolkit is available for SAP partners to build additional agents for target systems that are better suited to an API interface. These agents are developed in Microsoft Visual C#.

SAP Plant Connectivity includes additional intelligence functionality to provide surveillance on plant applications. A rules engine allows the authoring of simple scripts that watch for violations on operational issues. Once SAP Plant Connectivity is bound to the tag, a rule violation posts an XML-based exception to SAP MII. For example, SAP Plant Connectivity can watch a tank level. When the level reaches a threshold, a message is posted to SAP MII, which can trigger alerts and other activities in SAP MII.

Data Services: Real-Time Extraction of Data from the Source

Data services functionality in SAP MII provides bidirectional read-write access to data in plant systems through rapid configuration of query templates, which create named views of data (for example, Inventory_Totals, Machine_Cycle_Time, or Line1_Conveyor_Speed). Query templates can be categorized and cataloged for easy access and reuse in SAP MII. These templates can also be parameterized. Parameter placeholders allow the user to influence query behavior at runtime by inputting values for the query (such as start date or end date). Placeholders also enable queries to be chained so that the results from one query impact another query.

After a query is executed, SAP MII normalizes all data – regardless of its source – into a standard XML structure. This happens "behind the scenes" and is valuable when pulling together unstructured data. Furthermore, results from query templates can be cached on the SAP MII server as an XML document or permanently stored in the SAP MII database.

Data-services queries minimize the need to replicate data into a data cube or central repository. One of the key reasons for the application's success and fast time to value is that these templates manage the real-time extraction of data from the source.

Business Logic Services: Orchestrate Transactions in SAP MII

Business logic services in SAP MII are based on a graphical logic engine for orchestrating transactions in SAP MII. Action blocks are placed in sequences that are wired together to form transactions (as shown in Figure 3). The wiring between action blocks can include Boolean logic to allow for gates and loops.

Transactions are solved left to right and top to bottom. They are executed by a time-based scheduler in SAP MII or by external triggers (Web service call, Web page event, event in SAP Plant Connectivity, and so on).

Action blocks can call a query template where results are processed from the data service functionality in SAP MII. Complex calculations and key performance indicators (KPIs) can be run from other action blocks. E-mail alerts can be generated based on rules configured in the logic engine. Reports can be generated in HTML or Adobe PDF format from a business logic service. Other action blocks have other data transformation functions, such as handling values, strings, and dates. The results in any action block are available to subsequent action blocks.

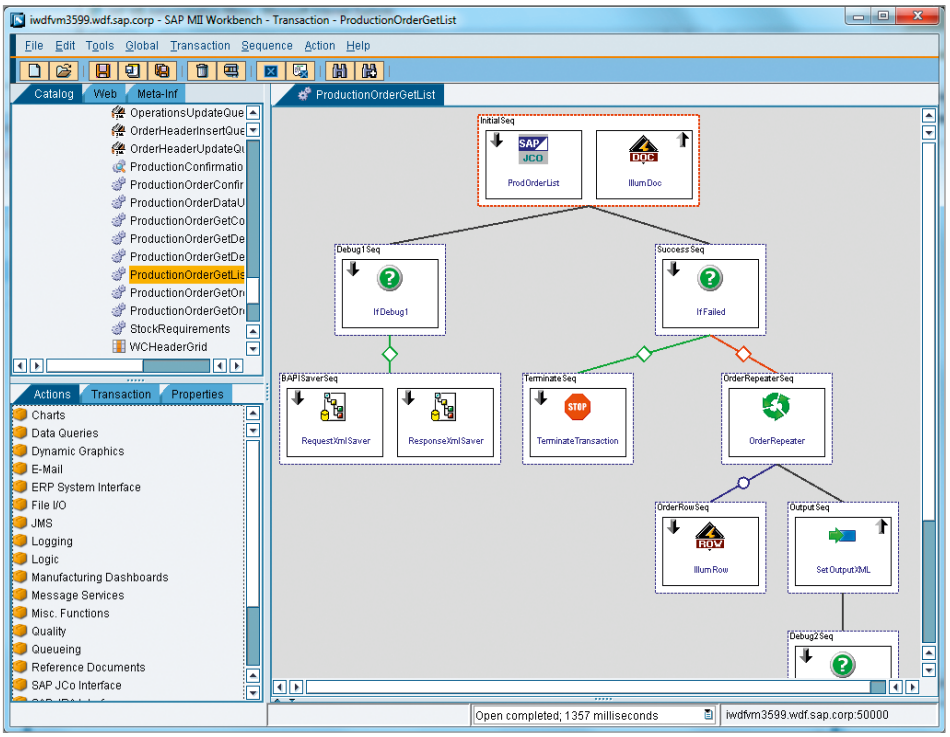


Figure 3: Example of Action Blocks for a Transaction in SAP® MII

Business logic services also provide transactional integration with the SAP ERP application through action blocks. These action blocks take advantage of numerous mechanisms to consume or post data from SAP ERP. A business logic service can use the Java connector, SOAP, or basic intermediate document (IDoc) exchanges to provide integration. Once the action block is in place, an application developer can browse all the available remote function calls (RFCs), BAPI® programming interfaces, and IDocs in SAP ERP for application composition.

The link dialog editor in a business logic service includes mapping functions that enable easy integration and transformation of plant data and enterprise processes between the action blocks. Within the entire transaction, all raw data and tags are available for mapping into calculations, into input fields for queries, into result records, and so on. Since all data is normalized into XML by SAP MII, mapping is a very simple task without coding.

Action blocks are also available to easily convert any data type into a form ready for consumption by visualization services in SAP MII.

Visualization Services: Deliver Data in Consumable Formats

SAP MII provides a variety of methods to display information through its visualization services. A set of rich applets in the application provides the means to deliver views of data in numerous forms. Charts, grids, tickers, and browsers enable users to gather and view data from disparate systems in a very intuitive manner. These user interface (UI) components, which are configured in SAP MII, are high performance – leveraging high-speed binary communications – and are integrated with SAP functionality for security and logging.

An additional library of scalable vector graphic (SVG) objects provides another level of data delivery. Custom objects can be created through the SAP MII application toolkit as well.

Optionally, you can build dashboard components from SAP BusinessObjects™ Dashboards software into a display in SAP MII. Dynamic objects in this software are useful for presenting information in a clear and consumable form for users.

Once the data is defined via the query template, transformed (if necessary) through business logic services, and linked to a display template or SVG object; the resulting visual object can be delivered to a Web page for presentation purposes.

SAP MII is fully extensible in the Web environment and leverages JavaScript to drive events from the page to the applets at runtime. Applet events are exposed by a script assistant. Web page dialog boxes, drop-down boxes, and events can trigger data filters and updates without the need for refreshing the entire page. Additional content can be developed using standard Web techniques via Dynamic HTML (DHTML) and extensible style sheet language transformations (XSLT), which is very useful for reporting views and other more comprehensive views.

Analytic Services: Analyze Data in Real Time

A full-featured statistical process control (SPC) engine, with complete Western Electric Rules, allows analysis of data sets in real time from any application. SPC analysis can also be run in the background as a business logic service action block. When violations occur, custom rules can be deployed quickly to trigger alerts or reports. SAP MII provides dozens of SPC analysis results that can be delivered through a rich set of views.

The resulting SAP MII content can be delivered through the lightweight portal in SAP MII, which manages users, roles, and security and delivers content to users based on their access rights. Security services can be hosted within SAP MII on a stand-alone basis. Alternatively, SAP MII can leverage an external lightweight directory access protocol (LDAP) directory or integrate with the SAP NetWeaver Single Sign-On application for user authentication through the SAP user management engine component. Security services include all functions for authorization management. In addition to read and write access to data, you can also administer authorizations for individual SAP MII functions.

Message Services: Send and Receive Messages

Message services include all functions for sending and receiving messages from other systems. These services can:

- Enable communication between systems
- Transfer data using IDocs, RFCs, and Web services
- Copy data from another system in the form of a buffer
- Queue data

Navigation Services: Offer Role-Specific Access

Navigation services include all functions for setting up the Web portal integrated with SAP MII with a user- and role-specific menu structure. Content is presented in the menus based on the user's single role or multiple roles to which the user has been assigned. Additionally, the theme for each user or role can be varied. A theme includes colors, fonts, logos, and images that are used in the portal framework.

SAP MII can also prepare content for consumption in external portals, most notably SAP NetWeaver Portal. Now users can easily access manufacturing data and enterprise data though a single information delivery environment.

Report Services: Deliver Reports That Meet Employees' Needs

Reports can be automated and printed, stored, or e-mailed based on time, an event, or demand. The format of reports can be text, XML, HTML, or PDF. Reports can include summary data, charts, grids, and analysis data. Production summaries, quality results, shift performance, certificates of conformance, environmental reports – among others– can be generated through report services in SAP MII.

Integration Enabler for Your Plant Environment

SAP MII functionality is an enterprise application integration (EAI) enabler for your plant environment. You can achieve a highly responsive and integrated "make" portion of your supply chain by leveraging business logic services, Web service components in SAP MII, and broad manufacturing connectivity, coupled with a range of integration alternatives to SAP ERP.

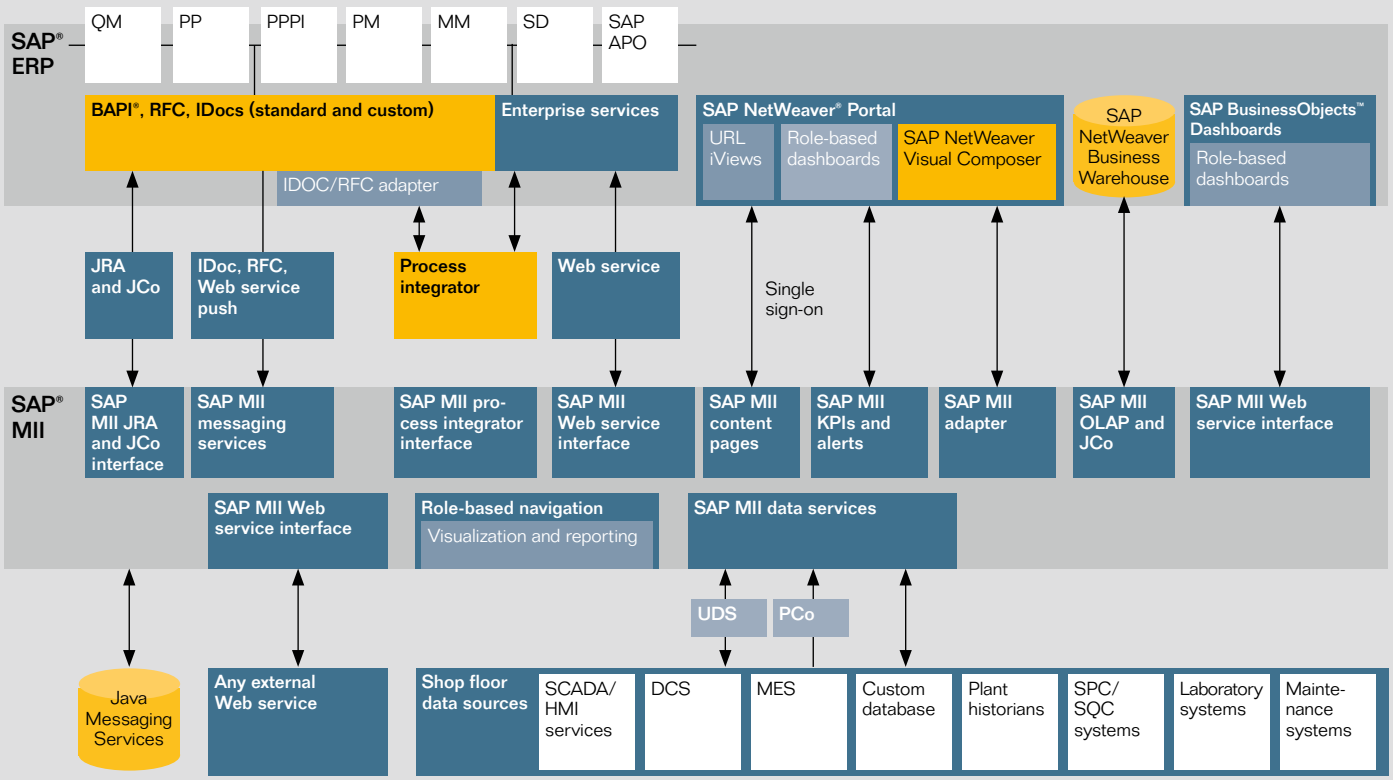
SAP MII was designed for ease of use. The transformation tools require no XML or programming expertise. These simple-to-learn tools enable your plant personnel to manage data transformations required for SAP ERP integration at their local sites where they have the domain and system expertise. This approach not only yields value in a short time, it also lowers your total cost of ownership.

SAP Plant Connectivity software provides the intelligence to integrate with plant floor solutions using a Microsoft .NET technology that operates close to proprietary systems running operations. SAP Plant Connectivity is enabled through a set of agents that manage the interface and protocols to these systems.

SAP MII INTEGRATION LANDSCAPE

TECHNOLOGY TO INTEGRATE ENTERPRISE AND SHOP FLOOR SYSTEMS

SAP MII has a number of built-in connection technologies that make it easy to integrate with shop floor systems as well as with enterprise systems, especially with SAP Business Suite applications. Touch points for SAP MII integration are highlighted in Figure 4, with SAP ERP at the top and plant systems at the bottom.



QM = quality management
PP = production planning
PPPI = production planning for process industries
PM = plant maintenance
MM = materials management
APO = SAP Advanced Planning & Optimization
RFC = remote function call
IDocs = intermediate documents
JRA = Java resource adapter
JCo = Java connector

OLAP = online analytical processing
UDS = universal data server
PCo = SAP Plant Connectivity
JMS = Java Messaging Services
SCADA = supervisory control and data acquisition
HMI = human-machine interface
DCS = distributed control system
MES = manufacturing execution system
SPC = statistical process control
SQC = statistical quality control

Figure 4: SAP MII Integration Landscape

SAP ERP Integration

SAP MII has the ability to integrate with any function in SAP ERP that uses BAPI, RFCs, and IDocs – both standard and custom. From a technology standpoint, transactional integration to SAP ERP can be accomplished directly through the Java connector or the Java resource adapter (JCo and JRA in Figure 4). The Java connector provides the highest performance. Both the Java connector and Java resource adapter utilize mechanisms in SAP NetWeaver for reliable messaging using built-in queues and logs should a transaction fail. Automatic retries can be configured to assure payloads are delivered. SAP MII can also integrate to enterprise systems using straight Web service calls. Information can also be pushed from SAP ERP to SAP MII using IDocs or RFCs.

Instead of direct communications to SAP ERP, SAP MII can process messages through SAP NetWeaver Process Integration or third-party enterprise application integration. Special function blocks are available in business logic services to move messages to and from SAP NetWeaver PI.

SAP MII can look up enterprise services that are published in Enterprise Services Repository (ES Repository) in SAP NetWeaver PI and consume them in business logic services. (Note: if you know the Web services description language [WSDL] of the service, SAP MII can consume an SAP ERP service without ES Repository present).

SAP MII is also well equipped to directly consume and publish to enterprise services in SAP ERP. Numerous enterprise services are published on the SAP Developer Network (SDN) site, and additional services are made available as they are published.

Typically SAP MII is connected directly to SAP ERP for synchronous applications, where speed is important and quick feedback to the user is desired. In addition, a multitransactional function, where a number of transactions are gated together, is better served through direct integration. An additional benefit of direct integration is that the transaction payload, process status, and transaction status (success or failure) are all carried on the same thread.

With integration through SAP NetWeaver PI, SAP MII is exchanging messages only and not getting the benefits of the synchronous approach. This integration is preferred when the enterprise strategy is to monitor all messages centrally, and asynchronous exchanges are appropriate.

Content Delivery

Content can be delivered through the lightweight portal in SAP MII, which manages users, roles, and security and delivers content to users based on their privilege. Security services can be hosted within SAP MII on a stand-alone basis. Alternatively, SAP MII can leverage an external LDAP directory or integrate with SAP NetWeaver Single Sign-On for user authentication through the SAP user management engine.

SAP MII can also prepare content for consumption in external portals, most notably SAP NetWeaver Portal. Users can easily access manufacturing data with enterprise data through a single common information delivery environment. With SAP NetWeaver Portal, SAP MII can deliver role-based iViews (portlets) for publishing in the portal with user security. SAP MII can also deliver KPIs and alerts to role-based dashboards in the portal. Additionally, results from SAP MII can be presented through the SAP NetWeaver Visual Composer tool, as query templates can be linked to in the tool's development environment.

SAP NetWeaver Business Warehouse Integration

Business intelligence includes the SAP NetWeaver Business Warehouse (SAP NetWeaver BW) component where enterprise data is often stored in a cube. SAP MII can read data from the cube using its online analytical processing (OLAP) connector, which uses XML for analysis (XMLA) protocols. Writing data from SAP MII to SAP NetWeaver BW can occur through a Java connector call. Users can take data sets, reduce and compress results, and deliver them to SAP NetWeaver BW for applications like a certificate of conformance or other quality records from the shop floor.

Shop Floor Integration

SAP MII connectors to the shop floor are shown in Figure 4 in two blocks. Universal data servers (shown as "UDS" in Figure 4) are the original connector designed for SAP MII. They can run on the SAP MII server or at the data source but require a Microsoft operating system to run as a service.

SAP Plant Connectivity (shows as "PCo" in Figure 4) is the latest connectivity option and offers a service-oriented connection technology that can bind to a data source and provide unsolicited events back to SAP MII based on a rule violation. Both universal data servers and service-oriented technology are the mechanism for communicating to shop floor systems.

JMS Integration

SAP MII supports Java Messaging Services (JMS), which can be used for integration to third-party applications. The JMS API is a messaging standard that allows application components based on the Java 2 Platform, Enterprise Edition (J2EE) to create, send, receive, and read messages. It enables distributed communication that is loosely coupled, reliable, and asynchronous.

SAP MII provides a variety of methods to display information through its visualization services. A set of rich applets in the application provides the means to deliver views of data in numerous forms. Charts, grids, tickers, and browsers enable users to view and gather data from disparate systems in a very intuitive manner.

INTEGRATING BUSINESS PROCESS AND INFORMATION

PREBUILT TRANSACTIONS FOR SHOP FLOOR INTEGRATION

Many of our customers use SAP MII for simplifying the operator's experience in receiving or sending data to SAP ERP within the context of a specific job function in the plant. The ability to relate enterprise data to plant data in a single view and to provide simple tools for inputting data has been very popular with plant personnel. This eliminates the need for a plant floor worker to log on to multiple applications and manually bring together all the data required to complete the task at hand. In the past, many customers have relied on paper and Microsoft Excel for gathering plant information and then using an SAP ERP administrator to enter data into various transactions through a user interface.

To speed customers' application development, SAP has prebuilt many of the common transactions that manufacturing companies use for shop floor integration and made these available on SAP Developer Network. These transactions are run in business logic services and can be modified or extended to suit the local requirements of the plant.

SAP MII functionality is an enterprise application integration (EAI) enabler for your plant environment. You can achieve a highly responsive and integrated "make" portion of your supply chain by leveraging business logic services, SAP MII Web service components, and broad manufacturing connectivity, coupled with a range of integration alternatives to SAP ERP.

Transaction Results

As shown in Figure 5, SAP MII extracts data that plant workers use from SAP ERP, such as customer details, orders, material, recipes and specifications, and maintenance details. The power of SAP MII supports intelligent operations in the plant by enabling the execution of multiple transactions from one view and the integration of results with plant information.

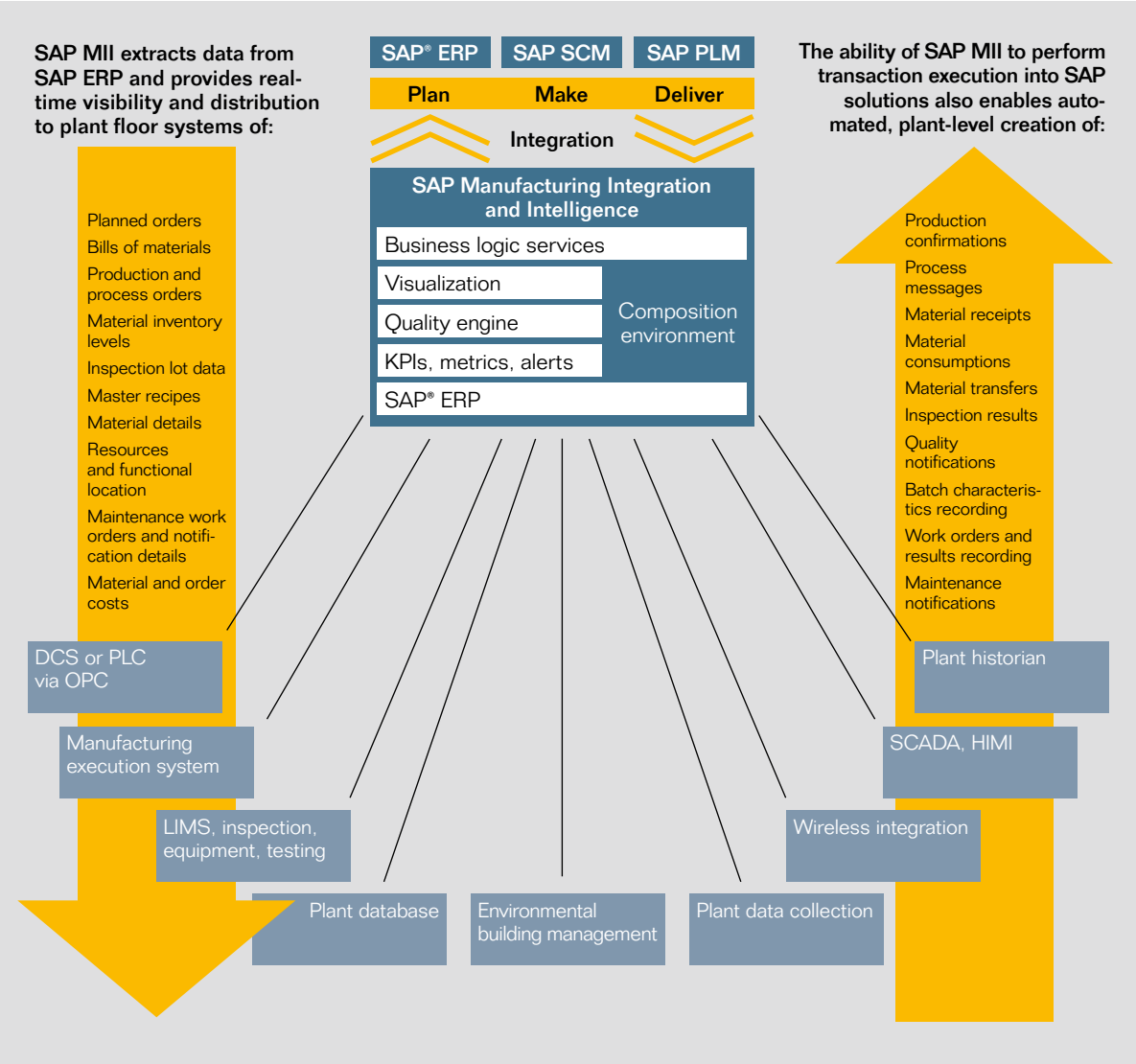


Figure 5: Manufacturing Platform Delivering Information and Process Integration

Content can be delivered through the lightweight portal in SAP MII, which manages users, roles, and security and delivers content to users based on their access rights. Security services can be hosted within SAP MII on a stand-alone basis. Alternatively SAP MII can leverage an external LDAP directory or integrate with SAP NetWeaver Single Sign-On for user authentication through the SAP user management engine.

Writing Transaction Results

Now armed with data from SAP ERP and the plant, the operator can feed results back into SAP ERP. On the right side of Figure 5, typical data entry transactions are shown. These can occur via operator input into a Web object – selection box, drop-down box, or data entry field, for example – or it can occur automatically. For example, SAP MII could read plant values from a production system and post the results into quality management, plant maintenance, or another component to feed work-in-process status and quality status or to deliver exceptions to SAP ERP.

Templates and Composites

Beyond transaction templates, SAP also develops composite applications. These applications include the query template examples, transaction templates, and UI that make up a complete application. Composite applications are available on SAP Developer Network; others are in development by SAP and its partners, which are developing and delivering prebuilt composite applications that meet industry-specific requirements.

INTEGRATING MANUFACTURING SOLUTIONS FROM SAP

EXTEND VISIBILITY TO THE PLANT AND AUTOMATE WORK PROCESSES

Within the set of applications for manufacturing, SAP MII is positioned between SAP Business Suite and shop floor solutions (see Figure 6). Customers can elect to use any or all of the applications shown in Figure 6 for their manufacturing requirements. SAP MII can run as a stand-alone application or in combination with any of the applications shown.

SAP Manufacturing Execution

SAP MII is delivered with the SAP Manufacturing Execution application as a solution for integrating SAP Manufacturing Execution with SAP ERP. SAP MII acts as the "connector." It includes prebuilt integration templates that drive business processes between SAP ERP and the execution environment for order management, materials management, quality management, and so on. Designed for discrete manufacturing environments, SAP Manufacturing Execution controls and supports production execution, tracking and tracing, genealogy, work instructions, quality, compliance, and other requirements in complex, discrete manufacturing.

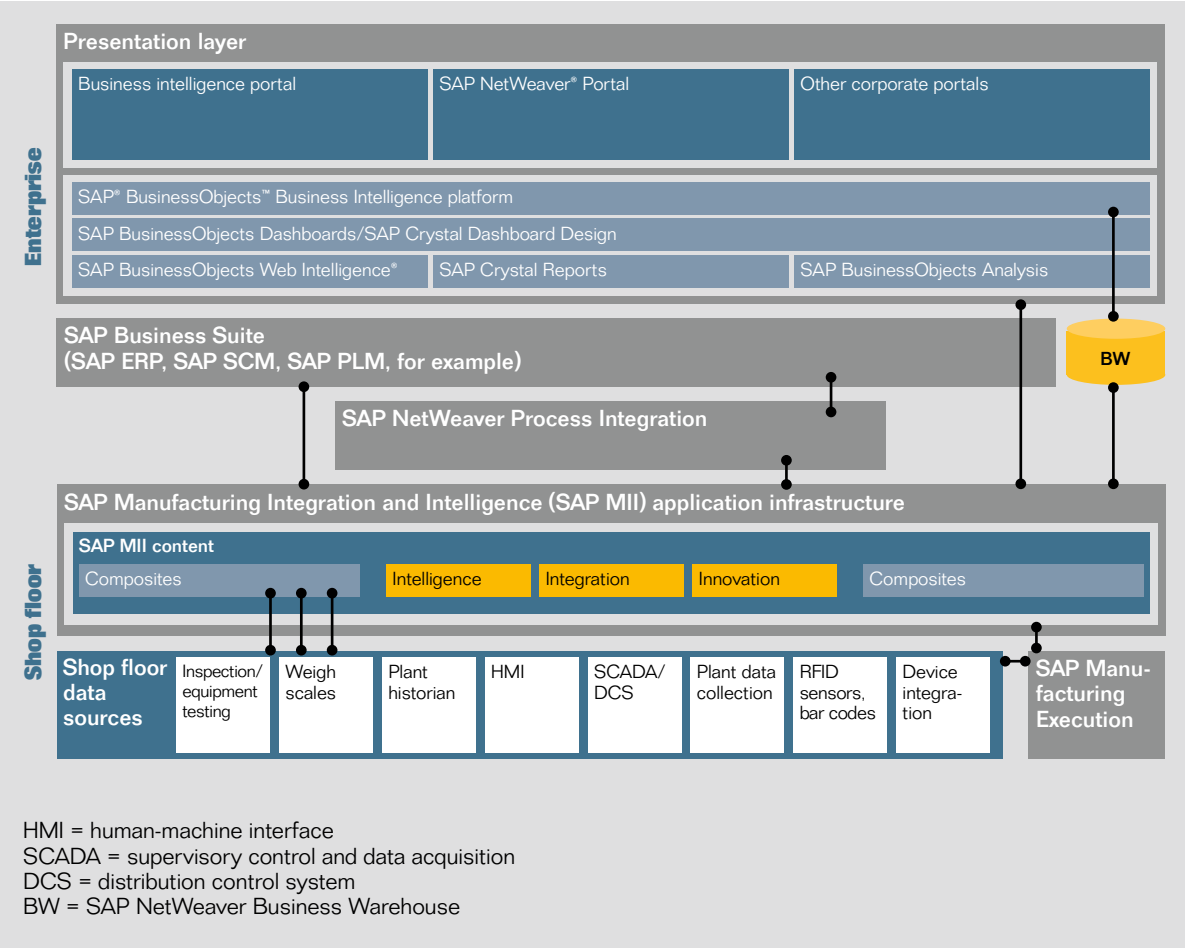


Figure 6: SAP Manufacturing – From Top Floor to Shop Floor

SAP BusinessObjects Portfolio of Solutions

Companies can take a number of strategies in leveraging SAP MII with reporting functionality in SAP BusinessObjects solutions. Since SAP MII is uniquely positioned to deal with the complexity of proprietary plant floor applications, it is well suited for real-time operations – not only as a transactional engine but also from a visualization perspective.

SAP MII can use its connectors to access plant information and condense results for disposition in SAP NetWeaver BW. The summary information can then be available for users through SAP BusinessObjects Web Intelligence® software and other reporting and visualization tools in the SAP BusinessObjects portfolio. Executives can use a single tool to get all of the information they need to support strategic decision making about their business. To get more granular data, ad hoc requests can also be made from SAP BusinessObjects solutions through SAP MII as Web service calls.

SAP MII can also leverage the functionality in the SAP Crystal Reports® family of offerings for structured reporting. This gives you the power to create highly formatted reports using plant data, with what-if scenario models and interactive charts – and deliver them via the Web, e-mail, Microsoft Office documents, Adobe PDF documents, or embedded in enterprise applications.

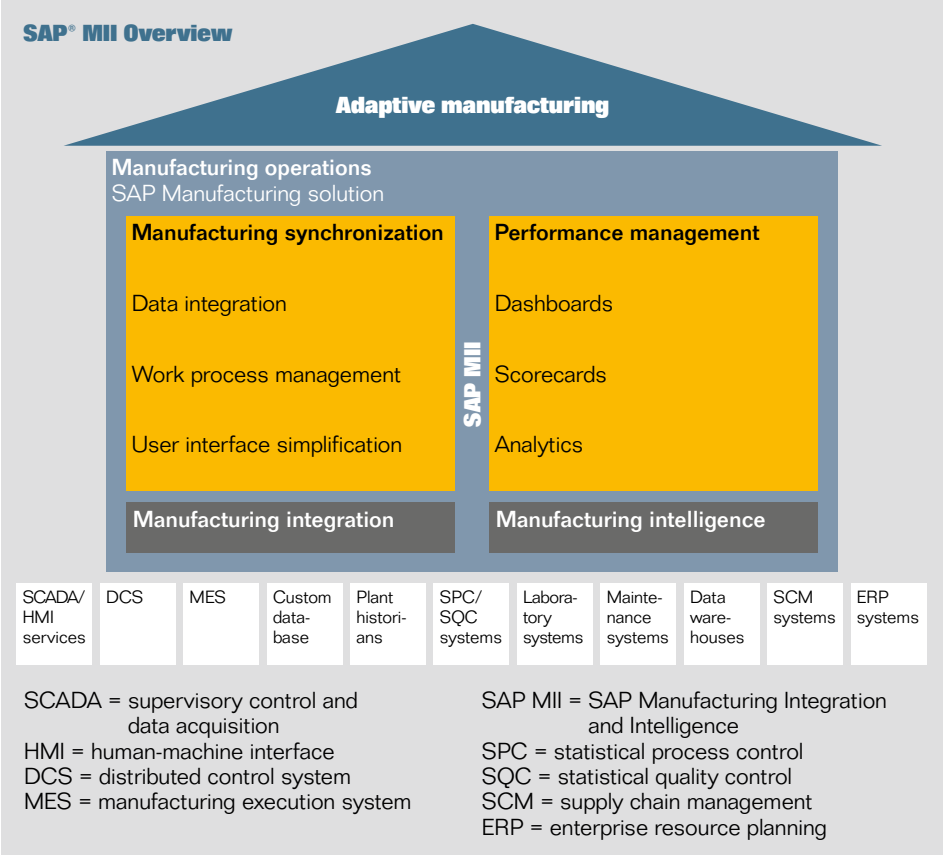


Figure 7: Typical SAP MII Application Areas

Manufacturing Intelligence Supports Performance Management

The key application area for SAP MII is performance management (see Figure 7). The ability to manage performance metrics and feed back real-time achievements is a significant driver for improvement. Actionable intelligence around performance management allows all employees to drive continuous improvement initiatives. Receiving latent feedback, such as reports that are a week or a month old, is not effective in driving behavioral change.

KPIs are generally created to allow the organization to focus on areas it can impact. One key to performance management is understanding the drivers that impact the business performance and making these visible to all employees that can make an impact. Dashboards that present KPIs in real time, with drill-down functions to underlying data, assist employees in root cause analysis of issues impacting performance. Alerts sent via e-mails or to pagers highlighting problems are another method for getting attention to problem areas.

Dashboards and Scorecards for Data Visualization
SAP MII plays a key role in the presentation of these metrics with support for data gathering, the calculations (with associated business rules), and the presentation of results for general consumption.

Performance management applications with SAP MII can be extended to many continuous improvement activities, such as Six Sigma and a balanced scorecard approach. Dashboards in SAP MII deliver the data visualizations that support the performance of these initiatives.

Companies armed with this capability can establish benchmarks using best practices to drive optimal performance across production lines and across plants. Significant return on investment can be demonstrated when real-time performance is compared to real-world targets achieved in other operating units.

Manufacturing Analytics
SAP MII provides a powerful environment for delivering manufacturing analytics to personnel in management, supply chain, quality, and plant floor operations. Data can be delivered within the context of the individual worker's role. Contextual presentation of data enables all departments and business units throughout the enterprise to collaborate more effectively.

Trending and SPC functionality extends the value of manufacturing analytics by assisting in root cause analysis of performance deviations. SPC calculations are extensive and are supported by a wide range of variable and attribute chart types. The full Western Electric Rules set is included, which can trigger alerts based on rule violations. Custom rules can also be generated easily. This improves quality by heading off control issues before substandard product is generated.

Charts can also incorporate attributes from multiple systems, thereby simplifying root cause analysis. Customer orders can be related to production lots and associated to labs results in a single view. Drilling into data by plant, production line, shift, operator, machine, and so on allows for dramatic improvement in operational troubleshooting and product quality.

Manufacturing Integration Supports Synchronization

Manufacturing integration is a critical part of the value chain for SAP MII (see Figure 7). System-to-system interoperability automates data presentation and data movement – significantly accelerating supply chain velocity. Synchronizing plant operations to the enterprise in real time is a critical functionality delivered by SAP MII.

Together with the ability to integrate systems, the execution of plant work processes is another key functionality of SAP MII. Eliminating the task of manually inputting data into SAP ERP is solved with the data services and business logic services available in SAP MII. Streamlined, real-time data gathering and delivery reduce workload, improve data accuracy, and promote an accelerated supply chain. Results include reduced inventories, improved customer deliveries, and reduced cycle times.

SAP MII also plays a key role in linking enterprise activities to plant floor workers. Simplified user interfaces can be deployed quickly to allow plant floor workers to consume enterprise data (production orders, bills of materials, material details, and so on) in the context of their local work process. Equally important, interfaces enable shop floor workers to appropriately feed back production events and values associated with their work processes. Production confirmations, material transfers, quality characteristics, maintenance notifications, and other transactions can be simplified for the plant environment.

Linking plant floor activities to the enterprise presents dramatic shifts in performance and increased value in your SAP ERP investment. Extending visibility to the plant and automating work processes improve support for decision making, increase accuracy, and drive business thinking to plant operations.

For More Information

SAP MII is used throughout the manufacturing industry worldwide. The ability to quickly create composite applications using plant and enterprise data delivers exceptional value for innovative organizations looking for faster response times with continuous improvements in performance.

For more information about SAP MII, call your SAP representative or visit us online at www.sap.com/usa/solutions/manufacturing/manufacturing-intelligence-software/index.epx.

QUICK FACTS

www.sap.com/contactsap

Summary

The SAP® Manufacturing Integration and Intelligence (SAP MII) application provides the direct connection between business operations and shop floor systems. It helps ensure that all data that affects manufacturing is visible in real time from one source – including information about orders, materials, equipment status, costs, and product quality. The application also delivers a rich set of manufacturing visualization and analytic tools for better-informed decisions.

Business Challenges

- Get real-time visibility into production operations
- Detect and respond to unplanned events
- Analyze manufacturing results to improve performance

Key Features

- **Plant connectivity** – Deliver instant integration to plant floor systems
- **Business logic services** – Enable data preparation, data transformation, and key-figure calculations
- **Web-based information delivery** – Consume role-based production data from your desktop or wireless device
- **User interface simplification** – Access data from collated from multiple data sources and streamline data entry with simple workflows and data visualization tools
- **Analytics** – Provide a framework for continuous improvement with cross-data-store analysis, trending, and statistical process control

Business Benefits

- **Higher productivity** within manufacturing operations thanks to availability of key figures, reports, and real-time alerts
- **Better-informed decisions** with fast, reliable access to data using role-based, configurable dashboards
- **Better asset utilization** by taking advantage of comparisons that enable benchmarking and rationalization of poorly performing assets
- **Enhanced responsiveness** to compliance requirements as a result of automated data gathering and reporting

For More Information

Call your SAP representative, or visit us online at www.sap.com/usa/solutions/manufacturing/manufacturing-intelligence-software/index.epx.

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