

A WHITE PAPER SPONSORED BY COGNIZANT

## Innovation by Design:

# CONNECTING THE PLANT FLOOR TO ENTERPRISE INFORMATION SYSTEMS

# Innovation by Design: CONNECTING THE PLANT FLOOR TO ENTERPRISE INFORMATION SYSTEMS

With the help of the right integrator, manufacturers can gain the real-time visibility they need to react quickly to market changes and realize their business goals.

**T**hanks to the forces of globalization, the playing field for manufacturers is leveling at an accelerated pace. To survive in the worldwide marketplace requires transformative changes in the ways companies do business. Globalization presents unprecedented opportunities to tap new markets, discover new suppliers, and trim costs. But with those opportunities comes the risk of doing business with unproven parties, fast-paced market environments, and the new face of a global economy. This means reduced cycle times between demand and supply, which creates tremendous stress to monitor and make mid-course corrections in real time. This typically happens at the intersection of demand and supply, otherwise known as the shop floor.

Today, manufacturers must synchronize shop floor inputs and outputs to related supply chain mandates in order to both seize opportunity and reduce risk. This challenge can be daunting for a number of reasons, although there are companies that have been making tremendous progress toward that end.

In most manufacturing environments, the factory floor is populated by heterogeneous legacy systems (such as control, data analysis, and quality management) that neither operate in real time nor connect to the enterprise information systems. The lack of visibility into activities on the plant floor prevents its counterpart departments and organizations from responding with adequate timeliness, which results in longer cycle times, lower customer satisfaction, and a limited ability to meet ever-changing market needs.

Manufacturers have a critical need to improve responsiveness, shrink cycle

## FIGURE 1: TOP BUSINESS OBJECTIVES

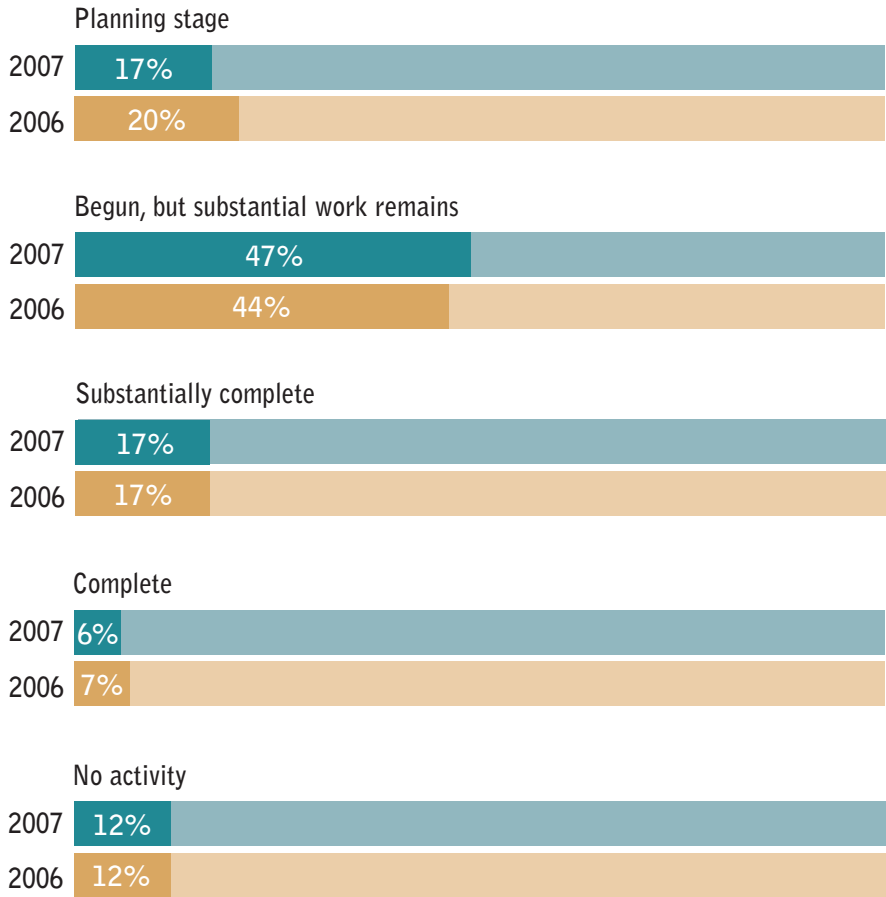
Respondents rank their business objectives for integration efforts (listed most important to least important):

1. Improve customer service, responsiveness.
2. Gain visibility into and reduce inventory.
3. Reduce downtime, maintenance via better diagnostics, repair.
4. Increase speed of product development, ability to build to order.
5. Reduce tech spending, number of suppliers.
6. Transform business model into an e-business model.

Source: MA poll, 2007

**FIGURE 2: INTEGRATION PROGRESS REPORT**

How would you characterize your company's progress in interconnecting factory floor systems with other systems?



Source: MA poll, 2007

times, and improve their return on assets/return on investment (ROA/ROI). Reaching those goals requires a quantum leap in the way they operate. One such leap is to connect shop floor systems to inter-enterprise information network in real time.

Today, more than ever, demand-side trends require supply-side responses if management is to achieve its objectives. To do this, management needs to evaluate the most effective response to trends that fall outside of "planned demand" in order to prevent over-reaction by supply lines. That means management needs information about what is happening on the shop floor while manufacturing needs to know more about these market changes and trends as they

occur. Connecting the shop floor systems to enterprise information systems enables this two-way information exchange.

**Plant-to-Business Integration:  
Helping to Meet Business Objectives**

With a focus on business goals, such as improving customer service, speeding time to market, and reducing downtime, manufacturers are indeed pushing ahead with plant floor-to-enterprise integration projects, a new *Managing Automation* poll reveals (see chart, this page). The fifth MA study of its kind since 2001, this year's poll of 330 readers indicates that integration momentum is picking up, and the incidence of project delays and funding problems is dropping.

Shop-floor-to-top-floor project funding has started to flow, as well. Of those manufacturers that found integration work more challenging than

**FIGURE 3: TECHNOLOGY VISION**

Manufacturers have clear technology goals for integration projects. Most important technology goals in 2007:

1. Integrate, share information throughout the company.
2. Provide a single view of data.
3. Rationalize, reduce systems via one information architecture.
4. Create new applications via integration.
5. Make information accessible to suppliers and customers.

Source: MA poll, 2007

expected, more than one-third expect to increase funding for integration projects this year.

Still, the work is difficult and progress frustratingly slow. The MA poll found that the extent of factory floor integration was largely unchanged this year, with only 27% of survey respondents saying they had more than 30% of their factory floor systems now connected to the enterprise systems, compared with 28% in 2006.

Even so, manufacturers have set the bar high for their integration projects to facilitate both manufacturing and

business processes. Among the most important technology goals are providing a single view of data, reducing the number of information systems, and simplifying the data architecture (see chart, this page). The top business objectives of integration projects are to improve customer service, reduce downtime, and decrease the amount of inventory (see chart, p. 2).

These objectives are, of course, subordinate to the most pressing business goal of all: to increase shareholder value. C-level executives are under intense pressure to increase their companies' return on assets and working capital. So they need to use technology to innovate in every corner of the business — from products to processes. That's not to say that satisfying customers is not top-of-mind for chief executives. It is, but the need to make a profit is paramount.

**C-level executives are under intense pressure to increase their companies' return on assets and working capital. So they need to use technology to innovate in every corner of the business — from products to processes.**

For that reason, reducing non-value-added cost is imperative for manufacturers and their broader supply chains. A soap company's supply chain, for example, might be optimized so that when a customer buys a bar of soap at a retail store in the United States, at that very moment the palm oil supplier in Malaysia knows about it and starts

making the next batch of palm oil and getting ready to ship it to the contract manufacturer in Vietnam. This scenario is perhaps oversimplified, but it demonstrates the chain of partners and suppliers working in concert to meet the customer's need in as near real time as possible.

Although plant-to-business integration is beginning to pick up steam and most manufacturers have yet to see the impressive benefits that are possible from that integration, a few select companies are ahead of the pack.

### Success Stories

Despite the challenges, companies that have succeeded in integrating their shop floor systems with their enterprise information systems are reaping significant benefits, including cycle time reduction, higher throughput, better quality, and enhanced decision making. Dow Corning and Mitsubishi Polyester Film Inc. have succeeded in integrating their plant-to-business systems with the help of Cognizant Technology

Solutions. Both manufacturers are innovators, and they typically incorporate innovation into their business processes.

## Dow Corning

Founded in 1943, Dow Corning is a specialty chemical manufacturer with approximately 25,000 customers worldwide and 7,000 distinct products and services. More than half of the company's sales are outside the United States. Dow Corning's roughly 9,000 employees work in its 35 global manufacturing and warehousing facilities in Asia, Europe, and the Americas. Its customers are in a wide range of industries, including aero-

space, automotive, construction, electronics, health-care, high tech, and paper.

One of Dow Corning's strategic priorities is to achieve operational excellence. Its goal is not only to provide efficiency within its internal walls, but also to work closely with partners, suppliers, and customers to add value to their businesses.

But before it set about integrating its systems, Dow Corning faced difficulties in making key decisions, such as whether to accept a new production order, order new direct materials, and alter outbound logistics plans based on occurrences on the shop floor. The problem arose because of a disconnect between the shop floor and business systems. Top management did not have real-time visibility into the day-to-day production activities.

Dow Corning implemented SAP as its enterprise ERP platform, including modules for customer relationship management (CRM), Advance Planner and Optimizer (APO), quality management, plant maintenance, production planning, and more. Dow Corning's manufacturing IT systems domain includes data historians, SCADA systems, bar codes, and distributed control systems (DCS). To achieve the visibility management desired, the company needed to capture events on the plant floor in real time and send them

to the manufacturing IT systems and then up to the enterprise ERP system.

To overcome this problem, Cognizant is executing and supporting Dow Corning's vision of SAP xMII (previously known as Lighthammer). xMII integrates data sources to enable easier data sharing. By customizing xMII, Cognizant was able to pull in data from various sources and display reports on the enterprise portal. Cognizant correlated views of data, such as production history, batch records, and customer records. The company developed customized reports using xMII's powerful Web-based reporting and rich charting capabilities. Sample reports created for Dow Corning include production variance, production output, inventory, forecast, fixed expense, production

To achieve the visibility management desired, the company needed to capture events on the plant floor in real time and send them to the manufacturing IT systems and then up to the enterprise ERP system.

### FIGURE 4: REAPING REWARDS

Dow Corning has realized a number of tangible benefits from its integration project, among them:

- Quick and effective tracking of production KPIs, such as production variances and output;
- Better product quality and delivery performance;
- Higher employee productivity due to more accurate, "right-time" access to content and applications;
- Reduced cost variances;
- Elimination of production reorder non-value-added tasks; and
- Much improved data accuracy.

Source: Dow Corning

schedule, and user profile. These reports are available on the enterprise portal with data pulled from the business warehouse.

Cognizant used other tools for the Dow Corning plant-to-enterprise integration project, including OSISOFT's PI system, OSISOFT Rlink Server, and Microsoft SQL Server.

In short, Dow Corning has realized major benefits in increased efficiencies and decreased cycle times. As a result of the integration effort, speed, accuracy, and visibility now carry the day, and customer, supplier, and shareholder values all have increased.

### Mitsubishi Polyester Film Inc.

Mitsubishi Polyester Film (MPF) was created in 1998 when Mitsubishi Chemical Corp. purchased assets from Hoechst AG. The company is among the largest merchant market producers of polyester film in the world — it manufactures more than 190,000 tons of film per year. Not

long ago, MPF recognized that its aging material-flow tracking system needed replacing. The company had long relied on a 20-year-old legacy system residing on Hewlett-Packard Co. hardware to track work in process through its sprawling production facility in Greer, S.C.

Not only was the system increasingly expensive to maintain, but also urgent requirements had become difficult to support. For example, interfacing the system to more modern applications was a significant challenge.

The IT environment was a complex mixture of homegrown and packaged solutions compounding the number of required interfaces. At the enterprise level were custom-built applications, SAP financials, and a third-party planning and scheduling system.

On the factory floor, meanwhile, the manufacturing environment was rich in digital data derived from SCADA and DCS applications. The material flow tracking system — conceptually positioned between the enterprise and process automation layers — was difficult to integrate with either layer, however. Not only was the data contained within the system difficult to access, but also the growing need to electronically write data into the system was causing problems.

As Mitsubishi's management team mulled its options, several things became clear. First, no one packaged solution came close to meeting the company's requirements without extensive — and expensive — modification. Second, porting the application over to newer — and less expensive to maintain — hardware wouldn't solve the integration issues at the

plant. What was required was a step-change, such as a move to Microsoft's .NET-based architecture. Third, the plant's relatively lean IT department lacked the resources to develop in-house an alternative, custom-designed solution in a timely manner.

The need to move away from the legacy system was becoming increasingly urgent. However, simply replacing the existing functionality wasn't

**Not only was the system increasingly expensive to maintain, but also urgent requirements had become difficult to support. For example, interfacing the system to more modern applications was a significant challenge.**

**The need to move away from the legacy system was becoming increasingly urgent. However, simply replacing the existing functionality wasn't enough. Management needed to redefi-  
fine and reengineer the new system.**

enough. Management needed to redefine and reengineer the new system.

A solution had to be found — and quickly. According to Mitsubishi IT Director Nancy Laye, offshoring was an attractive option from both resource and cost perspectives. Although lacking prior experience with an offshore development partner, Laye’s team engaged Cognizant Technology Solutions, which has offshore development activities centered in Chennai (formerly Madras), India.

Also significant in Mitsubishi’s decision was Cognizant’s approach to projects. The company’s “Transform while Perform” methodology is designed to help management work through issues and develop cutting-edge approaches that align IT activities with the overall business strategy.

**The goal was to complete the system — from first engagement through go-live — in under a year. That timetable was met, despite requests from Mitsubishi to extend the project’s scope.**

Cognizant architected Mitsubishi’s system in .NET around a Microsoft Server database and written in VB.NET. The system resides on two application servers and one database server. In addition to its core material-tracking functionality, the system delivers graphical outputs of inventory and manages the reporting of complex production line parameters.

With so many supervisory control systems in place around the plant, building the needed interfaces to the Cognizant-developed system was a significant challenge, involving close collaboration with control system vendors, makers of printers and RFID readers, Mitsubishi employees, and Cognizant developers.

The manufacturer’s goal was to complete the system — from first engagement through go-live — in under a year, according to Laye. That timetable was met, despite requests from Mitsubishi to extend the project’s scope.

Now live for nearly a year, the system has transformed plant operations. Processes have been streamlined, and real-time reports provide management with fresh insights and help reduce costs. The previous system required users to go through many screens to gain the information they needed. That burden has now been eliminated.

In addition, inputting data now involves much less effort, resulting in higher productivity. Most significantly, according to Laye, Mitsubishi Polyester Film now can respond more effectively to customer requirements.

**The pressures of globalization make it imperative for manufacturers to transform the way they do business by refocusing their attention on the critical things that can produce innovation and create competitive differentiation.**

## Conclusion

The pressures of globalization make it imperative for manufacturers to transform the way they do business by refocusing their attention on the

critical things that can produce innovation and create competitive differentiation. Connecting plant floor systems with enterprise information systems is a fertile avenue for optimizing business processes to achieve business goals and block out competition.

Few manufacturers are equipped with enough “flex” resources to undertake a complex integration project without supplementing the existing workforce with additional resources and new skills. Given compelling

cost and efficiency benefits, outsourcing can be one of the most viable options for many.

At Cognizant, we have experience and a proven ability to help manufacturers integrate their shop floor activities with more strategic inter-enterprise alignment throughout the wider supply chain. Our processes deliver superior returns for each client — not simply by delivering the desired economies in the transaction area, but also by enabling a company to innovate, expand, and, ultimately, profit from additional revenue-generation opportunities.

### **Cognizant's Transform while Perform™ (TwP) Approach**

As demonstrated by Dow Corning's and Mitsubishi Polyester Film's success stories, Cognizant's Manufacturing Operations Practice has a proven track record of helping customers transform the way they operate. Cognizant has helped execute specific shop floor data collection projects for clients across vertical industries, helping them develop a new framework for data collection.

Most manufacturers lack the time and resources to take on complex integration tasks without the help of a systems integrator or outsourcer. The selection of a partner should be based, in part, on the global resources and knowledge it brings to the table.

At Cognizant, we believe the true measure of success in outsourcing is not cost savings alone, but also the ability to integrate shop floor activities with more strategic inter-enterprise alignment with supply chain partners, thereby helping our clients transform their businesses. The level playing field of the global market now puts a premium on speed. Therefore, we have structured our processes to deliver superior total return on outsourcing (ROO) for each client. We don't simply deliver the desired economies in the transaction area; we also enable a company to innovate, expand, and, ultimately, profit from additional revenue-generation opportunities.

The key to driving ROO is to ensure that the approach to service delivery is closely aligned with the client's overall IT agenda. This enables Cognizant to add the maximum value — beginning with the desired operational efficiencies of outsourcing, and then deliver process effectiveness and, ultimately, technology-driven business innovation through inter-enterprise synchronization. We refer to this as a process of "transform while perform," or TwP.

Recognizing our commitment to deliver a significant ROO, clients are increasingly willing to entrust more sophisticated services to us. By expanding the range of solutions we provide, Cognizant can move up the value chain, making our teams even more valuable to their clients and driving their continued growth.

Fundamentally, our goal is to help your corporate culture become more innovative. Cognizant has a proven track record of helping manufacturing organizations transform. Every manufacturer must find a way to innovate in order to survive — and thrive — in the global economy.