



It's Time for Maintenance 2.0

**DELMIA**

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# Executive Summary

The current unsettled state of the global economy has placed manufacturers under extreme competitive and financial pressure. While this situation has affected all operational areas, maintenance has been particularly challenged. While many maintenance budgets have faced cuts, the importance of efficiently maintaining and utilizing aging equipment—specifically, maximizing uptime to meet production demands without increasing costs—remains a principal driver. Balancing cost, labor and equipment performance has therefore become increasingly important as capital investments are deferred.

This paper details why legacy maintenance systems, or ERP systems alone, are failing to help manufacturers meet the current challenges facing their maintenance operations. A new “Maintenance 2.0” approach that extends ERP plant maintenance without overlapping and duplicating functionality, and that coordinates maintenance with operations will lead to increased equipment uptime, improved compliance and lower manufacturing costs.

Synchronizing maintenance with production, quality and warehouse operations using a unified manufacturing operations platform, leads to a coordinated response to both planned maintenance and unplanned downtime that accelerates time to repair, reduces manufacturing costs and improves operational performance. By modeling maintenance tasks as unified, business processes spanning manufacturing operations and sharing those processes across your enterprise, manufacturers can achieve a more proactive approach to maintenance that reduces manufacturing costs while increasing equipment uptime.

# Why Current Systems Fall Short

In today's highly volatile economic environment, manufacturers' maintenance organizations face a dual challenge. Difficult economic conditions have put significant pressure on operating budgets, resulting in cancelled or delayed equipment purchases. Consequently, the vitality and ongoing efficiency of existing equipment has become increasingly important, demanding more effective maintenance to sustain these aging assets. At the same time, maintenance expense is seen as especially vulnerable to costs cutting. The result is that plant expenses and capital investment proposals now face greater competition and scrutiny from CFOs.

Many manufacturers turned to computerized maintenance management systems (CMMS) to help wring greater value out of existing capital assets. However, many of these systems have proven to be too expensive, too complicated or simply too cumbersome to deploy quickly and effectively on the shop floor for tracking work order progress and labor usage.

Too often these maintenance systems, like the maintenance departments that purchase them, have run isolated from production and quality operations and systems. Maintenance management systems have typically been deployed on a plant-by-plant basis, with local staff assigned to monitor and provide break-fix as needed. As a result, computerized maintenance systems were purchased as "point" solutions with a single plant in mind. In addition, they often suffered from too much overlapping functionality with the ERP system in such areas as spares procurement, work order scheduling, costing and inventory management.

Others have tried instead to leverage their ERP investment by deploying the ERP's plant maintenance module down to the shop floor. While we will discuss later in this paper how combining your ERP plant maintenance system with a unified manufacturing operations management platform can avoid these weaknesses, ERP plant maintenance systems alone suffer from many of the weaknesses of stand-alone CMMS systems including being too complicated or too cumbersome for the shop floor.

Furthermore, ERP systems are transaction based rather than process based, with complicated user interfaces that do little to guide the maintenance engineer through standard maintenance procedures. While ERP systems are initially highly configurable, they are difficult to change once configured, which makes them ill-suited for supporting Lean and other Continuous Improvement initiatives; they lack the flexibility to support unexpected or unplanned events arising on the shop floor.

Legacy plant maintenance systems have long suffered from running isolated from production, quality and warehouse operations. This led to more disruptions to operations and disjointed response to unexpected breakdowns. Further, isolation of maintenance from operations impedes root cause analysis because it is more difficult to correlate performance, quality and equipment information.

Recent surveys show continued focus on cost control, improving uptime, ROA, asset longevity and quality. *“Reducing costs without compromising operational integrity requires changes in the maintenance systems and business processes,”* asserts a recent report by ARC Advisory Group.<sup>1</sup>

This emphasis on cost control requires cutting costs without comprising safety, quality and manufacturing performance; the question is how to do it. Ultimately, the solution must simultaneously improve operational performance and asset longevity while reducing costs today and in the future, in order to offer a reasonable return on investment that the CFO can justify and approve.

## It's Time for Maintenance 2.0

Today's hypercompetitive world of global manufacturing, outsourcing and razor thin operating margins, demands a deep focus on operational performance. Microscopic attention is now being placed on every line item of the budget. Management expects system and process improvements that drive increased profits and faster return on investment.

Maintenance 2.0 defines a way for manufacturers to improve maintenance operations and manufacturing performance while lowering costs. It is a collaborative approach that aligns with Gartner's "Manufacturing 2.0," which they define as the *“next-generation approach to collaboration, business process, infrastructure and IT architecture that supports operationally excellent product supply networks to propel manufacturing into the 21<sup>st</sup> century.”*<sup>2</sup>

**Maintenance 2.0** eliminates information silos and the isolation of maintenance management by providing a solution that synchronizes maintenance activities with production, quality, warehouse and labor operations. It works with your ERP plant maintenance systems, extending their value by tracking and controlling shop floor execution, synchronizing with manufacturing operations while avoiding duplicate or redundant functionality to improve flexibility, visibility and control. This approach improves maintenance effectiveness by enabling manufacturers to respond faster to operational changes and unplanned events.

Both asset and manufacturing performance can be enhanced with a more collaborative approach to maintenance management. Not only can equipment uptime be improved, but manufacturing costs can be reduced. Coordinating preventive maintenance with production schedules reduces ad-hoc, reactionary scrambling and smoothes out production. Eliminating delays in notifications when unplanned repairs are required reduces time to repair and gets production back online as quickly as possible.

*“Reducing costs without compromising operational integrity requires changes in the maintenance systems and business processes”*

**Ralph Rio**  
Research Director  
Enterprise Software  
ARC Advisory Group

<sup>1</sup> *“Rationalizing Maintenance without Compromising Capability,”* ARC Advisory Group, July 22, 2010; [http://www.arcweb.com/Domains/Asset\\_Lifecycle\\_Management/Lists/Posts/Post.aspx?ID=179](http://www.arcweb.com/Domains/Asset_Lifecycle_Management/Lists/Posts/Post.aspx?ID=179)

<sup>2</sup> *“Manufacturing 2.0: A Fresh Approach to Integrating Manufacturing Operations with DDVN,”* by Simon Jacobson, Leif Eriksen and Phannee Kim, October 2010, Gartner

# Advantages of Maintenance 2.0

Maintenance 2.0 takes core maintenance management capabilities to the next level by breaking down the walls between maintenance and operations, by enabling continuous improvement of maintenance processes and by providing a global, enterprise-wide platform for sharing best practices and standardizing operational procedures. It extends ERP plant maintenance systems, providing work order tracking and execution without duplicating ERP functionality. It is a collaborative and proactive approach to maintenance operations that leads to improved uptime and operational performance while lowering costs.

The four essential attributes of a collaborative maintenance approach are:

1. Synchronizes maintenance with manufacturing on a unified operations platform
2. Extends and Enhances ERP
3. Supports continuous process improvement with BPM
4. Share best practices and KPIs with a global manufacturing operations platform

## Synchronize Maintenance with Manufacturing

Traditional CMMS software, or ERP plant maintenance alone, suffer from their isolation from other shop floor operations, operating in an information “silo.” The maintenance management system has its own database, which is either poorly integrated, or not integrated at all with the manufacturing operations management systems. Maintenance functions and business processes are not shared outside of the application. The result is a lack of visibility and coordination between maintenance and the other manufacturing operations including production, quality and warehousing.

For example, when a planner reviews his dispatching board for the day or the week, he may have limited visibility to planned maintenance orders. Without visibility to maintenance work orders, production schedules may be impacted causing cascading problems downstream, particularly in just-in-time or just-in-sequence operations. At the same time, quality management may need to increase inspection frequency or sample size calculation for some period following a machine restart, or after specific types of maintenance. However, without synchronization between maintenance and quality, product quality suffers resulting in increased costs, lower costs and missed customer deadlines.

In addition, shop floor operators rarely have access to the maintenance system. So, when equipment unexpectedly breaks down, the shop floor operator usually resorts to manually notifying his supervisor of the problem, who then manually notifies maintenance. Context about the problem is lost in translation causing further delays, which magnifies the disruption to production. When maintenance does arrive, they likewise don't have access to the production system and so struggle to put together all the pieces of the issue. Small problems become large ones resulting in increased costs, lower OEE and even delayed customer deliveries.

*“Maintenance processes cannot be effective if established in a siloed fashion. It is important to have both maintenance and operations groups working closely together to optimize both operations and maintenance processes. This will be a key step in achieving the top two goals of minimizing downtime and maximizing asset utilization.”*

**Mehul Shah and Matthew Littlefield**  
Research Directors  
AberdeenGroup

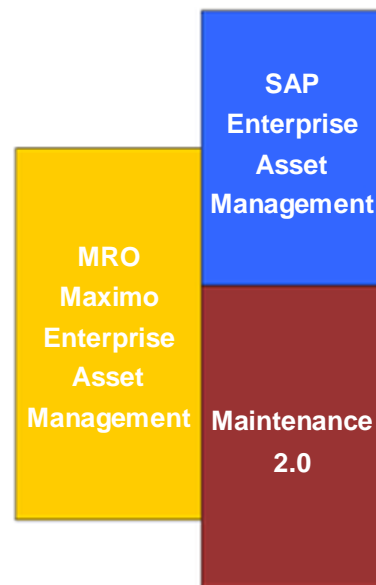
By synchronizing maintenance with manufacturing operations, the production planner has visibility to maintenance work orders and can visualize in real-time the impact to equipment availability and production schedules. Production, tooling and material movements can be adjusted to accommodate preventive maintenance and still meet production and delivery requirements. Quality management has visibility to maintenance work orders as well, dynamically adjusting inspection frequency, test characteristics and control limits during the initial start up phase of the equipment. This ensures that quality requirements are met, reducing the cost of quality while improving on-time delivery performance.

With a Maintenance 2.0 solution, delays in notifying maintenance of a problem are eliminated, reducing time to repair. When a breakdown occurs, the equipment operators generate an alert directly from their operator screen. Context from the current operation is automatically included in the notification, which is configured to route directly to the maintenance supervisor on duty. The maintenance supervisor determines which maintenance technician with the right skills is available, generates the work order from a pre-defined template and assigns the task. When the technician arrives at the equipment, armed with a mobile device, they have the complete context of the problem. Collaboration between maintenance and production results in faster, more effective resolution of the problem. A small problem can remain small, time to repair is reduced and productivity is increased.

Synchronizing maintenance with operations using a unified manufacturing operations platform provides the flexibility to model a wide range of collaborative maintenance processes from simple notifications and scheduling of future maintenance to complex integrated tasks that coordinate activities across operations. Production and maintenance managers can collaborate to develop integrated processes flows ensuring that equipment, labor and materials requirements are coordinated, communicated and visible. The result is improved manufacturing performance, increased uptime and lower costs.

### Extends and Enhances ERP

Traditional maintenance management or enterprise asset management systems (EAM) were developed as plant-focused, standalone systems. Consequently, there is often significant overlap in functions and capabilities with a manufacturer's Enterprise Resource Planning (ERP) system, particularly in the areas of procurement, costing, scheduling, and inventory management. This duplication of functionality often results in inconstant and even conflicting processes. See Figure 1.



**Figure 1:** Maintenance 2.0 Extends ERP without Duplicating Functionality

Maintenance 2.0 solutions eliminate notification delays, thereby reducing time to repair.

*“Eliminating the duplication in software capabilities, business processes and people with improved governance provides an opportunity to reduce operating costs without compromising the capability to maintain assets.”*

**Ralph Rio**  
Research Director  
Enterprise Software  
ARC Advisory Group

Maintenance 2.0 is architected to work with your ERP system, tracking labor, spares usage and work order progress with a shop-floor-friendly user interface. It leverages BPM to improve process flexibility and collaboration to effectively eliminate duplicate business processes. The flexibility of a BPM-based solution means that maintenance planning; preventive scheduling and parts inventory management can be performed within your Maintenance 2.0 solution or ERP, whichever works best to achieve your objectives. Integration between ERP and manufacturing operations platform can be achieved seamlessly and quickly, enabling you to synchronize the execution of maintenance processes with other manufacturing operations that might be planned and scheduled in ERP.

For example, users of SAP Plant Maintenance (PM) may schedule preventive maintenance tasks in their ERP. Plant Maintenance Orders are generated and automatically sent to the maintenance system. Maintenance 2.0 generates and dispatches tasks to engineers and technicians with an intuitive and easy to use interface that's appropriate for the shop floor. Maintenance order execution is tracked, even from mobile devices, including labor, spare parts and consumables. Labor confirmations are sent to the ERP along with any Cost Center, Goods Issue or Inventory Adjust transactions. ERP continues to handle procurement, parts replenishment and costing functions, without overlap with the maintenance system.

Maintenance 2.0 extends the value of ERP by providing an easy to use interface to maintenance engineers while tracking maintenance execution, parts usage, equipment genealogy and labor activities. It provides a directed and unified environment that brings together work orders, shop floor manuals, diagrams and work instructions that helps prevent errors and enforce standard operating procedures. Maintenance 2.0 closes the loop by providing progress and utilization feedback to the ERP to provide valuable visibility to and performance data from the shop floor. Furthermore, it eliminates duplicate and often conflicting functionality and business processes improving labor efficiency while reducing both IT and operational costs.

## **Supports Continuous Process Improvement with BPM**

One of the most important weapons in improving uptime while addressing costs for maintenance departments is getting more “wrench time” from the existing maintenance staff. Identifying and eliminating non-value-added tasks, a form of waste, improves maintenance processes and leaves more time for value-added tasks, increasing labor efficiency.

Continuous improvement initiatives such as TPM and Six Sigma are used by many organizations to remove waste and improve maintenance processes. However, traditional maintenance applications, or ERP plant maintenance systems alone, cannot be easily adapted to incorporate new maintenance processes or improvements. Legacy maintenance applications are essentially “hard coded” applications that have implicit maintenance processes embedded in them, providing a considerable obstacle to performing a change to any process or routine.



A Maintenance 2.0 system is specifically built for change, ideally by explicitly surfacing maintenance processes using visual business process management (BPM). BPM provides a form of value stream mapping to model the sequence of steps required for a maintenance activity. With BPM, each step in the maintenance procedure is visually mapped, specifications and maintenance manuals are linked, parts and materials are identified and skills and certifications required for the job are validated when work assignments are made. BPM directs the maintenance engineer through the departments' standard operating procedures including notification and signoffs, tracks labor usage, and updates systems for parts used, equipment lineage and work order progress.

More importantly, BPM empowers maintenance organizations to quickly and easily update their maintenance processes when improvements are identified. Process changes that remove non-value add activities such as travel time to the job or time spent gathering parts and tools or filling out paperwork means more time is available for the technician to do preventive maintenance.

Examples include enhancing the process for a regularly scheduled lubrication of motor bearings or giving visibility to all tasks that an engineer is qualified to complete within a predefined period of time or specific area of a plant. Evaluating ways to eliminate non-value added time means more preventive maintenance can be done within the same level of staffing.

Practitioners of Lean, TPM, Six Sigma and other Continuous Improvement programs will quickly recognize the benefits of utilizing a collaborative maintenance solution based on Business Process Management (BPM) that is built for change. Such a solution deployed alone or in conjunction with ERP plant maintenance enables process improvement programs to be implemented faster, with results being more effectively measured, adding further value to these types of performance improvement programs.

Many plants achieve only 25-30% wrench time. Best-in-class organizations can achieve wrench time of 50-60%.<sup>3</sup> Maintenance 2.0 empowers continuous improvement initiatives with BPM that increase wrench time resulting in lower costs and increased uptime.

### Share Best Practices and KPIs with a Global Platform

Traditional maintenance management systems are deployed as a stand-alone, plant-based solution. Larger manufacturers often end up managing tens if not hundreds of different maintenance applications, especially those organizations that grow by mergers and acquisitions. Many of these applications are underutilized or expensively tailored to individual plant needs. This diversity of systems creates an enormous burden on management and the IT staff, contributing to significant application management, upgrade challenges, training and IT support costs, resulting in considerable waste and unnecessary expense.

<sup>3</sup> "How to Double Your Lube Team without Adding Headcount" by Mark Barnes, September 2010; <http://www.machinerylubrication.com/Read/26919/double-lube-team-headcount>

*"In the maintenance and reliability field, the time spent doing work as opposed to every other aspect of planning, kitting and traveling to the job is called "wrench time". For many organizations, wrench time barely exceeds 25 to 30 percent, meaning that out of an eight-hour day, only two to 2.5 hours of useful work is actually getting done. Conversely, world-class companies have wrench times in the range of 50 to 60 percent. Compared to 25 percent wrench time, a wrench time of 50 percent equates to effectively having twice as many people to do the work required."*

#### **Mark Barnes**

"How to Double Your Lube Team without Adding Headcount"

Furthermore, the effectiveness of Lean, TPM and other Continuous Improvement initiatives is severely limited in scope, or experience dramatic inefficiencies, when results from Kaizen-type efforts cannot be easily leveraged and shared across the organization. At best, each plant must try to individually implement the recommended improvements and adjustments to the standard operating procedures. Best practices are trapped in individual plants. A lack of standardization exposes the organization to compliance risk.

Maintenance 2.0 takes a holistic, global view of maintenance operations to facilitate the understanding, standardization and implementation of best practices on an enterprise wide basis. It leverages a global platform to help maintenance organizations standardize processes, enabling best practices to be easily identified and replicated. Compliance risks are reduced because maintenance processes are consistently planned, executed, tracked and reported.

For supervisors, a global operations platform for maintenance management empowers you with real-time visibility to maintenance KPIs, such as OEE, MTTR, Unscheduled Downtime and Labor Efficiency. With this approach, your time is better spent preventing, rather than reacting to unexpected equipment breakdowns, with visibility to larger trends impacting your entire organization rather than an isolated machine's performance. Key Performance Indicators and dashboards are defined once and shared across sites to ensure metrics are meaningful and consistent. Senior management has greater visibility into labor costs, equipment uptime and ROA on a plant-by-plant basis, to compare processes and better evaluate best practices, resulting in increased maintenance labor efficiency on an enterprise wide basis. See Figure 2.

Maintenance 2.0 comprises a global platform to reduce IT and training costs. It enables greater efficiency by enabling maintenance best practices to be shared across sites. Compliance risk is reduced as maintenance standards are shared. And, management gains increased visibility to performance because KPIs are captured consistently across the enterprise enabling apples-to-apples comparison of department and plant performance.

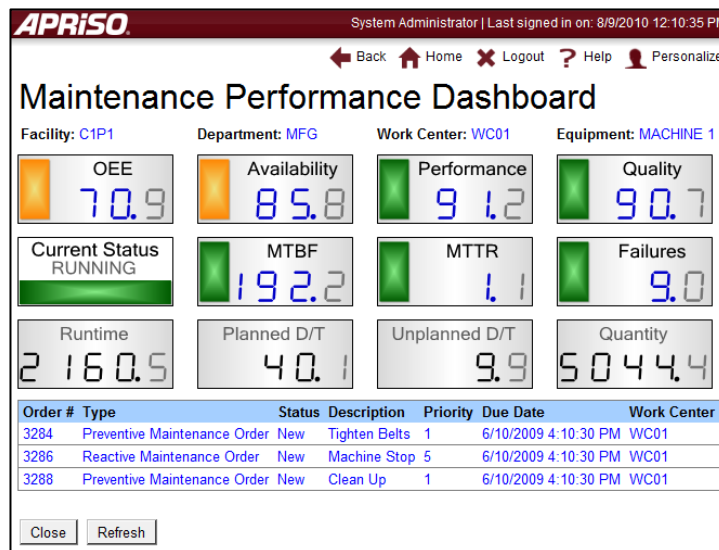


Figure 2: Example of a Maintenance Management Dashboard

# Powerful Business Benefits

In today's challenging manufacturing environment, a maintenance management solution built as part of a global manufacturing operations platform addresses these three prime objectives:

1. **Synchronize maintenance operations** with production schedules, quality programs, and logistics operations to reduce maintenance costs, improve responsiveness and increase efficiency with a global platform
2. **Improve uptime** by preventing—rather than reacting to—unexpected breakdowns; use calendar or usage-based preventive maintenance to improve equipment reliability, safety, quality and performance across the global enterprise
3. **Reduce operational IT costs** by standardizing maintenance systems on a global scale with a platform-based solution, operating as an extension of ERP

One example of a solution that provides these capabilities is Dassault Systèmes' Apriso Maintenance 2.0, which is an integral component of the Apriso solution for global manufacturing operations management. As part of the DELMIA brand, Apriso customers achieve improved manufacturing performance and reduced costs by deploying a global manufacturing operations management solution to synchronize their production, quality, warehouse and other manufacturing operations with maintenance activities. Apriso Maintenance 2.0 can be deployed as a standalone application or as an extension to your ERP-based plant maintenance. By managing maintenance activities with a solution that leverages a BPM-based architecture for global manufacturing excellence, each of the following benefits can be readily achieved:

- Extend the value of your ERP plant maintenance system by tracking maintenance execution and synchronizing maintenance with manufacturing operations
- Increased productivity and quality by reducing variability and unplanned downtime
- Improved reliability and availability by tracking both planned and unplanned work and reducing mean time to repair (MTTR)
- More effective continuous improvement initiatives by monitoring maintenance Key Performance Indicators (KPIs) and enabling process improvement
- Reduced cost of quality by detecting equipment-related issues and their impact on quality early
- Enhanced support for continuous improvement by standardizing on best practices across global maintenance operations
- Improved S&OP performance and adherence to schedule by synchronizing actual capacity and equipment availability with corporate business systems
- Streamlined maintenance planning and execution by more readily sharing data and synchronizing processes across enterprise plant maintenance applications
- Enforced SOPs and reduced costs associated with regulatory compliance by enforcing a more standardized approach to global maintenance operations management

# Conclusion

As the manufacturing industry continues to drive cost reductions, improved efficiency and greater quality, a Maintenance 2.0 approach enables improved operational performance by synchronizing maintenance processes with production, quality and warehouse operations. Greater visibility, control and synchronization of maintenance processes on a global scale means that equipment performance can be better understood. Broader context for root cause analysis means faster resolution of problems, resulting in improved uptime, lower costs and increased asset longevity.

Further, a collaborative, BPM-based platform for maintenance management helps support Lean operations and continuous improvement while providing a simplified work environment for maintenance engineers and technicians. It enforces standard operating procedures across the enterprise to improve regulatory compliance and safety while minimizing operational impact and costs.

Implementing a Maintenance 2.0 solution on a global manufacturing platform helps maintenance organizations to both operate more effectively and reduce costs without compromising safety or productivity. And, in these challenging economic times, that's a change most manufacturers can live with.

# About Apriso Solutions

Since 1993, some of the world's largest and most successful manufacturers have leveraged Apriso software and services solutions to ease the challenges of global manufacturing operations management. With Apriso, manufacturers can improve organizational agility so as to adapt more quickly and effectively to change. This agility enables firms to take advantage of new market opportunities by delivering the right product at the right time for the lowest total cost. Manufacturers choose Apriso to help manage today's manufacturing transformation of thinking global while acting local.

Apriso software solutions have won numerous awards and accolades for their ability to tightly synchronize global manufacturing operations and supply chain networks to deliver real-time visibility, control and synchronization of business processes performed across plants and the product supply network. Leverage an Apriso solution to establish a common set of operational standards that can be managed holistically on a global scale while still being continuously improved to meet your local market and customer needs.

Apriso Corporation was acquired by Dassault Systèmes in July 2013, and is now a product portfolio within its DELMIA brand. Apriso products and solutions provide a connection between the virtual world of digital manufacturing and the real world of manufacturing production.

# About Dassault Systèmes & DELMIA

Dassault Systèmes, the 3DEXPERIENCE Company, serves 170,000 customers across 140 countries, providing virtual universes for sustainable innovation. Dassault Systèmes' DELMIA brand offers products that connect the virtual and real worlds. As part of DELMIA, the Apriso product portfolio – including its suite of manufacturing operations management applications – helps manufacturers transform their global operations to achieve and sustain operational excellence. Learn more at [apriso.com](http://apriso.com), visit our blog at [apriso.com/blog](http://apriso.com/blog), or follow us on Twitter at [@Apriso](https://twitter.com/Apriso).

