

# MANUFACTURING'S HIGH-TECH REVOLUTION

Through the adoption of a standard communication protocol, software for the manufacturing industry will bring it into the 21st century.

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It's late on a Friday afternoon. You just got an email from your boss' boss that he's impressed with the predictive maintenance program you have implemented at the plant. Yes, by combining the technologies of vibration, infrared, electric motor analysis and ultrasonics, you've been able to spot possible motor failures and diagnose problems, saving the company many financial and production headaches.

As you walk to your car, your pager goes off. You recognize the code. The automated monitoring system on one of your remote critical motors has detected an alarm condition, one that could result in motor failure and lost production.

Not long ago, you would have had to return to your office, load up your motor testing equipment, strap on a tool belt and call your spouse to say that you won't be home for dinner.

Instead, you pull your palm computer out of your shirt pocket and view the affected motor's electrical information, which was collected, saved and routed to a desktop computer in the maintenance office. You run another electrical test remotely. The data, collected and analyzed by the permanent equipment on the motor, is sent back to your palm computer. You review the results and compare them to the previous alarm data. You then retrieve maintenance history of the motor and cross check it against the motor's vibration data and correlate the information. You send a work order request and the Condition Maintenance Management Software (CMMS) generates the work order and notifies the resource planning system, which adjusts the production schedule accordingly.

Finally, you continue on to your car and perhaps, take your family out to dinner.

Sound like a dream? It's actually a reality in the process of becoming mainstream.

## **The future is right around the corner.**

For years, most proprietary systems have occupied their own data islands, making it difficult to share information between the different applications. In an effort to improve productivity, very large companies invested huge amounts of capital, hoping to integrate their business and streamline operations. Maintenance systems, however, were seldom considered in these plans and were often excluded from integration all together.

There are many Enterprise Resource Planning (ERP) applications available to help businesses handle product fulfillment, logistic and resource allocations. However, without critical information from the maintenance systems, unexpected machinery failures result in serious down time. With more ERP applications linked to electronic commerce businesses for "make to order" services, the reliability of the machinery is alarmingly critical. If an ERP were integrated with the Condition Based Monitoring (CBM) and maintenance systems, then the ERP would be advised at the first sign of equipment trouble. Thus, the production schedule, logistics and resource allocations could be adjusted accordingly.

The Internet, emerging standards, wireless devices, broadband technologies, new business models and high customer expectations are forcing individual applications to work together to improve productivity and remain competitive.

### **Addressing the integration and automation of the manufacturing industry**

In the predictive maintenance world, vendors specialize in certain technologies with no single system able to provide every requested technology. In some cases, vendors attempting to provide solutions for their clients end up venturing into areas that they are not familiar with. CBM vendors try to develop their own maintenance modules, CMMS vendors try to diagnose the problems from imported data and ERP applications attempt to manage maintenance activities. To make matters worse, since few of the systems share data, duplicated information is stored in different systems. If one of the systems changes the data, the other systems with the same data must be updated as well. This can be chaotic for the user.

To answer the needs of the manufacturing industry, a group of member companies has formed to create industry-wide standards that will allow different technologies to work together, thus automating and simplifying the work of the predictive maintenance engineer. Machinery Information Management Open System Alliance (MIMOSA) is the group of member companies who are working together to define functional message sets that can be exchanged by different systems. MIMOSA standards are designed to allow seamless integration of CBM software with Condition Maintenance Management Software (CMMS), Enterprise Asset Management (EAM) and ERP programs. Information is designed to flow upward from machinery information at the base of the pyramid to the resource planning at the top.



The top priority of MIMOSA is to get application vendors in the maintenance world to adopt a standard communication protocol that will end the burden of data conversion and allow the end user to use their information collectively among various applications.

Extensible Markup Language (XML) is the emerging standard that will ease the pain associated with integration. If you think of the different software applications as pieces of a puzzle, with no standards in place, they fit together like a jigsaw puzzle, each application custom fitting only to its adjacent piece. However, using XML, these applications act more like Lego® blocks, each piece fitting easily with any other.

XML is a specification developed by the World Wide Web Consortium. It is a pared-down version of Standard Generalized Markup Language (SGML) especially designed for the transferring of documents over the Internet. XML specifies neither semantics nor a tag set. In fact, XML is really a meta-language for describing markup languages. In other words, XML allows a facility to define tags and the structural relationships between them. Since there is no predefined tag set, there cannot be any preconceived semantics. It allows designers to create their own customized tags, enabling the definition, transmission, validation and interpretation of data between applications and organizations.

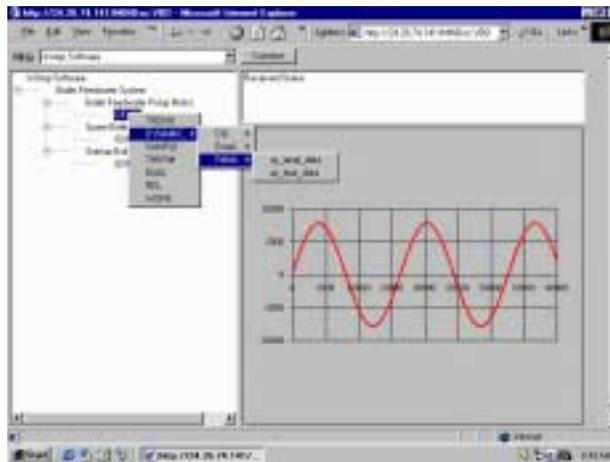
With XML, the contents of a message are defined by an interface. Applications being sent or received can interrogate, extract and interpret message contents by the tag, rather than by special translations. From a broader enterprise architecture view, this allows applications to leverage a common interface message framework.

XML can represent any information. That is very different from the usual ERP model, where every application has to know exactly how the data looks.

The XML standard allows vendors to focus on the business that they do the best. It lets the end user customize their maintenance system by selecting the products that best fit their needs. The data is stored in one location and is accessible throughout the organization by other applications. For example, there is no need to import the data from an EAM into any other system. A new CBM system will be able to retrieve asset information from the existing EAM. If the CMMS wants to know the condition of a machine, the CBM system provides the information. Everything works together simply, without duplication or fuss.

### **Maximizing Business to Business Relations Through the Internet**

Due to its initial design for Internet data transfer, adopting the XML protocol allows applications to take full advantage of the Web. Geographical location will not be a factor anymore. As long as an Internet connection is available, information can be accessed from anywhere and at anytime, regardless of location. An expert residing in Tampa, Florida can diagnose a problem in Seattle, Washington without ever leaving the office.



**New software standards will facilitate seamless integration of CBM vendors and allow testing and analysis independent of machine or technician location.**

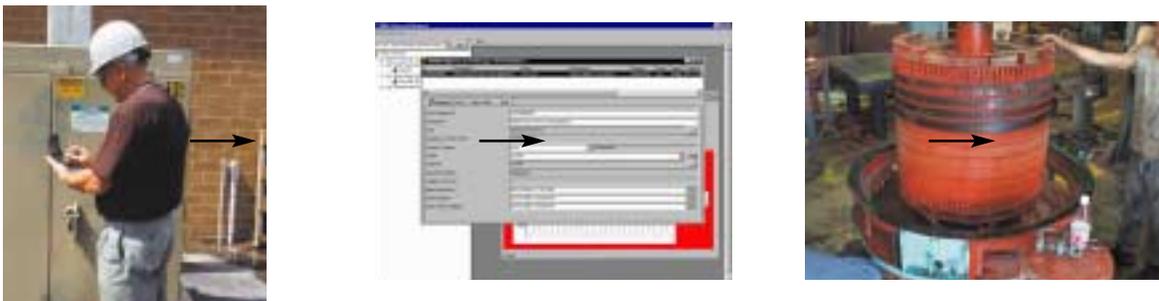
More importantly, XML will bring Business-to-Business (B2B) integration into the predictive maintenance world, just as it has in other industries. With B2B integration, it is possible to track the repair and maintenance records of components directly from the service providers. Quality assurance information can be reviewed, questions answered and equipment condition verified prior to shipping. This prevents the delays and expenses associated with unsatisfactory repairs. On the other hand, service providers are able to receive work orders in advance, giving them the opportunity to schedule the necessary resources before a component arrives. The workflow between businesses would be tightly integrated and access to the latest information would always be available, independent of component location.

Expect remote network storage and application hosting to be popular trends in the next few years. As the cost of bandwidth drops, high speed Internet access will become more common, offering a new breed of applications which were once too expensive for small businesses. Many small and mid-size businesses long to run their operations in the same efficient manner as Fortune 500 companies. However, the high cost of ERP implementation presents a significant barrier. By outsourcing application hosting and support services, companies gain a virtual IT staff and infrastructure. Application service providers will deliver applications in a secure, high performance infrastructure with network support, implementation and maintenance expertise. Information will be available to all users – under a single roof or at remote locations. Outsourcing enables a company to focus on their core competencies, directing resources to implement new technologies and create business processes.

Some EAM and CMMS vendors are already beginning to offer application hosting for their clients over the Internet. Facilities, regardless of size, are able to implement EAM/CMMS at minimum cost by avoiding initial investment and support fees. Hardware upgrades, technology dead-ends or inflexible system scalability will be of no concern. Data exchange standards, such as MIMOSA compliance, will enable end users to order different application hosting services to meet their specific needs. Your CBM vendors will work with the EAM/CMMS seamlessly over the Internet without special integration effort.

### **Go Wireless, Go Mobile**

With this newfound integration, access to information through wireless, handheld devices is a logical progression. Devices already exist that provide wireless connection to the Internet. They utilize Wireless Markup Language (WML), a language based on XML that specifies content and user interface for narrowband devices. Similar to XML, WML is also platform independent. This paves the way for handheld devices to become the mobile terminals for employees on the move.



**In the very near future, technology and software standardization in the maintenance industry will allow monitoring, diagnosis, work order generation and repair of equipment all through wireless handheld devices.**

### **Integration will be a necessity, not a luxury.**

Fluid communication between ERP, EAM, CMMS and CBM systems will help businesses make timely and qualified decisions. Companies will be able to select the best applications available to build systems designed for their specific needs. Maintenance/monitoring systems will provide detailed machinery information and play a larger role in enterprise resource planning. Maintenance personnel, with the help of wireless devices, will have unlimited access to information from anywhere at anytime. This method of maintenance and operation is not too far in the distant future. As technology improves, the opportunities to streamline operations expand. Standardizing communication between systems is only the start.