The Digital Revolution gets all the headlines these days," wrote Kevin Kelly, executive editor of Wired magazine, "but turning slowly beneath the fast-forward turbulence, steadily driving the gyrating cycles of cool technogadgets and gotta-haves, is a much more profound revolution—the Network Economy.

The emerging model for asset management includes teams of knowledge workers with ready access to equipment, process, and business information. MIMOSA is developing the conventions to make it possible.

"Those who play by the new rules will prosper; those who ignore them will not.
"The advent of the new economy was first noticed as far back as 1969," Kelly said, "when Peter Drucker perceived the arrival of knowledge workers."

Paul Smith, writing about the "Maintenance Knowledge Worker of the Future" (MT 5/95, pg 12), noted that Drucker defined the knowledge worker as a person who has formal education but may require manual dexterity skills to perform a job, and this description fits maintenance workers of the future.

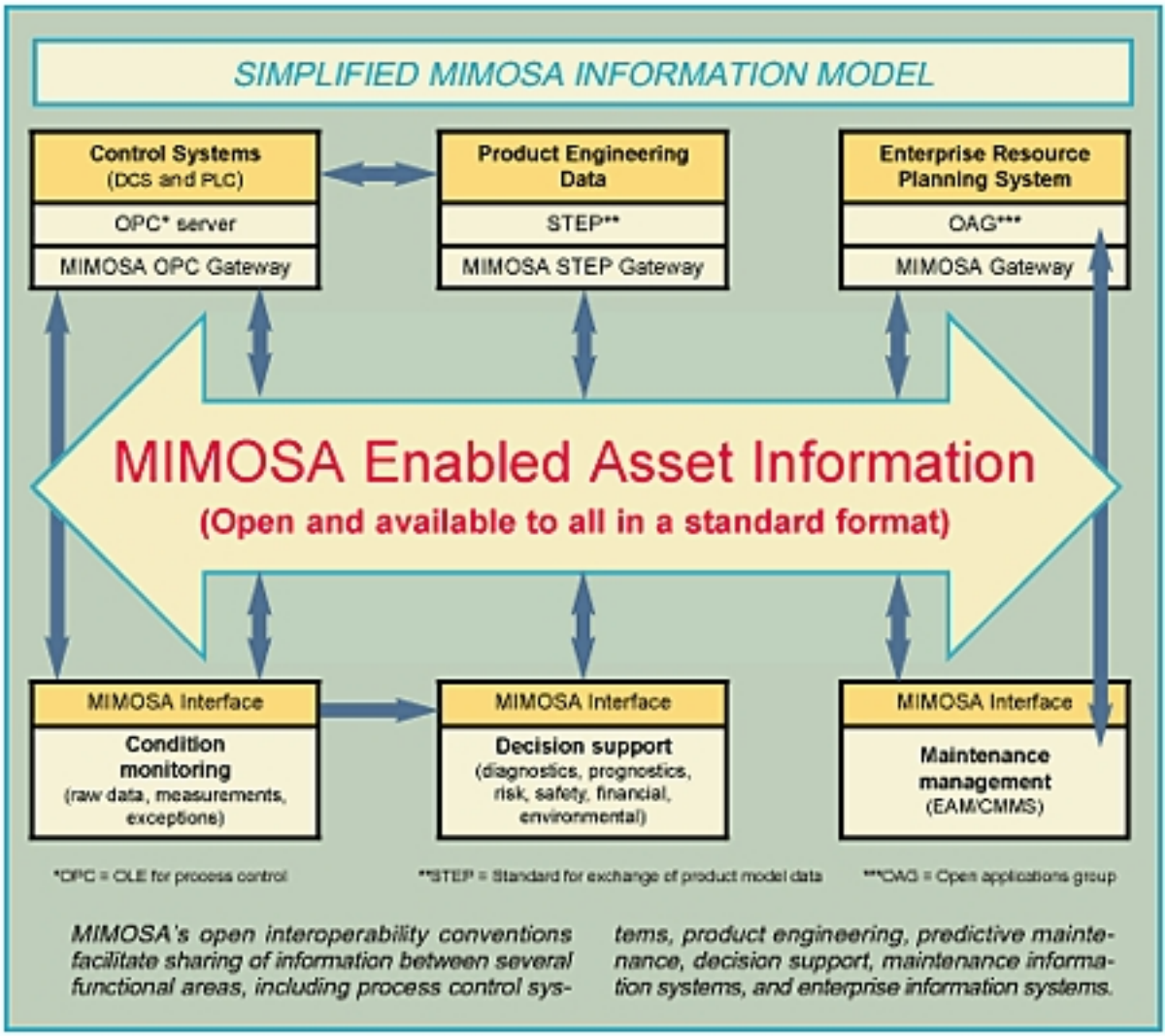
"The role of the maintenance knowledge worker changes from being a servant of the equipment to one who uses knowledge and information to make the equipment serve the organization," Smith suggested. "Computers and information databases allow blue collar knowledge workers to successfully make decisions that in the past were reserved for management.

"The knowledge worker of the future will spend less time trying to maximize the amount of wrench time and more time using information to find ways to optimize the effectiveness of the use of wrenches.

"What the maintenance worker of the future does, when he does it, and how he does it will be determined by knowledge and information. This new role will require that the maintenance system be tightly integrated with systems that control operations, production forecasting, engineering, process safety management, and financial results."

The big disconnect

To be effective, knowledge workers in the equipment reliability, maintenance, and asset management arena need information—about objects, procedures, processes, people, parts, rules, and more. But there is often a disconnect between the knowledge worker and the data and information.



Information is segregated into functional and proprietary silos. For example, vibration data is kept in the reliability team silo. And, furthermore, it is probably locked in a proprietary container defined by the supplier of the data collector.

The Machinery Information Management Open Systems Alliance (MIMOSA) has developed a key for unlocking the proprietary container and is well on its way to providing what is needed to link up the silos. Here is an overview.

The MIMOSA approach

MIMOSA has developed a model for information exchange between the traditional functional silos. It has identified six functional areas that can be linked effectively to build an asset management network. Those functions are equipment condition assessment, maintenance information systems, enterprise information systems, product engineering information, control systems, and decision support.

Their relationships are shown in the accompanying diagram "Simplified MIMOSA Information Model." The types of information that can be accommodated by the model are outlined in the section "Some Typical Elements of the MIMOSA Information Model."

All the functional elements of the model will be accessible through open MIMOSA interface gateways. Today, condition monitoring data exchange has been tested and is beginning to appear in products from leading suppliers. This significant advance eliminates the need for expensive, inflexible custom software to exchange data between the many combinations of functional systems currently available from multiple suppliers. The MIMOSA exchange protocol is being extended to include additional condition monitoring measurements as well as reliability and work information in a format that will offer better integration with computerized maintenance management and distributed control systems.

The large horizontal arrow in the information model represents the open MIMOSA link between various system functions. It also can provide links elsewhere in the enterprise to display information and provide access to data.

Within the condition monitoring function (lower left block in the diagram), MIMOSA conventions provide an open means to exchange information among a variety of systems such as vibration, fluid analysis, motor condition monitoring, electric circuit analysis, ultrasonic, thermography, and operating logs.

The MIMOSA information model establishes a close linkage between the condition monitoring and decision support functions. MIMOSA visualizes decision support as the heart of asset management. Decision support must have full facilities for balancing current and projected condition with safety, economic, and environmental risk considerations. Today, decision support is primarily accomplished manually by experts. MIMOSA links will greatly

improve the productivity of these experts by delivering information effectively and as required. MIMOSA conventions will pave the way to automating more of the decision process. Freed from the time consuming task of collecting and assembling data, human experts will have more time to spend in high value activities such as reliability improvement and root cause failure analysis that determine plant performance and profitability.

Enterprise asset management (EAM) systems and computerized maintenance management systems (CMMS) comprise the maintenance information function represented by the lower right block in the diagram. The function block above it is enterprise resource planning (ERP) made up of financials, human resources, production and materials planning, inventory control, scheduling, and other high-level functions.

The Open Applications Group (OAG) is establishing standards for exchanging enterprise business, financial, and administrative information. However, several EAM/CMMS companies have created direct proprietary links to certain ERP systems, and some ERP suppliers have purchased suppliers of CMMS and EAM systems.

Some Typical Elements of the MIMOSA Information Model

Technologies and functions
- Vibration—continuous protective, periodic predictive
- Fluid condition—lubricating and hydraulic oil
- Temperature—thermography
- Electrical—motor characteristics, current spectrum, circuit tests
- Corrosion protection—cathodic and anodic voltages
- Ultrasonics—leak detection, thick-ness
- Water chemistry
- Performance from control system and logs

Product engineering
- Engineering design
- Plant configuration
- Design specifications and drawings

Maintenance information systems
- Functional location and asset hierarchy
- Asset management

- Workforce management
- Scheduled maintenance
- Maintenance work management
- Spares inventory management
- Tool and rental equipment man- agement
- Maintenance cost accounting
- Nameplate data
- Manufacturer's specifications
- Maintenance history—action taken, costs, process downtime
- Spare parts availability
- Work orders—number, requirements, parts, resources, safety precautions, schedule
- Conditions—as found, as left

Decision support

Information used by decision support function

- Events
- Numerical (scalar) values
- Vibration characteristics—numerical values, vectors, time waveforms, FFT and CPB spectra
- Fluid chemistry and particle distribution

Information activity within deci-sion support

- Mechanical diagnostics life assessment
- Life assessment (prognosis)
- Performance and efficiency cal- culations
- Operating deflection shape analysis
- Root cause failure analysis (RCFA)
- Reciprocating machine analysis

Information provided by decision support

- Status of equipment health
- Event—abnormal change occurred
- Rate of change of health
- Time to action
- Problem identification and description
- Components affected
- Recommendations for operating and maintaining
- Explanatory remarks and com-ments
- Work requested

The Standard for Exchange of Product Model Data (STEP) provides a standard method for exchange of drawings, documentation, and other information within the product engineering function. It is being extended to other areas including process control, and possibly maintenance information.

OLE for Process Control (OPC) is an interoperability convention being constructed on Microsoft's Component Object Model. (OLE is an acronym for object linking and embedding). OPC originated in the control automation area as a high-level means to exchange information. The differences between OPC and CRIS structures will be handled by a MIMOSA business object model that will reside in the OPC Gateway element of the information model.

The MIMOSA initiative is solving asset information exchange issues. A MIMOSA business object model is being developed to facilitate full integration with DCS.

Membership

MIMOSA is supported by a variety of technology vendors, users, and other interested parties. Official sponsors of the MIMOSA initiative are Computational Systems Inc., ENTEK IRD International, Indus International, Predict/DLI, Prüftechnik, Reliance Electric, Siemens, SKF Condition Monitoring, and Solartron Group. Maintenance Technology is a regular member of MIMOSA. **MT**