Ready, Set, Get Proactive

Enterprise asset management will help to optimize and control plant equipment reliability
Everyone seems to talk about the importance of work planning within the enterprise asset management (EAM) system. Vendors often discuss how the software supports workforce management, work categorization, and job planning. And EAM users frequently participate in user forums, attend training classes, and talk with other peer groups in an attempt to improve work order planning. If all of this is true, why are so many sites still struggling to fully implement maintenance planning?

Although some industries have the work management planning process finely tuned, others are stuck in a self-imposed, reactive maintenance mode and are unsure how to escape. Just because they have planners doesn’t mean they are fully engaged in (or supportive of) future work planning. Rather they may be actively involved in reactive maintenance support.

A proactive maintenance planner actively supports future work scheduling and reliability centered maintenance. Job Planners often assist with identification of recurring problems, faulty parts, and work order feedback. Plus, they participate in maintenance backlogs, work priority validation, job plan creation and PM library reviews.

The lack of proactive planning is illustrated in Figure 1 where Process A handles all work the same and Process B allows for proactive maintenance (Figure 1).

This means we need to start identifying work that can be planned and begin making weekly schedules. But it’s not that simple.

There can be many reasons why the planning process is not working. And it only takes one reason to cause a real problem. When it comes to work order planning, you might encounter the following:

- No formal job planner position exists. The maintenance staff sometimes performs this role but usually as a non-formal process with inconsistent results.
- The planner position exists, but has no real training in planning/scheduling fundamentals or conceptual understanding of EAM system management, such as backlog management, work prioritization, and PM program design. Planners are afraid to estimate any work.

The Secret to Implementing Proactive Maintenance Planning

By John Reeve, Cohesive Information Solutions
prioritization, and PM program design. Planners are afraid to estimate any work.
• The planner position exists, but the planner has insufficient industry background in maintenance.
• The organization seems to do an excellent job at dispatching emergency and urgent work. Unfortunately, this is all it understands. Therefore, it processes all incoming work the same.
• Working-level supervision is not truly supportive of the work planning process. For example, there are many instances of self-inflicted reactive maintenance, and there is no process for weekly scheduling.
• Maintenance workers and supervisors aren’t really helping the planners in terms of feedback. Job step instructions are perceived as not needed. Maintenance staff only sees the EAM system as a work order ticket generator.
• There’s poor foundation data. No standard PM or job plan library has been established. PM work orders are created on the fly. The maintenance backlog is inaccurate and poorly categorized.

Foundation Data and Process
The maintenance program needs to clearly define the role of the maintenance planner. This skill set can add efficiency to the maintenance organization and is absolutely critical to reducing reactive maintenance. In order to make more informed decisions within the EAM system, it’s important to have all of the supporting elements (Figure 2).

Typical Conversation
Even though there are many books on the subject of effective planning/scheduling, no one seems to be discussing these real-world problems. A conversation might go like this:

<table>
<thead>
<tr>
<th>Planner / Scheduler</th>
<th>We cannot perform any additional work, such as work order planning, as we are fully utilized at this moment. There is a significant amount of emergency and urgent work which requires our immediate attention. And we are the main point of coordination when it comes to the EAM system input, as well as output. If we start planning work, who will handle the daily breakdowns and urgent requests?</th>
</tr>
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<tbody>
<tr>
<td>Interpretation of the above</td>
<td>We need more staff before we can enter any additional time for jobs such as status updates, planning/estimating of routine work, refining PM/job-plan library, attaining work-order feedback, and reviewing the maintenance backlog. But is it really just a staffing issue?</td>
</tr>
<tr>
<td>Management statement</td>
<td>We are not going to hire any more planning staff.</td>
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Thus, an impasse. It’s sort of like a poker game — management versus the planning staff. Is it possible to come up with a solution without hiring more staff? What would you do? If there really is no time to input anything else, then this is a significant issue. This sounds like a lot of reactive maintenance. As a result of this organizational impasse, the following happens:

Every day the maintenance backlog grows in size including the number of unplanned work orders in this backlog and poorly categorized data.

The work orders are essentially managed at the working level, meaning individuals are performing individual actions. Multi-craft coordination is difficult. Job safety is up to the worker. Frequent trips are required to get parts, tools, and documentation, resulting in job delays.

Since reactive maintenance costs more in terms of labor, materials, travel time, safety incidents, and overall confusion from redirects, this impacts the maintenance budget.

Without a formal planning process, it is difficult to implement any automated scheduling techniques.

**First Step: Do We Have a Problem?**

To verify there is a problem, you could perform your own survey, and ask these questions:

- Does management want a weekly maintenance schedule? Does it understand the benefit?
- Other than emergencies, is any work planned?
- How do you mark a corrective maintenance work order which has been “fully planned”? Does the system have this capability?
- Are all PMs (job plans) defined? Are they fully planned and ready to go?
- Do you have a maintenance backlog? Is it accurate? Are you conducting regular reviews of this backlog? Are the priorities valid or bogus? Do you have stale or duplicate work? What percentage planned is it? Consider that your target is for more than 90% of it to be planned.
- Have the planners ever been trained on methods for proactive maintenance? If you looked in their cubicles, are there any books on planning/scheduling and trending failures?
- Are recurring maintenance problems being identified and managed within the EAM system?
- Has the organization ever performed any EAM system benchmarking by visiting other sites or plants in other industries?

If the most of the above is answered as “no,” then there is a problem, and a formal assessment is warranted resulting in a remediation plan.

**Remediation Plan**

Proactive maintenance is a complex combination of software, data, and culture. Innovative strategies will be required to change course. The secret, however, is to transform the entire organization...
through dramatic change by altering perceptions, roles, and procedures. If the organization is struggling to become more proactive, then a paradigm shift in thinking will be required.

You could start this dialog by assembling all stakeholders for a brainstorming session. One or more of the following approaches could be applicable.

<table>
<thead>
<tr>
<th>Approach</th>
<th>Explanation</th>
<th>Significance, Impact, Benefit (10=High; 1=Low)</th>
</tr>
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<tbody>
<tr>
<td>Require operations involvement for emergency and urgent work</td>
<td>For reactive maintenance, operations or dispatch should create the work order in the EAM system, approve the request, make the work group assignment, and establish direct contact with the maintenance supervisors. Conversely, job planners should not be responsible for coding emergency/urgent work within the EAM system.</td>
<td>Significance: 9 Paradigm shift Culture change</td>
</tr>
<tr>
<td>Create a chief planner position</td>
<td>A chief planner would be the first to see all incoming work and then make assignments to the job planner. He would help standardize process and business rules. The chief planner would also filter planner-feedback forms. This person would also create the weekly schedule and oversee backlog trending.</td>
<td>Significance: 7 Supports gatekeeper concept</td>
</tr>
<tr>
<td>Split planning staff roles</td>
<td>If the operations department is not in a position to filter and process all reactive maintenance directly, then consider creating a work order coordinator position, and a proactive planner/scheduler. The work order coordinator would need to have client industry experience and familiarity with EAM system interaction, such as work group assignment, prioritization, and status changing. The proactive planner/scheduler however would receive advanced training in P&amp;S, SQL and database table relationships, KPI/metrics definition, ad-hoc reporting, foundation data responsibilities, failure/problem code hierarchy refinement, and failure analysis techniques. This later position would also be a higher-paying job.</td>
<td>Significance: 10 True paradigm shift</td>
</tr>
<tr>
<td>Approach</td>
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<tr>
<td>Request work order feedback</td>
<td>There needs to be a well-defined process whereby the technicians regularly provide feedback on CM and PM work. Workers have valuable insight as to what was wrong, how it should be fixed, and how to prevent this from occurring again. If this data is entered as actionable data, then this can be automatically routed to various staff positions for review and action. This technique is extremely useful to setting up and optimizing your maintenance program, and it supports failure analysis. The goal is to enhance workforce productivity and reduce reactive maintenance. The PM or maintenance strategy should also be reviewed and adjusted at work-order feedback time.</td>
<td>Significance: 10 Tip-and-trick Real ROI High-value rewards if this WO feedback is successfully leveraged</td>
</tr>
<tr>
<td>Make use of contractors to knock down the backlog</td>
<td>If the levels of reactive maintenance are very high and the existing maintenance organization is overwhelmed, it may be necessary to involve a contractor for a short period of time. Although initially expensive, this would allow the permanent staff to focus on proactive maintenance and get ahead of the curve by studying the causes behind these unplanned breakdowns, using failure analysis techniques and GIS to visualize recurring problems, to come up with improved maintenance strategies.</td>
<td>Significance: 9 Immediate change Initial cost increase, but expected long-term savings</td>
</tr>
<tr>
<td>Validate PM and job plan library</td>
<td>Conduct review of the current PM library and define your asset maintenance strategy. Verify priority assets/systems and determine failure modes. Review historical failure data. Establish risk-based maintenance strategies based on most likely failure modes.</td>
<td>Significance: 7 As a one-time review this can be tedious work, but a critical step</td>
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<tr>
<td>Establish dedicated PM crew</td>
<td>A dedicated PM crew should include specific staff skilled in this PM strategy or work area/zone. This crew will provide expertise and familiarity with the tasks and provide valuable feedback.</td>
<td>Significance: 8 Visible impact</td>
</tr>
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<td>Approach</td>
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<tr>
<td>Create fix-it-now crew</td>
<td>Create a cross-functional, fix-it-now crew. This crew could be staffed to handle reactive maintenance, preferably after hours.</td>
<td>Significance: 8 Visible impact</td>
</tr>
<tr>
<td>Involve operations department on backlog review</td>
<td>Data ownership is always important. The EAM system and work order backlog needs periodic review. In the case where a backlog has gotten out of control, bring a member of operations full-time into the maintenance management team until resolved. Have this person lead the backlog reviews, including priority, validity, work group assignment, work type, status, and duplicate identification. Related goals should be to minimize self-inflicted reactive maintenance and false priorities. There needs to be a level of trust between operations and maintenance.</td>
<td>Significance: 7 Culture change Expand level of trust and understanding between departments Create a true knowledge base within the EAM system</td>
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<tr>
<td>Use maintenance staff runners</td>
<td>In some cases, especially linear assets, it is helpful to send out a runner to first size up the job. This person should always communicate with the job planner once the assessment is made. The job planner, or the runner with mobile device, would then enter the work estimate (labor and materials). In an ideal scenario, the chief planner would take a cut at work for next week and then send the runner out to size up all of this work, in one road trip. This is a best practice as opposed to sending out a runner for each individual job across multiple days.</td>
<td>Significance: 9 Efficiency improvement Improves communication between maintenance staff and job planners Improves accuracy of work order plan</td>
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<tr>
<td>Centralize planning staff</td>
<td>Planning staff may currently be located in different facilities or departments. And, depending on how embedded a planning staff is in terms of bad habits, you may need to institute a significant change in the planning process. By relocating all job planners into one room/facility, you can quickly enhance communication, facilitate change, and standardize process. After a period of time, they can be decentralized again.</td>
<td>Significance: 8 Paradigm shift and culture change Helps standardize process and procedure</td>
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</table>
To achieve operational excellence, it is insufficient to just have a plaque on the wall. There needs to be a plan with a specific set of actions, backed by upper management and understood at the working level. Motivation is important, but a comprehensive roadmap that connects all of the dots with real world solutions is sometimes necessary.

Trying to escape the grasp of reactive maintenance is a complex problem involving software, process, and organization. Changing culture is hard, and it may take months or years to change the course, especially for large organizations with multiple work groups. As an organization, if you do not think boldly, then you will forever be reactive. Whatever solution is chosen, the results must be verifiable and sustainable. What’s important though is to understand the problem and then act.

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Information and links

- **Analyst Paper** | ARC report: Effective Maintenance Management Helps Lafarge Cement Grow to Become Global Market Leader
- **Video Case Study** | Lafarge: Asset Management software delivers great maintenance
- **Whitepaper** | Optimizing asset and service management in the manufacturing industry
- **Whitepaper** | Support lean manufacturing principles with IBM Maximo Asset Management
- **Webcast** | The Value of Integrating Health, Safety & Environment Processes with Enterprise Asset Management
Any company that has physical assets must maintain them over time, in order to maximize their return on those assets. Obviously, running all your assets to failure does not yield the highest return, but then neither does 100% preventive maintenance — that is, no assets run to fail. Comparing these two strategies in terms of cost, 100% preventive maintenance requires maintenance at regular intervals in order to prevent failure. This can be costly compared to simply replacing or repairing the asset upon failure. However, there are other factors that must be considered, such as the probability and impact of failure, the performance and reliability of the asset, and the age and condition of the asset.

**Maintenance Policy Options**

There are only three ways that maintenance can be triggered, regardless of asset type or its attributes. These correspond to the only three maintenance policies possible:

1. **Use-based maintenance (UBM):** This policy refers to maintenance triggered by time, meter, or event. For example, use-based maintenance on your car engine might be defined as changing the oil every three months, every 3,000 miles, or after every fourth tank fill-up. This corresponds to time, meter, or event driven UBM.
2. **Fail-based maintenance (FBM):** By running an asset to failure, you are adopting a fail-based maintenance policy for that asset. In the car example above, not changing the oil at all and running the engine to failure implies adopting an FBM policy.
3. **Condition-based maintenance (CBM):** The only other maintenance policy possible is condition-based maintenance — triggering maintenance when the condition of an asset exceeds an upper control limit, drops below a lower control limit, or trends in a given manner — for example, the slope is rapidly increasing. In addition to the actual maintenance work, a CBM policy necessitates regular condition inspections, from on-line real-time to manual inspec-
tions at regular intervals. Following the car example, choosing CBM over the other two policies would require regular inspections of the oil and sophisticated lubrication analysis to determine the level and characteristics of particulates. A cheaper alternative would be to visually inspect the oil to determine how black and dirty it is; however, this method is not as accurate in optimizing engine performance and lifecycle cost.

The three policies above replace the many words used to categorize maintenance work done. These include preventive, corrective, demand work, proactive, elective, predictive, daily/routine, scheduled, reactive, and many more. Ask three people in your company what these terms mean, including what triggers maintenance work, and you will undoubtedly get three different answers.

The most often used but least understood of these terms is “preventive maintenance.” If you ask your employees whether or not an inspection is preventive maintenance, most would say it is. This is false because an inspection is not maintenance at all. Nothing is repaired or replaced. It is a requirement of CBM in order to track when maintenance is triggered. If an inspection of the oil shows that replacement is required to prevent failure, then condition-based maintenance, not UBM, is performed. Use-based maintenance implies that the oil is simply replaced at a given interval, regardless of inspection results. Similarly, if upon inspection it is discovered that an asset has failed — for example, a light bulb is out — then the trigger for maintenance is failure, and it is classified as FBM.

The confusion lies in that companies mix the three policies on a given work order, thereby making it difficult to analyze asset history to determine the optimal maintenance policy. Keeping careful track of policies on a work order allows planners and asset owners to better understand for each policy, the relationship amongst probability of failure, impact of failure, asset performance, reliability, lifecycle cost, aging, and other factors.

Factors to Consider in Choosing the Maintenance Policy
Sometimes the best policy is somewhat obvious, such as FBM for changing a light bulb in an area where there are many other light bulbs and few people. However, for many assets or components, the choice of maintenance policy is not obvious. Even for the same asset, a light bulb, there are several factors that may favor a policy other than FBM.

Risk: One of the most important factors to consider in determining the optimal maintenance policy is the probability and impact of failure, or risk. For example, suppose the light bulb is in a safety-related device such as an emergency exit sign. Similarly, what if there is only one light bulb used to illuminate a short walkway through a park used by university students. In these two examples, UBM is probably a better option since FBM is too risky from a safety or potential liability perspective, and CBM too costly relative to UBM.

Maintenance costs: Each maintenance policy has an associated ongoing and one-time setup
cost. CBM is typically the most expensive as it requires both regular inspection and maintenance work orders, which in turn may require costly production downtime. As well, there may be one-time setup and equipment costs (sensors, monitoring equipment, analytical tools), or ongoing service costs such as vibration or lubrication analysis performed by a third party. UBM is typically cheaper than CBM to set up but is usually more costly on an ongoing basis because maintenance is done at regular intervals to avoid failure, regardless of condition. Note that maintenance work orders such as repair/replace are typically more expensive than inspection work orders. FBM is usually the least expensive in terms of maintenance costs if the impact of failure is low.

**Benefits:** The value in selecting the best maintenance policy is not just lower maintenance cost. Other potential benefits to consider are lower asset lifecycle cost and greater asset availability, reliability, performance, and quality of output. In some cases, the greater benefit of one maintenance policy over the other lies in the cost avoidance. For example, avoiding failure through a more expensive CBM policy may be warranted to avoid delay or loss in production, loss in reputation leading to reduced sales, or reduced health, safety and environmental damage/costs. Most maintenance departments tend to fixate on maintenance costs, but these other factors may be far more substantive in the short and long terms.

Thus, for each asset or component, starting with the most critical, ask four questions.

- What does this asset/component do?
- What happens if it fails, from negligible to catastrophic impact, in terms of financial, environmental, health and safety?
- What is the probability of failure?
- What is the best maintenance policy that balances the ongoing and one-time cost of the policy, the risk, and associated benefits?

Once the optimal policy is determined, the CMMS is used to build work plans for all three policies, plan/schedule UBM work and CBM inspections, and forecast CBM and FBM.

**Other factors:** The optimal maintenance policy should also consider factors such as:

- the remaining useful life of the asset or its parent (the plant will be shut down next year, so it is not cost-effective to replace a related asset)
- the asset’s degradation curve (suppose there is greater risk of failure at the beginning and end of a particular asset’s life, so adjust frequency of CBM inspections accordingly)
- aging factors that cause an asset to degrade faster or slower (an asset running in a hot and humid environment at peak load for an extended period requires more frequent UBM).

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Perhaps one of the biggest challenges in asset-intensive industries is how to effectively manage all their different types of assets—without creating a huge management workload that erodes the bottom line. Enterprise asset management (EAM) processes and solutions are big business due to the inherent complexity of this problem.

In developing or manufacturing a product, or delivering a service for a market, asset-intensive organizations must constantly track, assess and manage an extraordinarily wide range of physical, technology and human assets. Organizations in asset-intensive industries must manage both inventory and production; repair machinery; hire and schedule employees; deploy and manage their IT infrastructure; and maintain physical plants, their linear infrastructure or rolling assets. To further complicate matters, technology infrastructures are tremendously complex, typically running applications and data in silos that can limit the effectiveness of cross-organizational operations and efficiencies.

These organizations must deal with continually aging physical assets—from power plants to railroad bridges to sewer systems, or from generators to electronic devices such as handheld computers—that require ongoing maintenance and repair, since asset performance and the resulting quality of the company’s products are impacted by the reliability of the asset or equipment. The increased need for asset maintenance and its management therefore can have a direct impact on customer satisfaction. This applies to processes, as well—as production, maintenance or service processes age and erode, end goods or service output may not be produced or delivered to the quality standards that were originally specified.
Managing human resources—the most valuable asset of all—comes with its own special set of challenges. Long-term employees, for example, are continually edging toward retirement, which can mean a loss of knowledge and skills—and the expense of training new employees.

Despite these challenges, an organization’s products or services must constantly evolve to meet customer demands. Issues such as increased globalization; commoditization and competition; compliance with industry and government regulations; green and sustainable operations; health and safety in the workplace; eroding margins; and the resulting higher costs of doing business all contribute to this phenomenon.

So, how can an organization hope to both control assets and remain profitable? Successful organizations adapt to change by improving their operations and enabling flexibility and agility. And asset management can be a significant factor in their success. One critical step in rising to the challenge of change, and in controlling the complex asset environments necessary for bottom-line results, is to unify processes that manage wide-ranging functions across an organization’s multiple sites—while optimizing production and service systems within each site.

It is clear that enterprise asset management is critical to the health of an organization. If handled correctly, it can be the key to continued operations in times of reduced budgets. It can help extend the useful life of equipment, improve return on investment and defer new purchases.

On today’s smarter planet, where assets are becoming more and more instrumented, integrated and intelligent, an effective asset management solution can help organizations reach these goals by collecting, consolidating and analyzing information—and then putting information to use—across assets.

Introducing the IBM Maximo® Asset Management solution, which provides the key to better managing your physical infrastructure assets. This brochure offers insight you can leverage to make better decisions around all aspects of asset management, and describes how the Maximo Asset Management solution can move you toward this goal.

**Defining asset management**

The term asset management is defined by the PAS 55 industry standard as “… systematic and coordinated activities and practices through which an organization optimally and sustainably manages its assets and asset systems, their associated performance, risks and expenditures over their life cycles for the purpose of achieving its organizational strategic plan.”

There are different levels at which critical or strategic assets can be identified and managed—ranging from discrete assets to more complex functional asset systems, networks, sites or portfolios.

Asset management focuses on all types of assets, varying from critical or strategic physical assets to human assets.
Physical assets, which are part of an organization’s infrastructure, are positioned in the following four classes:

- Plant and production (occurring, for example, in industries such as oil, gas, chemicals, mining, manufacturing, pharmaceuticals, food, electronics and power generation)
- Infrastructure (including railways, highways, telecommunications, water and wastewater, and electric and gas distribution networks)
- Transportation (for military, airlines, trucking, shipping, rail and other use)
- Real estate and facilities (for example, in offices, schools and hospitals)

The human asset perspective provides a broad view of personnel motivation, expertise or skills, roles and responsibilities, as well as insight into leadership teams within the organization.

Maximo Asset Management provides an integrated approach to managing these discrete or complex assets, to help organizations overcome challenges rooted in their aging infrastructures or human assets and in their siloed or disconnected systems. By breaking down multiple silos of non-standard, non-integrated systems, an integrated approach can help align operations with overall business objectives.

Such an integrated approach can also support long- and short-term planning—controlling inventory, for example, to better meet demands. It can enable preventive and condition-based asset maintenance. It can help manage vendors with comprehensive support for a full range of contracts and full support for managing service agreements.

**Building on the enterprise asset and facilities foundation**

There are many reasons for the increasing demand for better asset management. When organizations raise the importance, risk, quantity and/or cost of their corporate critical or capital assets, they often see a corresponding rise in interest by management to better maintain control and visibility of all these assets.
In addition, governments, regulatory bodies, shareholders and other key stakeholder groups have increased the pressure on organizations in both the public and private sectors to be able to locate and track asset whereabouts. The higher the risk or opportunity cost in not knowing where an asset is located, the greater the incentive for management to implement an asset tracking system. Enterprise asset management can provide realtime insight or visibility into all physical assets, as well as across the maintenance, repair and overhaul (MRO) supply chain.

EAM foundational capabilities—such as tracking, monitoring and managing information around asset reliability, asset utilization and performance, as well as information around the services to execute this type of information—should be integral in managing a company’s smarter physical infrastructure.

These capabilities are included in two categories of activities: asset management and facilities management. The following diagram depicts the points of focus within these categories which are supported by the Maximo Asset Management solution portfolio.

### Asset management

- **Operations management**—An effective enterprise asset management solution must manage and optimize the use of all assets to achieve greater asset availability, reliability and performance. The result is the ability to extend the asset’s life because assets are better maintained. The ability to gather and analyze data about asset operations allows an organization to move from corrective (repairs made after a problem occurs) to preventive (maintenance dictated by a schedule based on past experience) to predictive maintenance (performed because data for a particular asset indicates that a failure is imminent).

- **Health, safety and environment**—The primary objective of health, safety and environment initiatives is to reduce overall risk, to comply with appropriate regulations and to create a safe yet efficient operating environment in which assets are used. Achieving this objective is as
much about standardizing health, safety and environmental practices and integrating these practices with day-to-day operations management.

**Supply chain management**—As traditional business assets become more technology-enabled, operations and IT functions are increasingly converging in today’s changing business and technology environments. As a result, one way to manage operational applications more effectively and efficiently is to consolidate them. Companies seeking to better manage their supply chains must:

- Find support that is able to manage all types of assets and asset maintenance information
- Establish a single technology system to manage all types of assets and asset information—production, linear, facilities, transportation and IT—including calibration support and use of mobile capabilities
- Have an integrated asset management solution that enables optimal return on assets, complies with regulations and helps minimize risk
- Be able to develop smarter processes and to provide users with an innovative, fully integrated supply chain management system designed for asset-intensive industries

**Service management**—Service management enables end users to submit new service requests for the deployment or use of assets, as well as track and update open service requests. This supports service management best practices through service desk capabilities. And it can align asset management goals and priorities in a manner that best supports overall business objectives. By infusing comprehensive service level management into an asset management practice, organizations can:

- Define service offerings to help improve organizational communication and verify that the services provided are those required to support the business
- Establish service level agreements (SLAs) to help increase communication between the organization and the business units or external customers, helping to align service levels with business objectives
- Monitor service level delivery proactively against metrics to avoid missing service level commitments
- Implement escalation procedures to properly manage resources to achieve service level commitments

It is also recommended that organizations have enhanced control over the service contracts they have with vendors, suppliers or customers. Integrated contract management provides comprehensive support for purchase, lease, rental, warranty, labor rate, master, blanket and user-defined contracts. Contract correlation links SLAs to vendor contracts, helping organizations identify unreliable vendors and low-quality products. It also enables them to reference SLA performance metrics when renegotiating vendor terms.
Facilities management

- **Facilities and space management**—This type of management refers to maintaining sustainable building operations by improving planning to ensure optimal use of space for offices, production floors, data centers, research laboratories and other physical spaces to enhance worker productivity. Facilities and space management can provide aggregated and processed information that includes a broad range of data to solutions for monitoring building conditions and maintenance from specific pieces of equipment operating at specific physical locations.

- **Environmental sustainability**—Managing assets for environmental sustainability can help an organization meet cost and regulatory drivers for energy efficiency by providing advanced abilities to analyze the energy usage of building systems in real time. The facilities management components of an EAM system can include automated solutions that can identify and suggest opportunities for energy savings in areas such as energy consumption, carbon management and greenhouse gas emissions.

- **Real estate management**—This type of management provides a clear view of strategic real estate objectives through portfolio plans and streamlines the implementation of these plans through integrated life-cycle processes. It tracks and manages real estate contract obligations, critical lease information required for reporting against federal guidelines and regulations, and provides real-time information about the real estate life cycle in one centralized location.

- **Capital and project management**—This standardizes and streamlines project portfolio management, project schedules and project vendor management. Business analytics help identify under-performing projects, resources and project management processes. It improves project planning and accelerates project schedules. It can also identify high return projects, reduce project schedule overruns and streamline project cost accounting processes.

Gaining asset management benefits with visibility, control and automation

In order to manage the full asset life cycle and better address business imperatives, asset-intensive organizations require integrated visibility, control and automation across their business and technology assets. This can help them better achieve their business objectives and maximize the value from all assets supporting the operation.

This increased visibility of all assets across the enterprise allows organizations to respond faster and make better decisions. Visibility provides an enterprise-wide view of asset details and processes from across the organization—including visibility into asset service processes across the enterprise supply chain.

With better control of their assets and asset-related data, organizations can:

- Better manage and secure their investments
- Increase governance and reduce operational risk

“IBM Maximo Asset Management helps us better plan and find the optimum balance between maintenance and operations. This will help us increase the uptime of our assets and reduce inventory costs to increase our profits.”

—Marc Boer, manager, plant and management support, Royal Boskalis Westminster, The Netherlands
Prior to implementing Maximo software, we were using many contractors to support our day-to-day operations, with little coordination. Using Maximo to plan our maintenance has significantly improved the efficient use of contractors here at PWCS.”

—Greg Harrap, specialist advisor, maintenance systems, Port Waratah Coal Service Ltd. (PWCS), Australia

- Extend asset life, reduce inventory costs and control spending
- Mitigate compliance issues and risk
- Improve health, safety and environment, and security

In addition, increased automation enables organizations to:
- Build agility and flexibility into their operations
- Improve asset utilization with proactive asset management and consolidation of their systems
- Enhance operational capabilities by automating workflow, reporting through key performance indicators and dashboards, and improving inventory data reliability

In order to manage the full asset life cycle and address these business imperatives, asset-intensive organizations can derive great value by implementing and using the Maximo Asset Management solution.

**Adding value through improved enterprise asset management**

Increased asset availability and greater asset reliability provide a basis for improving service delivery and growing more revenue from the same asset base. As organizations tune their supply chains to meet specific supply levels, their asset or equipment uptime and availability must align to these demand schedules.

Asset management has a direct impact on profitability, since it affects the quality of the product or service produced or delivered. It can be a significant component toward justifying the price, and ultimately, determining profitability. The quantity of goods produced or services delivered directly contributes to the top-line revenue for any organization, whether in energy, utility, manu-

Figure 3: A comprehensive enterprise asset management solution provides increased visibility, control and automation.
facturing, transportation, logistics or public sector—whether that good produced is a hard asset, such as an engine component, or whether the good produced is a service delivered to a customer.

Asset management also has a logical impact on operational costs. Efficiencies realized by effectively managing labor, inventory and other support services directly impact the bottom line by helping to control costs. More timely and precise user intervention can improve productivity and reduce materials use and, in turn, overhead.

A significant challenge for organizations today is to balance the utilization loads of their asset portfolios effectively to meet customer expectations with the lowest operational cost. It’s common practice, as a result, for organizations to overstock equipment and fleets to make sure they always have the assets they need. Other companies stockpile spares and inventory to shorten repair times by eliminating delays caused by an inefficient supply chain. Each of these “insurance policies” comes with high premiums associated with constant upkeep, refurbishment and financial carrying costs that will never go away.

These strategies can increase, rather than decrease, costs. Using Maximo Asset Management, however, helps control or eliminate overstocking and stockpiling, and can also help reduce the organization’s fixed capital investment and contribute to positive, bottom-line results.

**Choosing a solution that can increase revenues and decrease costs**

With Maximo Asset Management, organizations are better able to meet today’s business, op-
erational and technology challenges, as well as more efficiently address the complete life cycle of resources. This solution enables companies to:

• Manage an aging infrastructure by:
  – Implementing and enforcing standard processes for asset management
  – Supporting real-time data collection, diagnostic and analysis tools that closely monitor aging assets to extend the useful life while improving overall maintenance best-practices, as well as meeting increasingly complex health, safety and environmental requirements
• Control the “brain drain” among employees facing retirement by:
  – Responding to global price pressure by enabling a reduced workforce to work more efficiently and cost-effectively
  – Putting into place proven workflows and enforced best practices that capture the knowledge and critical skills of long-time employees
• Consolidate operational applications by:
  – Standardizing asset management best practices across all asset types across the entire enterprise
  – Supporting global operations by leveraging a wide range of languages
• Provide a lower cost of ownership by using one global enterprise application instance, consistent metrics and best-in-class practices that are enforced with the same standard asset management solution at all of the organization’s sites
• Enable asset-intensive organizations to optimize their maintenance and repair supply chain with management of materials and spare parts inventory that is fully integrated into the asset management solution
• Leverage easy-to-use, integrated capabilities for integration with other systems for enterprise resource planning, operational systems, financial management, reporting and analysis to support better quality decision making overall

Implementing a solid enterprise asset management solution can directly contribute to the way organizations in asset-intensive industries increase revenues and decrease costs.

**IBM Maximo Asset Management**

The IBM Maximo Asset Management solution offers the required visibility, control and automation of key information an organization needs to achieve greater efficiency in asset management by managing all asset types, from traditional IT, physical and emerging smart assets, on a single technology platform.

Maximo Asset Management can support the maintenance of an organization’s smarter physical infrastructure and improve customer service, increase return on assets, enable greater compli-
ance, improve asset performance and reduce risk. And it can do it in a shorter time period, while providing better visibility and control of all required information to better align with an organization’s overall business goals and objectives.

The IBM solution for an integrated enterprise asset management approach is designed to naturally align with asset management best practices across an organization or in an industry. Maximo Asset Management software provides industry-leading capabilities and functionalities that allow capital, asset-intensive industries to leverage the benefits of an integrated enterprise asset management system to manage all critical assets and facilities within the organization.

Maximo Asset Management software unifies comprehensive asset life cycle and maintenance management activities, providing insight into all enterprise assets, their conditions and work processes to achieve better planning and control, leveraging the business function within an organization.

Maximo Asset Management is available for and can be tailored to the following industries:

• Government—Addresses requirements unique to federal and local governments, including municipalities managing contracting and personal property
• Utilities—Provides smarter work and asset management activities for transmission and distribution in water and wastewater, as well as gas and electric power distribution
• Oil and gas, mining and metals—Focuses on operational excellence by improving safety, reliability, compliance and performance while reducing costs through standardization, collaboration and the adoption of better operational practices
• Manufacturing—Helps industries such as automotive, aerospace and defense, electronics or industrial products, food and beverage, or consumer products manage all their assets and maintenance activities; leverages concepts such as Lean/Six Sigma; and complements product life-cycle management requirements
• Life sciences—Helps monitor, track and manage equipment, facilities, mobile and IT-enabled assets; integrates with IBM Maximo Calibration to help meet complex compliance requirements from the FDA and to provide support in validation projects
• Healthcare—Tracks and locates all critical assets, monitors facility conditions, complies with reporting requirements and integrates with operational health information systems
• Nuclear power—Helps nuclear organizations manage all work and asset management activities and address stringent regulatory requirements on compliance, health, safety and security
• Transportation—Provides best practices to help improve the availability and utilization of critical transportation assets in companies operating rail, road and air traffic or logistics
• Service providers—Helps manage SLAs and all related service management activities for multiple customers in a single deployed instance
In addition, Maximo Asset Management solutions can leverage the following key aspects of enterprise asset management to their advantage:

- **Asset maintenance management**—Optimized at the process level. Examples include reactive, preventive and planned maintenance combining materials and service management. Maximo asset and work management modules in general address this requirement.
- **Asset risk management**—Optimized at the asset performance level. For example, asset reliability, service and performance management, Maximo Calibration and key performance indicators and metrics, such as mean time to repair and mean time between failures, address such requirements.
- **Infrastructure management**—Optimized at the service performance level. Examples include utilities and facilities management. Spatial and linear asset management, facilities and integration with intelligent building management systems address these requirements.
- **IT asset management**—Optimized across the enterprise. This aspect is important in today’s asset management environment to integrate specific requirements from the shop floor to the corporate office. Examples include management of data repositories, servers, telemetry and database connection services. Maximo IT Asset Management addresses these capabilities.

Figure 5: IBM Maximo Asset Management provides a core business solution.
Optimize asset utilization with enhanced approach to work management

Doing more with less is the work management mantra, especially when it comes to critical assets. Everywhere, the push is on to maximize asset uptime—and extend the useful lives of these assets—by deploying the resources that maintain these assets as efficiently as possible. Responding to this need, the latest version of IBM® Maximo® Asset Management Scheduler goes well beyond the rich scheduling capabilities that have already made it a valuable add-on product to the Maximo asset management solution. Now, it not only provides easy-to-use graphical tools for planners and schedulers, but also includes map-based resource and route optimization tools for foremen, dispatchers and field technicians. It can simplify the assignment of labor, help dispatchers track the progress of mobile crews and facilitate the work of mobile technicians.

It takes a team
Asset management typically starts with planners and schedulers who create a strategic, short- or long-term work plan or schedule. Labor assignments are then applied against the scheduled work. A dispatcher manages the sequenced workload of the field technicians, adding new unassigned work to the existing schedule as it is submitted. If any individual in the chain lacks the tools necessary to perform his or her role properly and efficiently, the whole process can falter. Inefficient dispatching of resources can drive up maintenance costs—for example, when resources are inadvertently assigned to multiple work orders at the same time or when schedules need constant readjusting because they were based on incomplete information. Such inefficiencies can cause work backlogs across the entire team.

Support for a variety of roles is critical to effective work management
The enhanced Maximo Scheduler provides easy-to-use, graphical tools that can facilitate the work of every role on the asset management team. For example:
• Planners and schedulers can easily view the many factors that influence the creation of a realistic and attainable work schedule. The Maximo Scheduler Gantt view compares available crafts against the skills demanded to complete the selected work orders. Nothing impacts a schedule more than planning work for a time when the necessary materials are not available, or before an asset can be taken down for main-tenance. Maximo Scheduler graphically shows planners when the materials are available, or when they are scheduled to arrive. Enhanced asset and location calendar functionality enables planners to see when the asset or location is available, eliminating the scheduling of work for when an asset is known to be in use. As a result, planners can create more accurate schedules and more easily manage them to completion.

• Foremen can use a drag-and-drop approach to assign labor to scheduled work. System logic ensures that the pairing of worker skills with those demanded by the activity is enforced by highlighting mismatches. Vacations, breaks and unplanned absences are plainly visible. Work can be easily adjusted or split according to shifts.

• Dispatchers can view the routes for their field technicians or crews based on the labor assignments made against the schedule. By leveraging public maps, dispatchers can view the actual positions of field resources, the positions of their route stops and the positions of neighboring work teams. Unassigned work appears on the map, enabling dispatchers to easily assign and manage incoming work by balancing and adjusting technician and crew routes according to geography, priority, the nature of the work or any other factors critical to their business.

• Field technicians can also view the sequence of their work assignments on a map on their mobile device. The map also shows their work locations and routes, complete with turn-by-turn directions to their next route stop. In a true work team environment, the field technician can see the locations of neighboring resources or crews if assistance is needed. In support of performing their work, technicians can view all relevant work order details, receive newly assigned work and provide the dispatcher with real-time updates related to completed work.

By supporting the demands of all of these roles within the work management chain, Maximo Scheduler provides a refined perspective on the entire work management process within an organization. Having this perspective ensures that all work is completed in an optimally efficient manner. Managers gain a greater awareness of resource or crew location and utilization, as well as the status of new and ongoing work. This translates into higher levels of asset and resource optimization or, if applicable, service compliance and customer satisfaction.
Extended visibility is key
Earlier versions of Maximo Scheduler provided Gantt chart views of critical craft demand and availability information for work orders and preventive maintenance forecasts. The latest version provides a graphic display of asset, location, material and tool availability to facilitate more accurate planning and scheduling decisions. In addition, map controls allow dispatchers to better manage their resources and field technicians by seeing the exact location of their work over the course of their entire day.

Fully embedded solution requires no integration
Because these enhanced capabilities of Maximo Scheduler are embedded directly into the Maximo solution, organizations can quickly roll them out to their users. In most cases, current Maximo implementations already have the data elements needed to support these capabilities. To get started, they simply need to create the selection criteria for their various scheduling scenarios. Since Maximo Scheduler applications are based upon the graphic display of information, new users are quickly able to achieve product fluency.

With Maximo Scheduler, organizations can save valuable time in scheduling, assigning, dispatching and monitoring asset management resources. Not only can they achieve higher levels of productivity and efficiency with their resources and crews, but they can also complete maintenance work faster. Together, these efficiencies can lead to extended asset life.