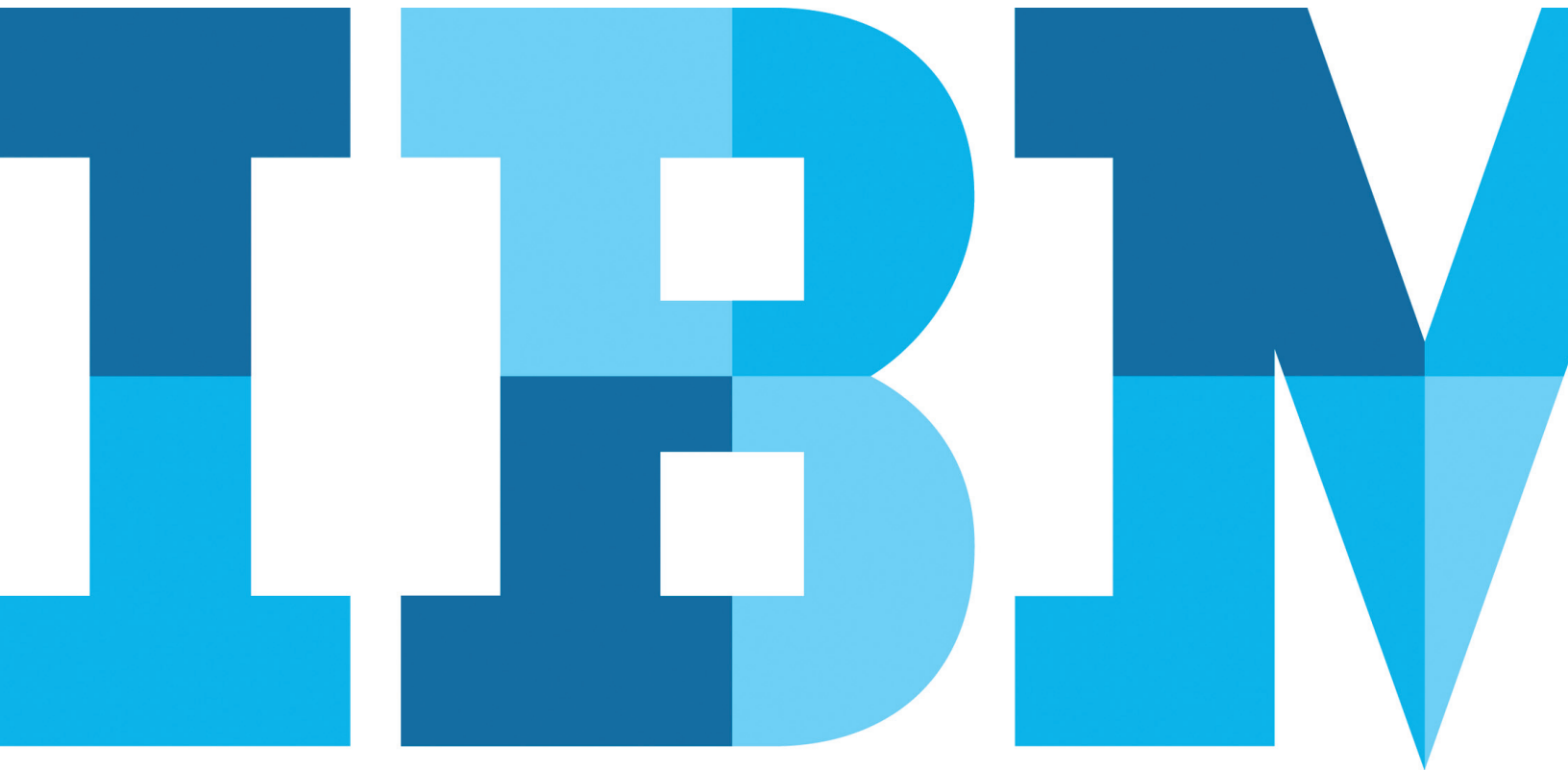


Smart asset management for the chemicals and petroleum industry

*Meeting unique enterprise asset management challenges with
IBM Maximo solutions*



Contents

- 2 Handling today's complex challenges
- 3 IBM Maximo for Oil and Gas: An integrated approach
- 5 Extending the value of Maximo Asset Management
- 8 For more information
- 8 About Tivoli software from IBM

Executive summary

Companies in today's chemicals and petroleum industry face unique asset management challenges. These issues include capturing best practices of a soon-to- retire workforce, managing increasingly converged business and technology assets, safeguarding and improving mechanical asset integrity, and addressing process safety management requirements and procedures.

The challenges are formidable—and tackling them requires smart, industry-specific solutions and technology. IBM® Maximo® Asset Management solutions for the chemicals and petroleum industry, including IBM Maximo for Oil and Gas, provide a consolidated, trusted platform for easily and effectively managing everything from the smallest tools and parts to the largest exploration and production facilities.

Handling today's complex challenges

As workforce members reach retirement age, and as the line between business and technology becomes increasingly blurred, companies in the chemicals and petroleum industry face three principal challenges. First, they must make a successful transition to a younger and less experienced workforce while at the same time managing the transition out of an aging technology infrastructure. Second, they must consolidate operational applications to support an increasingly converged environment of IT and operational assets. Third, and above all, they must secure processes around operational practices to protect the workplace and the environment, and to comply with legal and regulatory requirements as well as quality management initiatives in order to achieve health, safety and environmental excellence.

Managing workforce and infrastructure transitions

Making the transition from a retirement-age workforce to a younger and less experienced one is a key challenge for chemicals and petroleum companies. Today, there are vast numbers of highly qualified personnel leaving the industry, resulting in companies losing vast stores of practical knowledge. To manage this transition, companies must be able to capture knowledge and asset management best practices from experienced employees who have developed proven workflows. Companies must establish knowledge repositories of industry best practices for the workforce of the future.

At the same time the workforce is aging, so too are the operational assets of onshore and offshore equipment. Aging is characterized by deterioration which, in severe operational environments, can be significant with serious consequences for asset integrity. Equipment may become less reliable, obsolete or simply no longer fit for service.

Minimizing the impact of aging infrastructure assets requires companies to:

- Use historical data to prioritize asset replacement.
- Enable condition-based maintenance to minimize asset downtime, reduce spare-parts inventory and control costs.
- Develop smarter processes to address aging assets.
- Centralize management of assets based on age, maintenance records and other important criteria to optimize return on investment, comply with regulations and minimize risk.

Controlling risk, ensuring safety

Companies in the chemicals and petroleum industry also must ensure that safety and environmental information is captured and maintained for each facility and/or key asset. This information should include documentation on process and mechanical design as well as processes defined for maintenance in order to avoid failures, maintain compliance and manage enterprise risk. Proper document management systems must be in place in order to capture processes and best-practices as well as historical and actual information on status and performance of each individual key component or asset.

Consolidating operational applications

Operations and IT are increasingly converging in chemicals and petroleum companies, as traditional business assets become more technology-enabled. This creates the need to consolidate operational applications in order to manage them more efficiently. Companies that seek to do this must:

- Find consolidated support to manage all types of assets and asset maintenance information.
- Establish a single technology system to manage all types of assets—production, linear, facilities, transportation and IT—and asset information, 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.

The chemicals and petroleum industry has made steady progress in improving operations through better data capture, visualization, analysis and automation of critical data. Companies in this industry need to establish a platform for integrated operations and maintenance. In this model, all key criteria of process safety management, aging infrastructure and aging workforce, as well as asset integrity are secured and embedded with operations, maintenance and performance management systems.

IBM Maximo for Oil and Gas: An integrated approach

IBM Maximo Asset Management solutions for the chemicals and petroleum industry bring together a complete set of targeted extensions and options, along with support for industry best practices. The result is a fully integrated solution for meeting the unique challenges that companies in this industry face today.

Integrated operations and maintenance process architecture

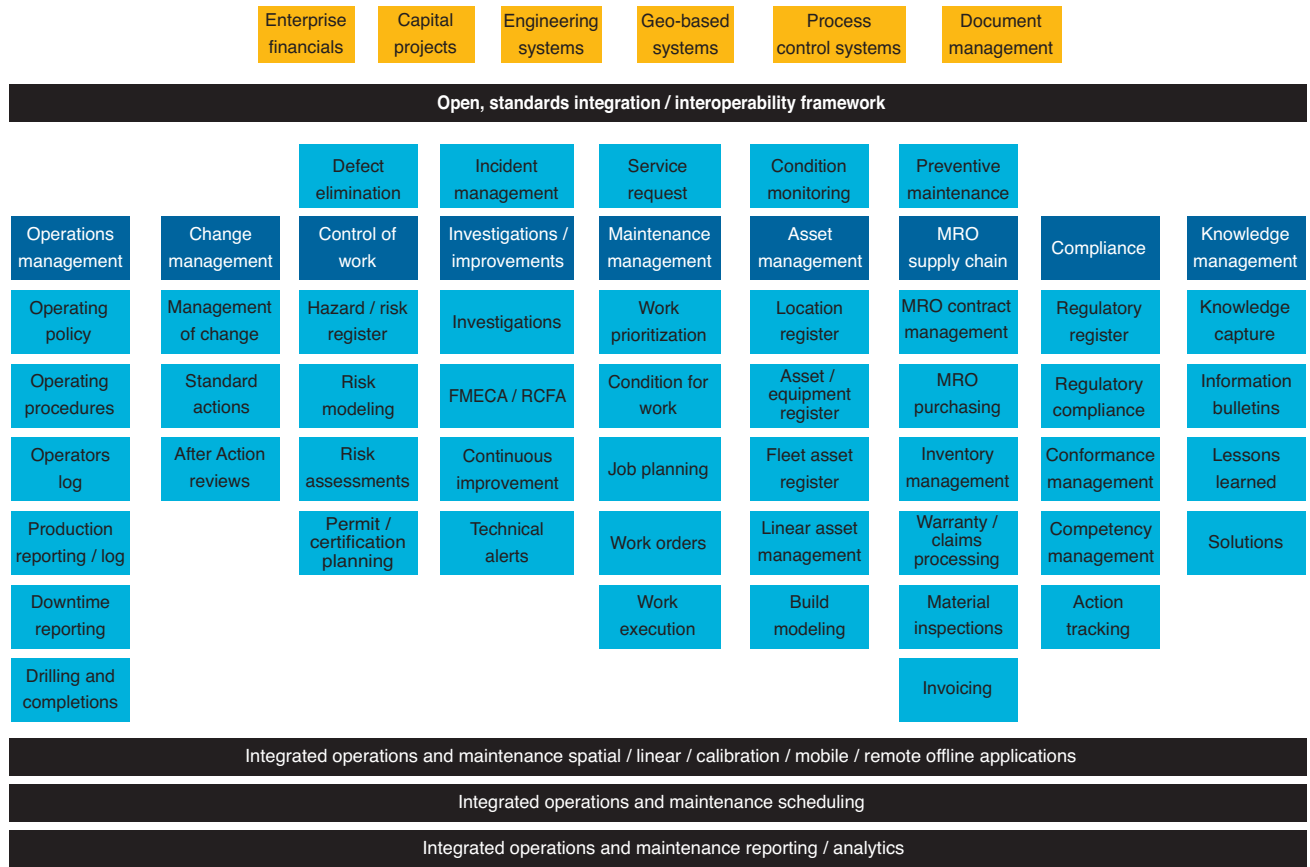


Figure 1: A fully integrated, multifunctional approach to asset management.

Maximo Asset Management provides a comprehensive foundation for enterprise asset management, as well as numerous industry-specific extensions to help meet the unique asset management requirements of chemicals and petroleum companies. Asset management capabilities can help organizations manage all types of assets, optimize their availability, reliability and performance, and reduce the cost of labor and inventory.

Work management capabilities enable the efficient management of planned, unplanned and emergency work. These capabilities support a variety of functional areas, including job planning and routes, service requests and service items, safety, labor reporting, qualifications, lock-out/tag-out, labor, materials and tools, planning versus actual costing, and preventive maintenance.

Other capabilities allow for management of detailed asset information, including locations, hierarchy modeling, condition monitoring, metering, hazards and precautions, costing, and rich work order history.

Extending the value of Maximo Asset Management

The following options can be acquired separately based on specific needs. Together with the capabilities described above, they provide a full complement of industry-specific capabilities for chemicals and petroleum companies.

- **Calibration** uses an integrated approach to automate calibration processes, leverage traceability, and improve compliance and work planning. With today's explosion in the numbers of instrumented devices, being able to view calibration work alongside other work drives efficiency of work planning, scheduling and execution, and helps increase equipment reliability.

- **GIS Spatial Integration** enables spatial visualization and analysis of work and asset objects. Many chemicals and petroleum companies use GIS software to provide geospatially enabled applications, and these solutions may capture information that can help with asset management. The GIS Spatial Integration capability enables bidirectional data exchange that allows valuable work and asset information to be exchanged between the IBM Maximo solution and GIS software systems.
- **Linear Asset Modeling** makes it possible to leverage the improved data capture, exchange and analysis that come with using linear models for assets such as gathering lines and product pipelines. This is important because many data elements associated with a linear asset—such as station and offset, or mileposts—are not relevant for a hierarchical asset. Some data elements (such as leaks) are also dynamic, which means they need to be managed in different ways. Given these facts, capturing linear information in free-form text fields within a hierarchical model is ineffective. A better practice is to model a linear asset based on the associated features and attributes.

Integration with other systems becomes increasingly important as companies embrace operational intelligence. IBM Maximo Asset Management solutions for the chemicals and petroleum industry feature enhanced, open integration for real-time systems and engineering data, based on standards such as MIMOSA, ISA88/95, ISO15926 and Open Operations & Maintenance (O&M). Real-time system integration with instrument, data historian or other operational systems can trigger work orders into IBM Maximo Asset Management. Additionally, bi-directionally integrated systems (including engineering systems) can enable cross-domain workflows and process orchestration.

Support for industry best practices

IBM Maximo Asset Management solutions for the chemicals and petroleum industry support the following best practices to address the industry's specialized needs:

Action tracking tracks applications for actions resulting from regulatory audits or internal reviews. It provides a mechanism for ensuring that audit findings and recommendations are managed and tracked through to closure.

Condition for work aggregates similar jobs across assets, groups of assets, areas or individual locations supporting opportunity maintenance. This makes it possible to improve efficiency by identifying work that can be merged into other planned or unplanned work, when equipment or systems need to be in a certain operating state.

Contract management is essential for keeping track of multiple types of contracts associated with maintenance, repair, and overhaul materials and services. IBM Maximo Asset Management solutions for the chemicals and petroleum industry support purchase contracts, master contracts, warranty contracts, lease and rental contracts, labor rate contracts, payment schedules, terms and conditions libraries, and others components of contracts.

Control of work helps improve both safety and efficiency by making it possible to plan ahead to include permit and certificate requirements in work orders and job plans. It also helps address aging workforce issues, as well as improving communication and collaboration between operations and maintenance.

Defect elimination is based on an integrated, standardized approach. Using a common system for operations and maintenance to record equipment defects, and tying the process to service levels, improves communication between these domains and engineering.

Failure reporting conforms to the ISO14224-based standard for Failure Mode Effects Analysis (FMEA) and Failure Reporting and Corrective Action (FRACAS) processes. This standardized better practice around failure reporting and root-cause analysis helps establish the foundation for a strong reliability program.

Incident management is based on an integrated approach to work and safety incident management. This provides asset custodians with a view of incidents and trends in their area of responsibility, as well as status information on corrective and preventive maintenance work. Integrated incident management is essential to effectively capturing the incidents that can occur in challenging and hazardous work locations.

Integrated investigations are based on the assumption that not all incidents and defects are created equal. Therefore, as the enterprise determines its standard for investigating incidents and defects, an integrated investigation application is a better practice because it provides complete traceability into historical incidents, defects, work orders and other data supporting the investigation. IBM Maximo Asset Management solutions for the chemicals and petroleum industry support required incident and defect investigation processes including Root Cause Failure Analysis (RCFA) and After Action Review (AAR).

Location and work details provide extensive operational intelligence to enable better operational decision-making. The standard capability included with IBM Maximo Asset Management solutions for the chemicals and petroleum industry enables all fields within the database, delivering more information for describing a location. The details include physical location, engineering reference numbers, drawing IDs, safety zones, safety criticality, permitting requirements and the ability to report production losses against a work order or location.

Management of change integrates full management of change process capabilities with work management and other applications. To accommodate constant change in working environments, IBM Maximo Asset Management solutions for the chemicals and petroleum industry provide transparency and visibility across operations, maintenance and engineering domains, and cover all types of changes, including mechanical changes, operating procedures and maintenance job plans. This broad coverage can improve communication and collaboration across domains, driving more efficient operations.

Nonconformance management supports safety and reliability by helping ensure conformance to policy, engineering standards, regulatory requirements, specifications and parameters that have been tested, proven safe and approved. Maximo's capabilities supporting health, safety and environment provide non-conformance management capabilities designed to automate, manage and streamline for identifying, evaluating, reviewing and handling on nonconforming engineering specifications, materials, components, parts and processes.

Operators log is an electronic log of events that occur during a shift. In IBM Maximo Asset Management solutions for the chemicals and petroleum industry, this log is integrated with work management, incident management and other asset management applications, raising the bar for collaboration across operations, maintenance and engineering domains. The log works on an individual plant unit or staff position basis to track shift staffing, plant operating parameters, log entries, associated qualifying data and web/document links.

Permit and certificate types are defined for use on job plans and work orders, an essential step in ensuring safety. A critical part of a safety culture is identifying the hazardous locations within operating environments and defining the appropriate procedures for isolation and safety—for example, permits and certificates. Having this capability integrated with work management planning and scheduling increases the effectiveness of work management while helping to improve overall safety compliance.

Plant, facility and equipment modeling uses ISO14224-based engineering and asset specifications to establish a common approach for the capture, exchange and analysis of reliability and maintenance data. Standardization of location, asset and equipment referencing and asset classifications across the enterprise provides a solid foundation for measurement, benchmarking and continuous improvement.

Regulatory compliance is designed to enable companies to clearly demonstrate efforts to comply with health, safety and environmental statutes, and to meet the licensing requirements established by regulators. Maximo Asset Management solutions for the chemicals and petroleum industry support regulatory compliance with capabilities to identify compliance against assets and locations, and to associate job plans and work orders with regulations, significantly reducing the cost of compliance.

Risk analysis standardizes how an enterprise manages risk and records risk assessment in challenging operating locations, for assets and equipment, across job plans and work orders, and in the management of change records. This enables a comprehensive approach for managing risk and improving safety, reliability and compliance.

Risk matrices allow companies to model probability and consequences of events which support risk management processes and a common approach across operating locations, assets, equipment and different types of work. This best practice improves how a company manages risk, promotes a safety culture, improves reliability and helps ensure compliance.

Solution knowledge repository is available to capture, store and share operational learning associated with lessons learned or proven solutions that have an operational, maintenance or engineering context. This is critical to recording the accumulated experience of the chemicals and petroleum industry's aging workforce. It enables companies to capture the environmental context, history, scenario and experience across operations, maintenance and engineering domains and leverage this information as needed across the organization.

Work prioritization optimizes planning and scheduling maintenance in a matrix that uses operational standard criteria to prioritize critical assets. This better practice enables dynamic scheduling and scheduling optimization, improving overall operational efficiencies.

For more information

To learn how IBM Maximo Asset Management solutions for the chemicals and petroleum industry can help your company meet today's unique industry challenges, contact your IBM representative or visit ibm.com/software/tivoli/products/maximo-oil-gas

About Tivoli software from IBM

Tivoli software from IBM helps organizations efficiently and effectively manage IT resources, tasks and processes to meet ever-shifting business requirements and deliver flexible and responsive IT service management, while helping to reduce costs. The Tivoli portfolio spans software for security, compliance, storage, performance, availability, configuration, operations and IT lifecycle management, and is backed by world-class IBM services, support and research.



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