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Capitalizing On A New Mindset For Asset Management

Reasons for changing water or wastewater asset management practices include unacceptable process downtime, statutory requirements for documenting infrastructure integrity, or the desire to refine process cost-effectiveness and maintenance-budget ROI. Here are examples of strategic approaches that can better match desirable asset management outcomes to the real needs of water utility operations.

The Never-Ending Quest For Improvement

Asset management is more than equipment maintenance alone. It touches all aspects of water infrastructure operations. Today, the availability of real-time data from virtually every facet of operations, plus comprehensive digital solutions tailored to water industry operators, supports more options for improving performance than ever before.

- **Focusing On A Higher-Level Enterprise View.** The more granular and abundant data becomes as a result of Industrial Internet of Things (IIoT) capabilities, the more desirable it becomes to blend data management, data analytics, and control into a comprehensive digital system that can support an enterprise-wide asset management strategy.

- **Matching Maintenance Efforts To Maintenance Needs.** Across industry in general, 82 percent of equipment has a random failure pattern where schedule-based maintenance is not reflective of actual maintenance need. Switching an organization's approach from calendar-based preventive maintenance to truly predictive maintenance can garner big savings if it is part of an organization-wide approach to asset management (Figure 1).

  Monitoring equipment vibration, temperature, sound, etc. lets decision-makers combine those indicators with seasonal or diurnal performance demands as well as the load the process places on the equipment when the readings were taken — all of which can impact failure rates. One example within wastewater treatment would be increased aeration requirements due to fluctuating biochemical oxygen demand (BOD) triggered by a sudden influx of wastewater from food processing or other industrial activities.

- **Using Non-Invasive Inspection Techniques.** By using non-invasive techniques while the process is still running, instead of requiring a shutdown for 100-percent visual inspection, it is possible to gain huge benefits from extending maintenance intervals and reducing production losses due to downtime. For example, one energy utility was able to shift 66 percent of its asset inspections from invasive to non-invasive processes for things like monitoring corrosion under pipework insulation and inspecting storage vessels without shutting down the process and sending workers inside those vessels.

- **Fine-Tuning Operating Efficiency.** Beyond managing assets for optimum maintenance activity, the same data collection and analysis systems can also monitor key performance indicators (KPIs) to help in fine-tuning pump and blower performance for optimum energy efficiency and asset life.

- **Meeting Regulatory Requirements.** Documenting performance improvement in water leakage, potable water quality, effluent water quality, or energy efficiency — to achieve environmental compliance or justify rate increases — are additional reasons for utilities to revisit their asset management approach.

Recognize The Challenges Of Managing Change

Harnessing the full potential of detailed data collection is not a matter of technology alone. It also involves people and processes as part of the change. Getting all players on the same page is important, especially if their old responsibilities and performance metrics were different than what a new maintenance approach requires.

- **Hands-On Staff.** Maintenance workers and managers directly responsible for equipment operations are highly motivated to avoid equipment failure and downtime, but holding onto past experience with scheduled equipment maintenance can get in the way of using predictive analytics to maximum benefit.

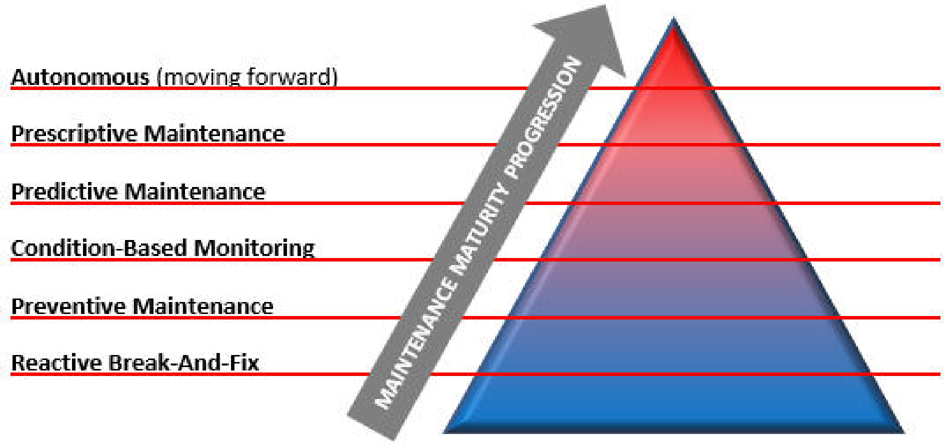


Figure 1. Maintenance Hierarchy. The availability of IIoT sensors, SCADA systems, and advanced analytical software are making it easier for water utilities to migrate up the maturity curve from reactive maintenance toward prescriptive maintenance for better asset management.

- **Asset Managers.** While asset managers are interested in preventing downtime and loss of productivity, they also need analytical insight for achieving it at the optimum cost.

- **Strategic Leaders.** Corporate decision-makers who want to balance the priorities of high-availability performance against the financial risks of equipment failure, unplanned downtime, or less-than-100-percent worker safety must be able to appreciate the dynamics of their organization every bit as much as their technology stack for data integration. Enterprise solutions that incorporate asset management analysis and strategic planning along with a broader enterprise asset management (EAM) and workforce management (WFM) approach can satisfy the needs of all parties involved.

A Structured Approach To Change

Evaluate the readiness of existing asset management practices by comparing them to this progression of steps for a holistic asset management approach.

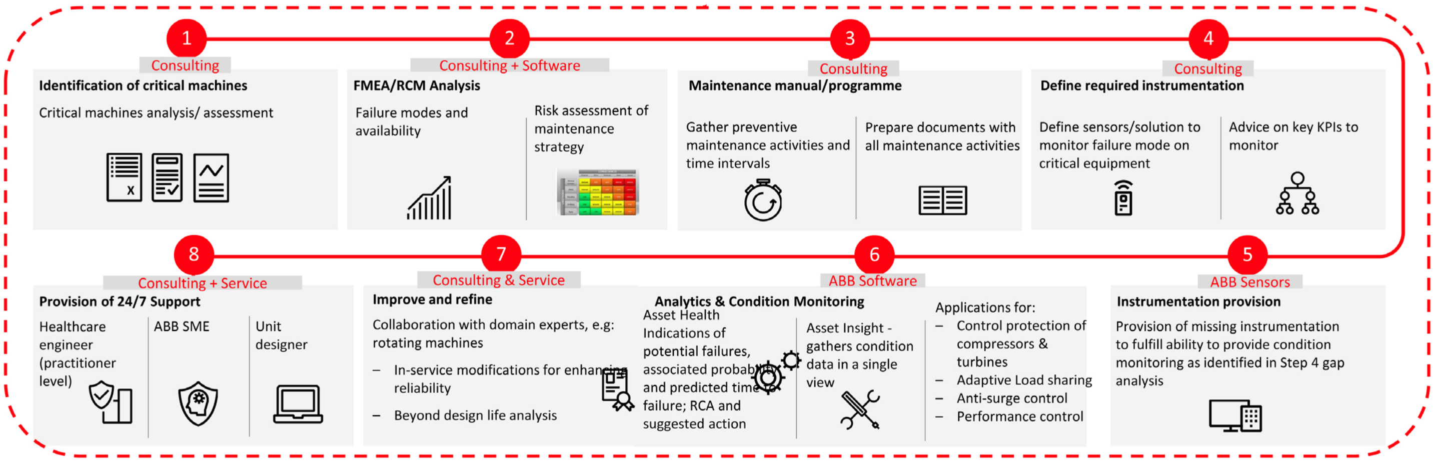
1. **Identification Of Critical Assets.** Identify the most critical equipment in the process and assess the related impacts of downtime. Improving the integrity of operations and assets through a risk-assessment approach can pinpoint which areas stand to gain the most from improvement efforts

2. **Failure Mode And Effect Analysis (FMEA) /Reliability-Centered Maintenance (RCM) Analysis.** Asset health checks can identify areas of concern that show gaps between current operations and best practices.

3. **Maintenance Program Manual.** Document current preventive maintenance activities and associated time intervals to compare to corresponding preventive maintenance characteristics.

4. **Define Required Instrumentation.** Define the sensor solutions needed to monitor failure modes on critical equipment and identify the related KPIs to monitor.

5. **Provide Missing Instrumentation.** Implement missing instrumentation needed to monitor conditions defined in the previous step. Vibration-monitoring sensors feeding performance data from rotating equipment to a smart network



(Graphic courtesy of ABB)

Figure 2. Forward-thinking utilities eager to reap the benefits of digital asset management should work with integrity management consultants to establish and execute a step-by-step process for managing equipment, people, engineering changes, operation practices, improvement practices, maintenance practices, and reliability practices.

can provide those capabilities throughout a treatment plant, distribution system, or collection system. In the water industry, ABB has partnered with Hewlett-Packard to incorporate advanced IT technology into its Ability™ EdgeInsight solution as an effective way to capitalize on operational technology (OT) data from the edge of water-utility IIoT networks. By gathering timely data, visualizing it, and establishing a set of rules to link data attributes to known failure modes, users can change their focus from reactive or preventative maintenance to condition-based or predictive maintenance.

6. **Analytics And Condition Monitoring.** Combine an analysis of asset health — including indications of potential failures, associated probability, and predicted time to failure — in a single view for easier overall performance-control decision-making. Both distributed control system and enterprise asset management system approaches provide the ability to integrate OT with IT and incorporate self-learning technology to improve performance even more. Machine-learning-based software can also help to identify early degradation in equipment.

7. **Improve/Refine Domain Expertise.** Collaborate with domain experts on in-service modifications for enhanced reliability of rotating equipment and other key assets. Asset life studies help to identify the investments of money and resources required to achieve optimum asset performance over the equipment's projected lifetime. They typically include an overview of equipment status and deterioration, action plans for key equipment, an overall asset investment profile for the study period, and improvement plans for asset support processes.

8. **Provide 24/7 Support**. Ensure ongoing support for asset management solutions through water-industry-experienced practicing engineers and systems experts. Collaborative operations centers that create a digital twin of physical water infrastructure can collect and analyze asset and operational data 24/7 to help utilities identify, categorize, and prioritize follow-up actions. This approach has been shown to reduce overall maintenance costs by 50 percent, reduce capital expense and operational expense up to 30 percent, improve uptime by 30 percent, and extend machine life by 20 percent.

A Final Caveat — Be Realistic About Digital Transformation

From a practical standpoint, even the best asset management systems do not rely on equipment and data communications systems alone. They depend on human involvement in a culture of continuous improvement among plant operators, maintenance crews, and plant management derived from statistics, data science, heuristic learning, and other expert knowledge. This white paper offers some perspective on how to make the transition to digital solutions realistically, with eyes wide open. It even addresses issues regarding human acceptance of predictive maintenance and asset management systems. For example, something as small as giving users the ability to tweak automated predictive analytics approaches with their own personal experience can be key to successful initial adoption. ■