# Data When You Need It: A Guide to Ensuring Your Reliability Experts Have the Right Information

**EMERSON**™

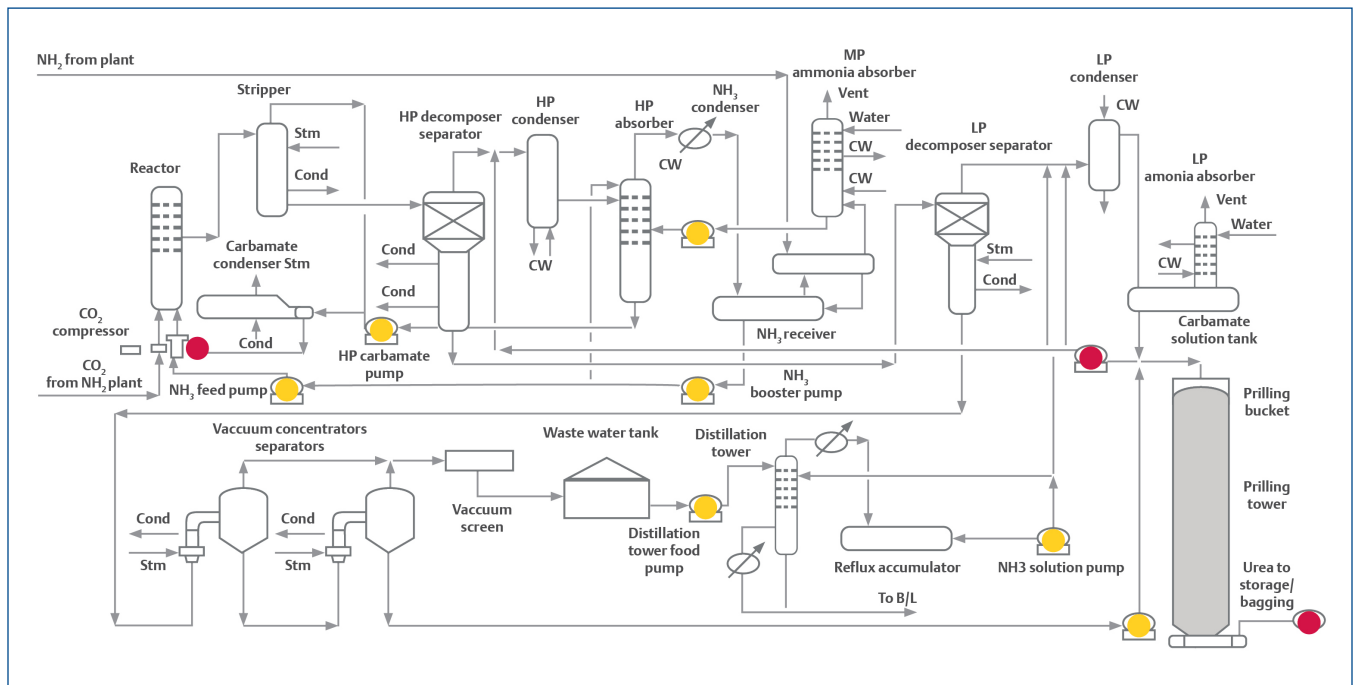Managing assets can be overwhelming:



*Figure 1. Which asset should you work on next?*

Monitoring asset health allows organizations to sustain current production goals and accomplish the performance improvements necessary to meet changing production goals and business commitments. But today, manufacturing is running with fewer operators and minimal maintenance staffing. As result there is less than 100% compliance in monitoring assets. In fact, according to a recent study, 48% of respondents considered a lack of resources or staff to be their top challenge to improving facility maintenance[1].

However, while it is very difficult to solve worker shortages immediately because skilled personnel are rare, digital transformation can help close the gap, enabling an organization to make the most of its people through effective deployment of technology and training.

[1] Plant Engineering Facilities Maintenance Report, March 2019

# Digital transformation drives reliability culture

A 2019 survey of personnel in the power industry ranked an aging workforce and aging infrastructure as two of the most challenging issues they face today[2] .

The survey results illustrate that plant personnel want to maintain the highest reliability for their assets; however, ever more limited availability of qualified personnel means they need a solution that allows them to do more with fewer people. Digital transformation is the answer; it automates workflows and delivers data to help plant personnel make better decisions— ultimately promoting better asset reliability even with a leaner staff.

40% of respondents to a Plant Engineering survey said that aging equipment is the leading cause of unscheduled downtime in their plants[3]. The obvious answer to this problem is more intense maintenance or upgrading the equipment, but each of those solutions involves dramatically increased budgets and time. 31% of respondents planned to decrease their downtime by expanding their monitoring capabilities, giving them more access to data surrounding asset health. But access to data isn't enough. New monitoring means new procedures, and personnel must be trained to use them.

Digital transformation technologies such as digital twin simulations, augmented reality overlays, and remote assistance tools can provide personnel with the hands-on training they need to confidently and successfully complete their tasks—and can provide critical collaboration with more experienced plant staff when they encounter something they don't understand—to help avoid user-induced failures.

# Digital transformation drives Top Quartile performance

Looking at a facility holistically shows that all aspects of its operations are intertwined, and poor performers generally perform poorly across the board. A renewed focus on reliability of assets—particularly balance of plant (BOP) assets—can help organizations achieve Top Quartile performance. Top Quartile organizations achieve performance within the top 25 percent of their peers by enhancing areas such as capital construction projects, operational reliability, and energy management. Emerson estimates that process industries focusing on driving Top Quartile performance could save upwards of $50 billion in maintenance costs and more than $10 billion in energy costs[4].

Significant improvement of reliability performance requires paying moment to moment attention to assets. The only way to do this is with a proactive planed approach enabled with digital transformation technologies such as online prediction monitoring.

Facilities achieving the greatest results from increasing reliability performance use:

- Safety as more than a requirement—production and site safety are good business

- Energy savings and emissions reduction resulting from optimized asset performance

- Reliability as a strategic opportunity for improved production availability

The risk of undetected failure is particularly high among BOP assets—assets that are not critical but can temporarily reduce or halt production capacity when they fail. An asset failure does not necessarily mean a shutdown due to a mechanical event. It can also cause other problems called functional failures, such as high operating costs, missed goals, and lack of actionable data leading to slow decision making. All these problems can lead to poor production that prevents organizations from achieving the highest levels of reliability.

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[2] Black & Veatch Strategic Directions Electric Report, 2019

[3] Plant Engineering Facilities Maintenance Report, March 2019

[4] Black & Veatch Strategic Directions Electric Report, 2019

## Case #1 - When essential data falls through the cracks

To really understand how assets are performing and use that data to drive better performance requires a moment to moment assessment of their health. Monthly surveys do not effectively track developing issues and can result in surprise failures and loss of production capacity. This was the case at one manufacturing plant where a lubrication starved roller bearing failed just days after a manual vibration check indicated that the bearing was running normally.

Plant personnel can't be everywhere all the time—but digital monitoring solutions can. Digital predictive maintenance solutions help eliminate the risk of missing an important asset health signal. Online monitoring watches an asset all the time and can provide that data in real time, meaning that plants no longer run the risk of an event occurring in between infrequent manual checks.

Advanced technologies like the AMS Asset Monitor provide continuous access to the data plant personnel need to prevent asset failures. It costs approximately 50% more to repair a failed asset than if the problem had been addressed prior to failure. This is why Top Quartile companies focus on applying vibration monitoring on their important rotating machinery assets.

## Case #2 – Constant cavitation

Another case study example comes from pump monitoring at a paper mill. The paper mill has two make-up liquor pumps which they needed to monitor pervasively due to constant cavitation from lack of sufficient feedback.
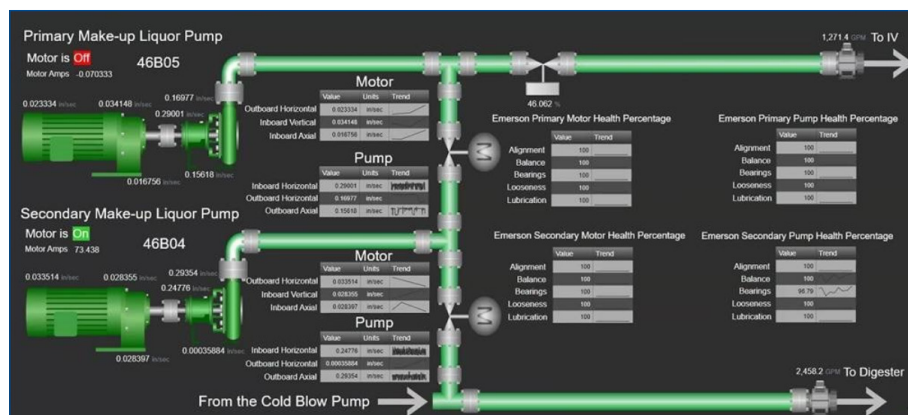


*Figure 2. Pump monitoring with AMS Asset Monitor.*

Not only did the plant not have enough personnel to constantly monitor the pumps, manual monitoring also limited the reliability team's ability to track and trend pump health, which was necessary to make changes to adequately address performance issues.

Each direct motor driven pump is now monitored with a single AMS Asset Monitor that delivers real-time data on its health. The increased feedback using OPC UA output to a PI system has resulted in better overall performance and reliability of the pumps.

## Case #3 – Not enough people, not enough time

A major refinery reported that it could no longer financially and practically justify sending out valuable SME maintenance resources to collect manual data on assets. Data collection took too much time and the data collected was too far apart to detect all the developing asset issues. The organization decided it would be more cost effective to add online monitoring to the plant's many assets and use the organization's valuable SME resources to follow up on only the assets that show issues in the online monitoring system.
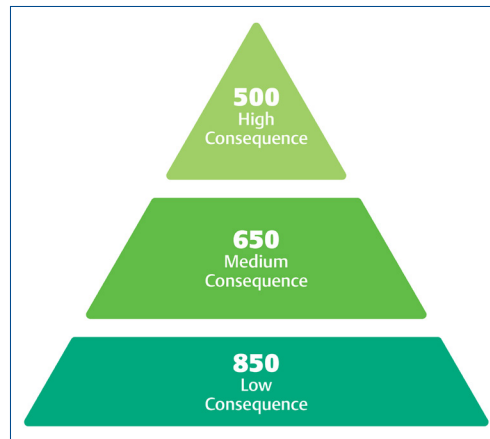


*Figure 3. Refinery Asset Criticality Pyramid.*

The organization developed a monitoring method based on asset criticality. Critical assets will use protection monitoring technology and medium consequence assets will use technology such as AMS Asset Monitor. Low consequence assets will have minimal online monitoring.

## The right tool for online monitoring and edge analytics

In all three case studies, the plants needed meaningful moment to moment edge analytics feedback on assets. All three organizations are in the process of implementing Emerson's AMS Asset Monitor to provide real-time health data and analytics with actionable guidance.
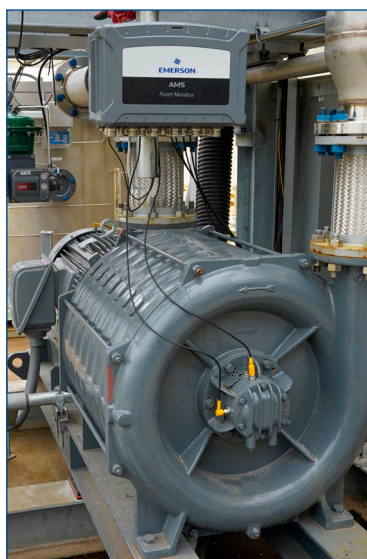


*Figure 4. Emerson's AMS Asset Monitor.*

AMS Asset Monitor uses rule-based analytics to assess the ten most common asset analytics needs including balance, alignment, looseness, and lubrication. It is designed to be easily installed by one person at the asset with short sensor cabling and wired or wireless network access. The system comes with a built-in web interface which can be accessed for setup and monitoring.
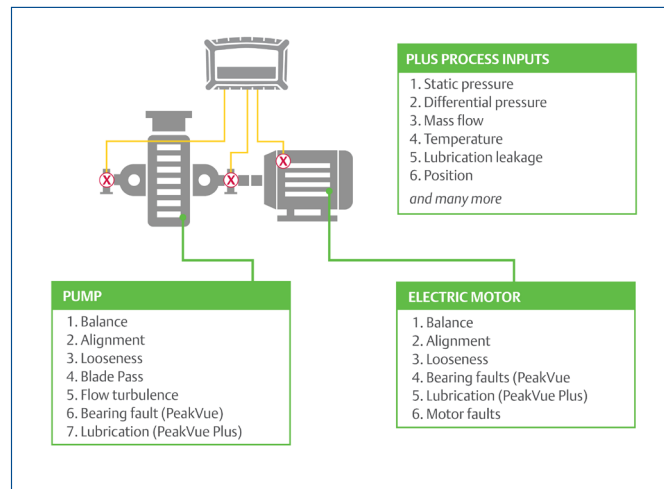


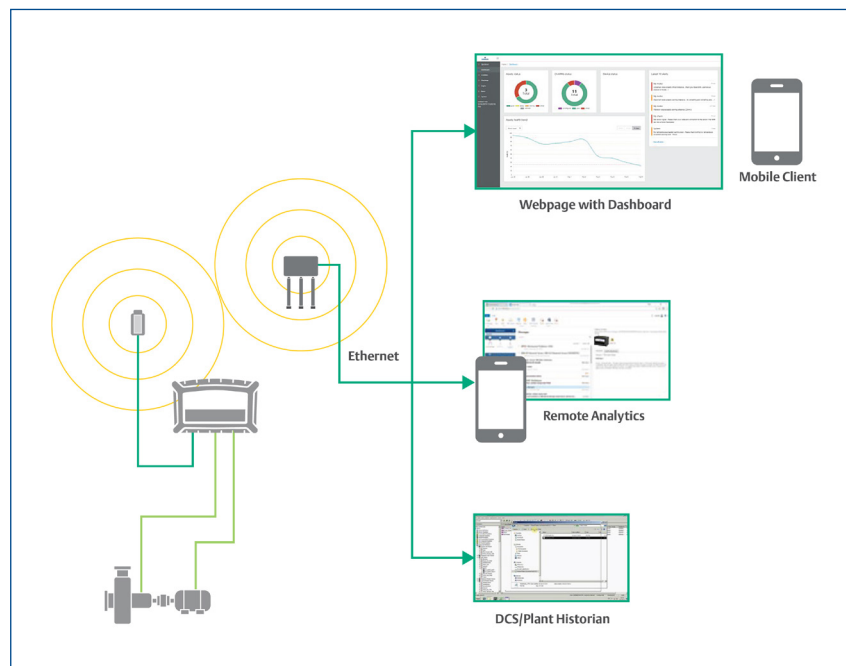*Figure 5. AMS Asset Monitor assesses the ten most common asset needs.*



*Figure 6. Wireless AMS Asset Monitor Implementation.*

AMS Asset Monitor instantly delivers easy-to-interpret asset health data to any modern web browser on any device. And the system can be interfaced to Emerson's Plantweb Optics™ asset performance platform to summarize asset health over a fleet of many systems. AMS Asset Monitor is based on DeltaV™ CHARMs technology which allows it to monitor process-based pervasive sensors as well as vibration sensors.
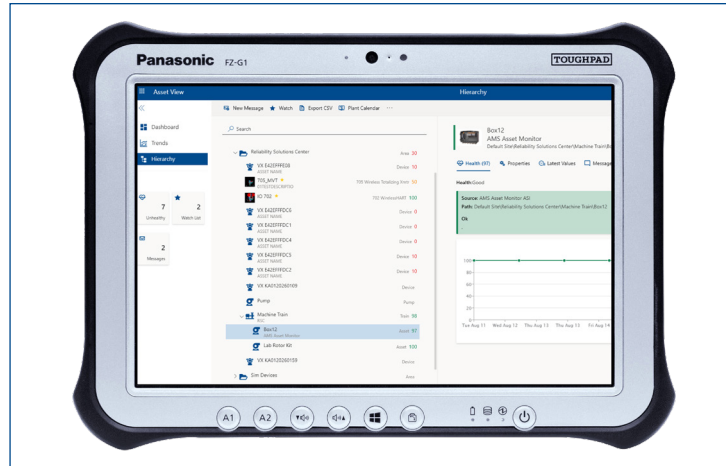
*Figure 7. Emerson's AMS Asset View.*

To help in applying the analytics, AMS Asset Monitor has prebuilt asset prediction templates for various pump, fan, gearbox and motor assets. Also available are pump and heat exchanger health apps that make it easier to quickly configure more detailed monitoring for these assets.



**Pump Health App**

- Bearing defects
- Cavitation/pre-cavitation
- Plugged strainer
- Seal fluid/hydrocarbon leaks
- Pump in/out of service

**Heat Exchanger Health App**

- Fouling/cleaning
- Fouling rates
- Lost energy cost
- Duty error
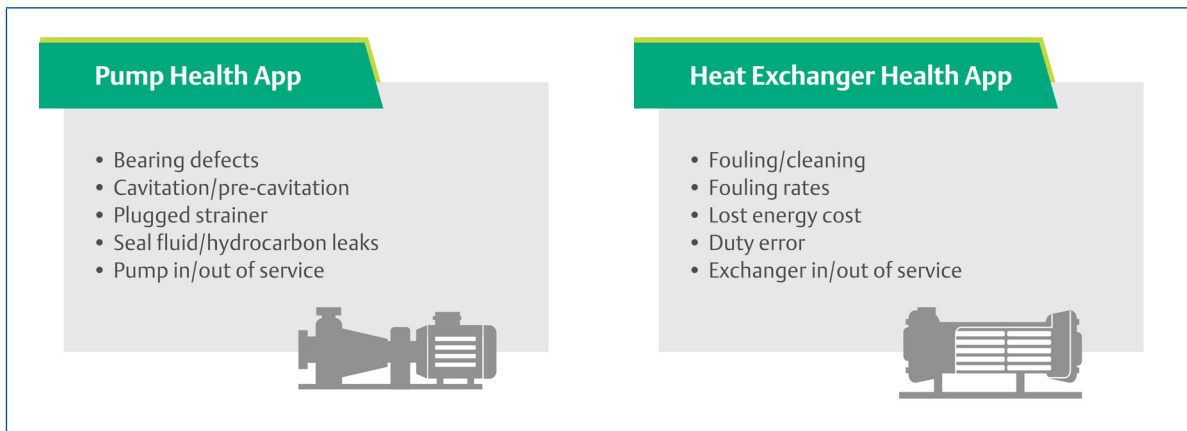- Exchanger in/out of service

*Figure 8. Out-of-the-box asset health apps make it easy for users to quickly configure monitoring for the most common assets and more detailed analysis for pumps and heat exchangers.*

AMS Asset Monitor bearing and gear analytics use both traditional PeakVue™ detection technology and newer PeakVue Plus technology to assess mechanical asset bearing and gear health.

To further ease the use of AMS Asset Monitor, the system has four preinstalled ISO 10816 alert limit sets to help start asset monitoring out of the box. AMS Asset Monitor also provides the ability to set custom alerts for users to fully tune their alert limits to fit their assets.

## Why change?

Significant improvement in reliability across the organization using digital technologies can have a tremendous impact including:

- 50% lower maintenance spend

- 4% more asset availability (15 days)

- 66% reduction in safety incidents

But real results also require a change in culture across the organization, cultivating an understanding of why reliability is important and how it is best accomplished. Culture change starts with comprehensive training to generate buy-in for new technologies and methods. In addition, any new technologies implemented should be designed to provide the needed moment to moment "edge" based feedback on your assets. The newest technologies go beyond just taking sensor data and reporting alert amplitude. New edge analytic devices are packaged to better fit the monitoring needs of a machine train of assets. Being edge devices, they are mounted right at the asset, reducing installation complexity and costs. They monitor more than just vibration and use asset-centric technology such as experience derived rules, machine learning, and/or  artificial intelligence.

Modern sensing technologies provide singular health assessment of each asset with an ability to tell you which issue may be causing poor asset health. These edge analytic devices keep you aware of the changing health status of each asset and track specific analytic issues. In addition to 24/7 coverage of your assets, the best edge analytic devices provide results in a clear manner that all facility personnel can understand, while at the same time providing the deep data that assists more experienced SME's in working on more significant asset issues.

Emerson can help you get started on your digital transformation journey by assessing your asset monitoring and training needs and supplying the best technology and upskilling to ensure your personnel understand plant technology and your operations, as well as their role in helping to drive the best performance from your facilities.

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