WHITE PAPER

Addressing Challenges of Online Monitoring

Introduction

According to the Electric Power Research Institute (EPRI), online monitoring is the implementation of applications for monitoring, maintaining, and optimizing assets from a centralized location. Such monitoring becomes necessary in today's fast-evolving global economy for companies that rely on assets as they face increasing reliability concerns. Unexpected downtime and maintenance can lead to significant cost and safety repercussions that can easily affect a company's bottom line.

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More than ever, organizations need a dependable maintenance program that helps alleviate risks and can lead to millions of dollars in return on investment.

Reliability engineers and maintenance professionals are keenly aware of the optimal balance of plant safety, reliability, and financial returns. They know they must deploy maintenance strategies that address these three objectives:

- **Increase revenue** through the maximum uptime and optimal efficiency of machinery. With properly functioning assets, organizations can achieve maximal output within the constraints of the facility.
- **Reduce costs** by minimizing downtime and scheduling maintenance only when necessary. Being able to identify developing issues with enough lead time to properly schedule maintenance during planned downtimes allows maintenance managers to optimize the workforce and increase the mean time between failures.
- **Reduce risk** and increase safety through decreased worker contact with large, dangerous machines in potential hazardous environments. In addition, properly functioning machines can remove uncertainty in business operations, which prevents catastrophic failure and unforeseen outages.

Challenges in Today's Plant Maintenance and Asset Maintenance

As maintenance managers build a maintenance strategy, they are challenged to address each of these objectives without spending more on a maintenance program. They report difficulty in finding enough experienced equipment specialists, spending too much time collecting data versus analyzing it, feeling discouraged with inconsistent diagnostics and a lack of insight into overall reliability, and working with new technology that is more complex, expensive, and difficult to maintain. Often plant systems are custom-made packages. But over time, sustaining a custom package can be trying, especially when maintenance managers have limited resources.

Equipment monitoring systems are used to detect trends and anomalies for accurate diagnosis.

As assets grow more important to the performance of a facility, maintenance managers use technicians to collect asset condition data through manual, route-based measurements. This data provides the context necessary to better understand asset health and allow organizations to schedule maintenance when necessary. As the number of assets that demand this attention grows in the facility, these technicians are spending upwards of 80 percent of their time collecting data and 20 percent analyzing it to determine the root cause of issues. Further studies by the International Data Corporation (IDC) show that 22 percent of data stored digitally is documented well enough to be analyzed

and that only 5 percent of data is actually analyzed. In addition, organizations are finding it more challenging to locate, hire, and train new equipment specialists while today's experts are retiring at a rapid pace.

According to a survey performed by Allied Reliability Group, a global maintenance, reliability, and operational consulting organization, 78 percent of maintenance managers are not happy with their current maintenance approach. Despite expending too many resources, organizations still failed to produce results that predicted equipment failures, and unexpected asset failures still occurred. The reality of budget cuts, workforce gaps, aging equipment, expensive technology, and shrinking profit has forced maintenance managers to seek new technologies that allow organizations to scale and prevent costly failures in the future. This can be especially daunting as technology ages because plants and enterprises require systems that can accommodate needs for years to come. But on the business side, plants and enterprises are constrained because monitoring systems are tied to equipment providers. So the trend is to seek platform solutions that are independent of equipment providers, thereby gaining the flexibility to have one system that can monitor equipment from any supplier and then integrate this for accurate diagnosis.

More than 50 percent of the generating capacity in the United States is greater than 30 years old.

Gaps in Current Technology

Today, packages custom-built for the plant feature monitoring functions but lack flexible processing capabilities or I/O count. Or, on the other hand, they offer I/O count but limited programming options to customize the system behavior.

As utilities and enterprises move toward centralized monitoring, the integration of advanced monitoring applications with existing monitoring efforts enables a plant view of operations and maintenance along with the back-end integration into the enterprise. This can help reliability and maintenance managers achieve the optimal balance of safety, reliability, and cost returns.

Benefits of Online Monitoring

Managers need a predictive maintenance strategy that integrates with existing enterprise infrastructure and automates the collection of data on more assets to predict asset failure in advance of catastrophic and costly repairs. This strategy involves data acquisition and analysis systems that continuously acquire and compare key measurement indicators, such as vibration and power consumption, to baseline normal behavior to pinpoint any equipment health degradation. When the systems detect this, they immediately alert operations staff to examine the issue. These condition indicators can help influence decisions about when to perform

maintenance, which can lead to more revenue, reduced costs, and advance warning of impending risks of failure while increasing safety.

Companies are discovering that predictive maintenance strategies are a superior approach. EPRI compared the maintenance costs for a pump in US dollars per horsepower (HP) and found that a predictive maintenance strategy was the most cost-effective at only $9 per HP. When compared to a scheduled maintenance strategy at $24 per HP or a reactive approach at $17 per HP, predictive maintenance offered attractive financial benefits and all but eliminated the risks of secondary damage from catastrophic failures. In addition, McKinsey & Company stated that organizations who use data and analytics in their operations can deliver productivity and profit gains that are 5 percent to 6 percent higher than the competition!

Though the financial benefits are attractive, additional industry trends such as lower cost sensors, automated monitoring systems, and the emergence of intelligent analytics are also fueling the adoption of automated solutions for online monitoring. When compared with other maintenance approaches, online monitoring and diagnostics for predictive maintenance offer the following benefits:

- **Workforce optimization**—Online condition monitoring helps ensure that the limited specialized personnel are spending maximal time on the highest value tasks such as assessing required maintenance rather than low-value tasks such as traveling to assets, setting up tests, and recording data.
- **Fewer gaps in data**—Online condition monitoring ensures data accuracy and provides continuous data collection. Manual measurements offer only a few snapshots of manually recorded data for any given asset every month, if any at all, which increases the possibility of data errors or missed events.
- **Improved diagnostics**—By using a single database with online condition monitoring, more historical trend and baseline data is available for predicting faults with greater statistical significance. This ensures consistent analysis and eliminates reliance on the experience and knowledge of an equipment specialist.

These online condition monitoring systems provide the greatest insight into overall reliability, which helps companies thoroughly understand their operations and make business decisions.

Top Considerations

Before choosing a condition monitoring system, maintenance managers need to understand which assets and which failure modes should be monitored. They must make decisions based on the breadth and number of assets and the types of measurements needed to detect the failures.

Once the assets and necessary measurements have been identified, maintenance managers should consider the following when choosing a vendor for a condition monitoring solution:

- The ability of the solution to scale with evolving needs, such as support for new types of algorithms, a wide variety of I/O and emerging sensors, and expansion to large numbers of systems.
- An openness that allows for access to the raw engineering measurements so new and innovative analysis techniques can be adapted and the solution can be extended to meet the maintenance program requirements.
- Interoperability with third-party hardware and software packages so the solution can integrate with existing CMMS and ERP systems and any data historians or process management enterprise software used.

- Rugged mechanicals and a breadth of available analysis algorithms.
- A monitoring hardware and software solution for a price that allows for the solution to scale to a larger percentage of fleet assets.
- The services to help facilitate the end-to-end solution from asset to IT infrastructure, either directly or through a network of partners.

Maintaining high reliability of equipment requires monitoring performance and condition.

When implementing an online condition monitoring system, there are three main technology factors. The first is data management, which involves using an appropriate data structure, database considerations for easily mining data, alarming capabilities, and the implementation of an aging strategy to manage data volume.

The second is data analytics, which includes application specific algorithms and higher level predictive analytics or prognostics. It involves both real-time decisions and embedded intelligence closer to the sensor source and performing data analytics on servers using aggregated data from multiple assets.

As the number of data acquisition or monitoring systems increases, data management and analytics grow more complex. Then a third consideration becomes increasingly important: systems management. Remotely managing large numbers of monitoring systems helps to increase reliability, serviceability, and availability of the overall solution. These capabilities should help perform tasks such as viewing the health of asset monitoring systems, connecting to the network and acquiring accurate data, and remotely configuring channels and analysis functions.

Take the Next Step

With online condition monitoring, organizations can achieve better insight into the health of their assets. They can use this data to drive predictive maintenance programs, which allows maintenance managers to schedule and plan maintenance only when necessary. This leads to more revenue, reduced cost, and advance warning of potential failures while increasing safety.

Learn how NI InsightCM™ can address these challenges.