HanAra Software

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HanAra

BREAK THROUGH THE LIMITATIONS

What if you could be alerted to potential equipment failure before it happens?

With 89% of all equipment failures being random, knowing the status of your facility is key to improved operations. To understand the current operating status, plants collect data from a variety of sources. What is important though is how the organization uses this data.

One effective use for equipment data is to help identify potential and hidden failures. Organizations can combine their equipment data with advanced pattern recognition (APR) technology to reduce failures, protect their assets, and increase availability and reliability. With APR techniques, plants expand their maintenance strategy to include predictive maintenance and receive early warnings of failures, increasing lead time to plan and implement.

Not only do these early warnings save time but they also reduce operation and maintenance costs through actionable intelligence. By taking advantage of intelligence provided by equipment data, organizations improve their overall operations and in turn improve efficiency and optimize decision-making.

Operation and Maintenance Challenges

Though operation and maintenance costs are a part of life, many plants are being asked to do more with less. Traditionally, plants manage assets through regular maintenance, repair, and replacement of equipment and systems. Unfortunately, corrective and preventative maintenance can be costly as a plant is replacing a piece of equipment that may not require attention or waiting for a failure to happen.

In fact, studies show that the longer it takes to identify impending failures in equipment, the cost of repair also rises and the downtime for that equipment extends. And when unscheduled downtime does occur, it takes significant financial and human resources to repair or replace the equipment.

Impact of Unscheduled Downtime

- Lost production
- Increased O&M costs
- Productivity loss of personnel reacting
- Overtime when forced to react
- Safety risks

Random Failures

A major cause of unscheduled downtime are random failures. In the late 1970s, the airline industry determined that the bathtub curve does not adequately represent equipment reliability. The curve is a hazard function to describe reliability, divided into three parts. The first part represents early failures, characterized by a decreasing failure rate. The second part represents random failures, characterized by a constant failure rate. And the final part represents wear-out failures, characterized by an increasing failure rate.

The airlines found that the bathtub curve does not properly characterize their equipment. What they found was that 89% of failures are random, meaning that 89% of failures cannot benefit from a limit on an operating age. Put another way, preventative and corrective maintenance techniques are an incomplete maintenance strategy as random failures will occur.

Shorter Lead Time

To combat random failures, organizations implement alarm systems based on real-time values. Using real-time data, traditional alarms alert plants when a value exceeds a high or low limit. Unfortunately, these alarm systems are incomplete and may result in inadequate lead time. These alarms alert a plant before equipment enters a critical state that can lead to destruction, part failure, or unplanned outages. As a result, plants are limited in the amount of lead time they have to plan and respond.

Limited Insight of Current Plant Operation

To overcome the limitations of setpoint alarms, organizations implement equipment monitoring procedures. When monitoring equipment beyond setpoint alarms, plants can:

- Monitor all the equipment on a rotating cycle. This allows the plant to check the status of all the equipment periodically. A plant hopes that a piece of equipment misbehaves when it is being monitored.
- Monitor important and critical equipment all the time. In any plant, there are more critical systems that significantly impact the safety and output of the plant. By monitoring these critical systems, a plant reduces the potential risk of catastrophic failures.

Yet, neither of these options provide a complete picture of the current operating status of a plant or fleet.

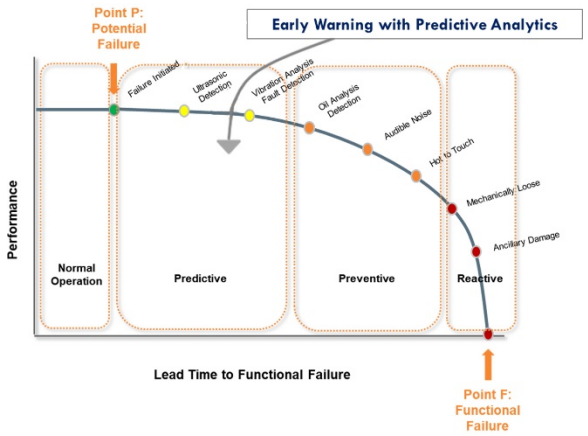
Intuitive Predictive Analytics with Instant Root-Cause Analysis

Fortunately, maintenance has seen a progression towards predictive maintenance to reduce the risk of unscheduled downtime, operating costs, and process operation variability. Predictive maintenance does not fully replace the other types of maintenance, but studies have shown that predictive maintenance costs significantly less over corrective maintenance. This represents a huge savings potential by expanding an organization's maintenance strategy.

Types of Maintenance

- **Corrective maintenance**: identifying, isolating, and rectifying a fault. Getting the system or piece of equipment back operational is required, but corrective maintenance means that the failure occurred. This can be costly and a safety concern.
- **Preventative maintenance**: complete maintenance activities to avoid a breakdown or malfunction. Here the failure is not occurring, but it is typically done based on a time duration. How long do you typically expect this fan to run before going out? This can be costly and miss random failures.
- **Predictive maintenance**: identify hidden and potential failures in advance so that a plant has increased lead time to take the necessary actions.

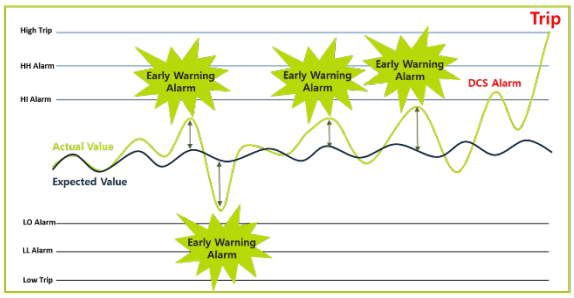
The goal of advanced pattern recognition (APR) is to enable the use of predictive maintenance. And this increases efficiency and productivity of existing equipment, reduces operation cost, and maintains a high level of operation. Plants achieve these benefits by diagnosing and detecting the condition and performance of the plant to predict equipment failure. As a result, with APR predictive maintenance, an organization will be able to make decisions based on the actual equipment condition, not just the average or expected life span.



APR Technology

As seen in historical data, every plant asset has unique characteristics. By using APR and intelligent predictive modeling technology, a solution builds prediction models for equipment, systems, and plants based on normal historical data.

APR models account for the fact that equipment has some degree of variability compared to its original specification sheets. The equipment may be operating in slightly different environmental conditions; the equipment may be operating with different types of equipment; the equipment may operate in a slightly different process. This variation means that a one-size-fits-all approach is not the best option. By using the historical normal, fault-free data to create models, a plant has a better understanding of how their equipment operates in their environment in their process.



By comparing and analyzing actual and predicted values from the APR models in real time rather than threshold values, plants identify abnormal equipment conditions in advance. This early identification provides personnel enough time for the plant to act.

Selecting an APR Solution

After implementing a predictive maintenance strategy, an organization enables its members to be plant advocates, not plant order takers. When equipment can raise its hand and say "I'm sick!" plants have more time to address the problem and plan. When selecting an APR solution, consider the following:

1. **Early warning accuracy**: advanced analytics should provide improved insight into the current operating status of a plant. As a result, an APR solution should not provide nuisance early warnings or miss potential and hidden failures.
2. **Ease of use**: all layers of an organization can benefit from an APR tool. To facilitate collaboration, an APR tool will provide an effective and simple method to share insight. For example, a real-time health index from 0 – 100% for the plant, systems, equipment, and sensors is an effective illustration for all users regarding the current status of the plant and equipment.
3. **APR maintenance**: the value of APR comes from its ability to learn a plant's operation. This means that the models may need to be updated if a plant replaces a piece of equipment, completes a plant overhaul, significantly changes the process, or experiences significant environmental changes. An APR tool must have built-in tools to quickly and easily update models to reflect new operating conditions.

What is the Difference?

- Does not use alarm setpoints
- Detects small variations
- Delivers information intuitively
- Learns system behavior

How Does It Work?

- Pinpoints problems regardless of process variation
- Analyzes and tracks the root cause of issues
- Alerts you of equipment failures and anomalies in advance

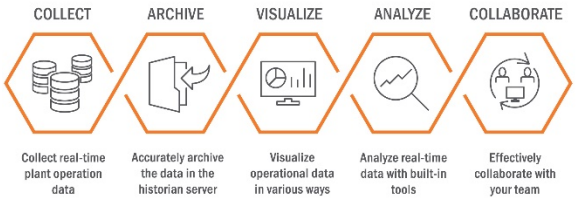
Why Is It Better?

- Makes your job easier
- Reduces risk of catastrophic failures

Reliable Data Management and Centralized Monitoring

When implementing an APR solution, the first question to ask is do you have a good plant management system. Predictive analytics bases its advantage on analyzing the data that a plant generates every millisecond of the day, determining the correlation between related sensors and notifying the plant of anomalies. This works well if all the data is in a single format delivered immediately. It does not work well if the plant is missing data due to lagging capture rates or inefficient data storage.

Organizations should have the necessary data management system as equipment across the plant continually transmits various types of data. To manage this large amount of data, a data management solution, also known as a data historian, gathers, stores, and manages this highly complex and dynamic data without data loss or interruption to provide needed insight into plants.



There are different types of industrial data historians: from SCADA historians to enterprise data management systems and from cloud-based to server-based historians. At their core, these systems collect real-time data from equipment and archive the data into the database. But with industry 4.0, smart factories, and smart plants, the industry is experiencing an organizational shift that makes data a tool for all levels of the organization and requires data historians to go beyond simple data storage. As a result, historians provide built-in data visualizations, data collaboration tools, automated reporting, and Application Programming Interfaces (APIs).

Data Historian Features

- Historical and real-time trends
- Calculation scripts
- Alarm management
- Historical and real-time process graphics
- Comparison trends
- Excel add-ins

Data Historians in Action

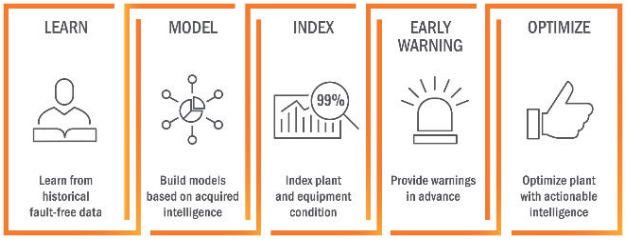
A combined heat and power plant had problems with their legacy historian missing critical operational data that led to misguided decisions. Not only that, but they had limited scalability and intelligence, which hindered efficient operations. After upgrading their legacy system, their historian manages highly complex and extensive data without any loss or interruption. 14,000 points became more accessible and informative.

A natural gas company had concerns regarding their historian's role in improving its safe operations and minimizing risk while steadily supplying natural gas. There were challenges with the legacy system's maintenance and upgrades and cybersecurity. After converting over 18,000 points and over five years' worth of data to their new data infrastructure, they had improved cybersecurity and reduced maintenance expenses. Their users now easily monitor their data with intuitive user interfaces and graphics. They also receive necessary support and training, assuring everyone at all levels of the organization can easily use the solution for advanced analytics.

A Proven and Reliable Plant Health Index

HanPHI®, our plant health index, allows you to monitor the condition of all your equipment quickly, identifying anomalies across assets and providing early warnings of impending equipment failures days, weeks, or months in advance. This intelligent software learns, models, and analyzes data to provide actionable early warnings to plant operators, engineers, and managers before a catastrophic failure occurs.

With the help of HanPHI's actionable information, you will identify the point of potential and hidden failures well before the incident occurs, significantly reducing unplanned maintenance activities.



To provide meaningful intelligence, HanPHI uses:

- **Unsupervised machine learning**: HanPHI compares real-time data to your normal, expected operation. This allows you to identify previous and never before-seen failures easily.
- **Advanced pattern recognition**: Equipment do not operate in silos. Sensors, components, and equipment are related. Rather than relying on alarm setpoints, users can have dynamic representation of any early warning based on their status.
- **Historical data**: Every plant's equipment and operating environments are unique in nature and are different from one another. Base intelligence on your plant, not the ideal plant.

HanPHI In Action

HanPHI is a powerful predictive analytics software solution that identifies maintenance needs and helps you keep your valuable assets in optimal condition. Every day, HanPHI monitors a wide variety of assets across the globe, accurately predicting impending failures for our users.

A 10,000-MW power generator increased productivity and decreased costs across its plants with the help of HanPHI. Before HanPHI, this company had limited insight into plant operations, resulting in increased random failures and short lead time to act on those failures. After installing HanPHI, the time given to plan and prepare for equipment failure increased significantly. Rather than not knowing when equipment might fail, HanPHI continuously gives plant personnel the status of equipment, identifying priority systems and areas for maintenance.

Another electric power company had issues with technical safety and operational efficiency. Alarms lost their meaning, creating an unsafe approach to dealing with equipment downtime. They soon understood a predictive maintenance solution was needed to promote safer working conditions across the enterprise. After installing HanPHI, the dynamic analysis of expected and real-time values enabled the identification of hidden failures. Maintenance and operations were optimized at this 27,000-MW organization with ease, being installed in all future sites for improved efficiency.

About HanAra Software

HanAra helps its customers achieve operational excellence by providing innovative technology backed by years of experience in machine learning, advanced pattern recognition, data management, predictive maintenance, and customer care. All combined to create software solutions that maximize operational returns and help organizations break through the limitations.

HanAra software solutions help organizations move towards digitalization and viewing data as a corporate asset. By turning data into actionable intelligence, organizations reduce costs, improve efficiencies, and increase safety. HanAra delivers each solution with training and care programs, supporting customers every step of the way and beyond.

HanAra is the North American Headquarters of South Korean-based BNF Technology. Since 2000, BNF Technology has been developing intelligent software across multiple industries. By utilizing advancing technologies, BNF has assisted more than 250 facility sites across two continents in optimizing operational management.

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