Healthy Power Generation

Introduction

The power generation industry has made a commitment to cleaner methods of providing electricity to its customers. This can be seen in the prevalence of natural-gas-fueled power plants, solar-energy farms, wind turbines, and hydroelectric dams for new power stations. This drive for renewable and clean energy is not without its costs, and the new technologies must be efficient if they are to survive economically.

Fuel costs have traditionally been a major component in determining the financial feasibility of power plants. One way new technologies attempt to circumvent this cost is by using the wind to drive giant turbines to produce electricity. Wind is free, but using ambient wind decreases the power that can be obtained in each turbine, requiring many wind turbines to generate the needed electricity.

Wind farms consist of many individual wind turbines dispersed across a broad area. One of their key challenges is the high variability of the electricity generating capability at several points in time (hourly, daily, or seasonally).

Due to its high variability, wind farms are exposed to frequent equipment failures and operational inefficiencies. The renewable and clean energy initiative is increasingly prevalent in South Korea, resulting in wind power industry growth across the country. However, questions regarding frequent failures of wind stations and consequent inefficiency issues have been raised.

Yeong-Am Wind Farm, located in the Yeong-Am County of the South Jeolla province, generates 40 megawatts of electricity from 20 wind turbines across its 1,100-acre farm.

Equipment failure at inopportune times impaired efficiency and resulted in increased costs for unplanned outages. Yeong-Am Wind Farm needed to move from reactive maintenance to predictive maintenance and selected HanPHI to help them achieve this goal.

Since installing HanPHI, the Yeong-Am Wind Farm has improved operational efficiency and reduced equipment failure significantly. Yeong-Am Wind Farm is now the fourth-largest wind farm in South Korea. Every day the farm provides electricity (90,000 watts/ hour) to a population of 20,000 in the southwestern part of South Korea.

HanAra
S o f t w a r e

Maintaining Healthy Assets:
How to Maintain a Healthy Plant

HanPHI is an intelligent plant health index solution that identifies impending equipment failures days, weeks, or months in advance. Every day HanPHI serves customers in diverse process industries, including thermal, combined-cycle, nuclear, and renewable energy power plants. HanPHI identifies abnormal patterns that may signify impending failure, allowing time for predictive maintenance.

HanPHI's intelligent predictive empirical modeling technology draws prediction models based on historical normal operation of a plant and groups correlated equipment signals. This advanced technology enables HanPHI to predict the correct parameter behavior based on each real-time sensor value.

The innovative and patented intelligent health indexing technology allows a plant to monitor and check the status, or health status, of your entire plant at any time. Additionally, HanPHI's SuccessTree provides the health status of individual equipment.

These two unique technologies provide an intuitive view of equipment status and an overview of the entire plant. This allows users to easily and conveniently detect the root cause of abnormal conditions. Thus, HanPHI is an optimal solution for easy and convenient plant operation and maintenance.

On average, power plants experience two to three unscheduled downtimes annually. Unscheduled downtime has a number of negative impacts on a plant and its operation.

- Decreased net generation
- Decreased fuel efficiency
- Increased maintenance costs
- Shortened equipment lifespan
- Increased safety threats

However, if a plant can have a clear view of impending equipment failures in advance, the plant can prepare for critical failures beforehand. With extended lead time, a plant can proactively maintain valuable assets. Eliminating failures that previously led to costly downtimes significantly improves the plant's ROI. HanPHI is a proven solution that has helped customers across the globe identify signs of failures in advance.

Historical Data

Utilizing historical data with normal operation and without faults

Prediction Model

Empirical modeling and correlated signal grouping

Model Execution

Predition of correct parameter with values based on the condition with less than a second execution time per model

Index Calculation

Tag Index
Equipment Index
Plant Index

HanAra
Software

How Predictive Analytics Works in HanPHI

Medical practitioners regularly monitor vital signs to prevent serious illnesses or diseases. With this medical data, doctors can detect signs of illnesses by comparing the normal parameters of vital signs with the deviations from expected values. Blood pressure, pulse, heart rate, and other vital signs are key biometric data for detecting potential illnesses or diseases. However, because each individual has unique normal parameters of vital signs, the relative value is more important than the absolute value. For example, children have different normal parameters of vital signs than adults. Therefore, doctors must analyze the medical data in the context of the individual patient's characteristics to find meaningful information.

This same concept can be applied to a process plant. Each plant generates a vast amount of data in real time. Like human vital signs, real-time data generated from equipment contains crucial information about the status of that equipment. Critical signs of impending equipment failure are embedded in the ocean of real-time and historical data. Like different individuals have different normal parameters of vital signs, equipment display different data values according to the operational status and environment. Because the parameters are varied, it is important to identify the normal parameters in the context of the operational situation. An alarm solution must learn the unique context of an individual plant to accurately analyze the data. It should be able to recognize the correlation of data and group data sets accordingly. Also, an alarm system must learn the normal parameters of values by analyzing real-time and historical data.

HanPHI identifies abnormal equipment conditions in advance.

Trip

Traditional Alarm

Early Warning

Secure Lead Time

HanAra
Software
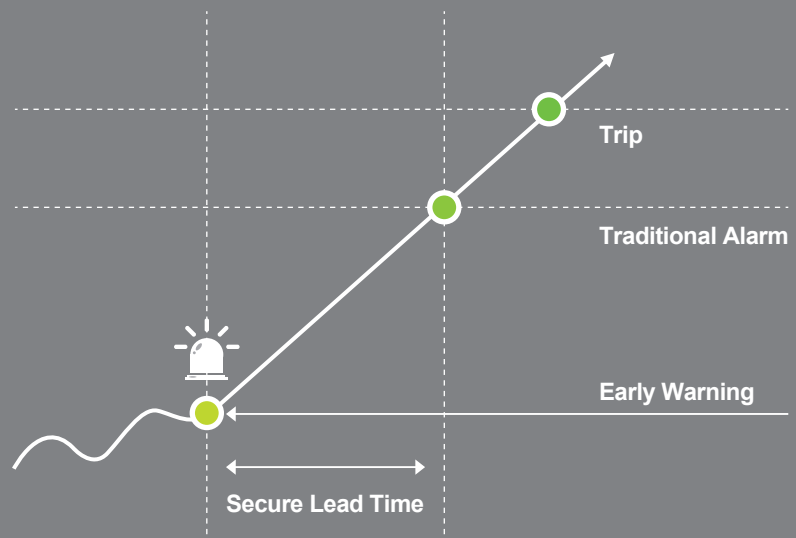
HanPHI monitors all equipment in real time, constantly learning the normal patterns of individual equipment. HanPHI continuously monitors the entire plant and identifies even the slightest sign of impending failure in advance. Once HanPHI detects any sign of failure, it provides a clear view of relevant equipment through the SuccessTree. With this valuable information, the plant can manage predictive maintenance days or weeks before the critical event.

For years, diverse types of process plants have installed HanPHI, proving its effectiveness and feasibility. Every day HanPHI supports numerous plants across the globe in maintaining thousands of valuable assets in optimal condition.

Thanks to advanced medical systems, humans are now healthier than ever before. People eliminate health risks by identifying the abnormal signs of illness in advance and taking precautionary actions. Likewise, plants can achieve greater operational excellence by eliminating impending equipment failures through an intelligent early warning technology.

The Simplest Way to Monitor a Plant's Health

HanPHI is an intelligent solution that identifies the signs of equipment failure in advance. Every day HanPHI provides insight into equipment status and a detailed view of the entire plant. It allows the plant to monitor the plant health index in real time through percentage values, representing the deviations from normal parameters. Users can also easily check the status of individual pieces of equipment through the SuccessTree.

HanAra
Software

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