Understanding the voice of your machine
OnCare.Acoustic

voith.com
The increasing demand for energy and the use of different energy sources world-wide requires greater flexibility and more precise data from hydropower providers.

Unlike other industries, the energy sector embraced automation technologies decades ago. Today hydropower plants are highly automated: Plants are networked within the power supply grid, controlled or operated remotely as a power plant pool, and software algorithms control many processes automatically. However, over the past few years, cost pressure within the energy market during the last years has led to reduced maintenance efforts and often aged equipment.

As a reliable and innovative partner, Voith helps these customers with deep domain knowledge and data intelligence to leverage the digital transformation and brings value-driven intelligence into the hydropower sector. By reducing maintenance efforts to reduce costs, optimizing maintenance to budgets more efficiently, increasing profits and reducing impact and damage to machinery, our customers remain competitive and achieve future viability.

Hydropower plants
On the edge of digitalization
OnCare.Acoustic
Modular bundles for individual requirements

The three OnCare.Acoustic packages:

1. OnCare.Acoustic Anomaly Detection
2. OnCare.Acoustic Diagnosis Service

Voith provides these packages together as a comprehensive offering for the highest customer support or as single modules.

Flexible payment models make it possible for customers to invest in OnCare.Acoustic as a large upfront investment or a smaller initial investment with manageable monthly fees. OnPerformance Consulting is for the customer interested in assessing existing maintenance, operation and data to identify optimization. Combined with the OnCumulus.Suite, the customer also has access to analyzer, cockpit and coordinator applications.
Detect and recognize sound anomalies. Along with Voith experts, identify anomaly source and continue monitoring. Take decisive information and derive smarter solutions to optimize resources.
OnCare.Acoustic
Supervise your power plants wherever they are

Today’s hydropower plants are typically situated in difficult to access areas, far away from the congested communities of consumers and providers. Because of this, many hydropower plants are unmanned, relying on regular service cycles and automation systems to discover any occurring anomalies that could lead to dangerous events.

With advanced analytics and monitoring systems, hydropower plant operators are risking that possible dangerous conditions, especially with equipment that has no condition monitoring access or is not continuously surveilled, might stay undetected and therefore can cause severe damages for equipment, plants and safety.

OnCare.Acoustic Anomaly Detection
Hear and recognize

OnCare.Acoustic supports hydropower operators in getting aware and discovering potential dangerous events by detecting sound anomalies.

Equipped with sound recorder for acquisition, preprocessing and transmission of sound data, and data recorder for acquisition, preprocessing and transmission of process data, OnCare.Acoustic is based on the IIoT platform OnCumulus.Platform with specialized visualization and analytics functionalities.

This base kit, with technological infrastructure, gives power plant operators the first package of OnCare.Acoustic Anomaly Detection to be informed of suspicious detected sounds with warnings and alarms.

This allows customers to discover the anomaly based on frequency spectra and decide if they need to take action. It also helps identify the acoustic patterns of the hydropower plant, forming a visualization of the acoustic fingerprint.

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OnCare.Acoustic Diagnosis Service
Understand and learn

By adding the package OnCare.Acoustic Diagnosis Service, Voith offers plant operators further insights into their hydropower plant by adding value-driven data intelligence, supported by the Voith OnPerformance.Lab Hydro.

The Voith OnPerformance.Lab Hydro combines hydro domain know-how with state-of-the-art data analytics*.

By reviewing the sound samples together with these experts, the anomaly is not only identified but already narrowed down to the specific equipment causing this event. Additionally, this package offers the continuous monitoring support of the Voith experts who further classify warnings and alarms to detect possible dangerous conditions, ahead of other alarms.

Customers can therefore better understand and learn about reoccurring changes, such as seasonal patterns, and track long-term trends and influences.

*Beyond the OnCare.Acoustic offering, the OnPerformance.Lab Hydro provides a multitude of hydro data intelligence services, including remote diagnostics as well as value-added software tools to connect hydropower plants to optimize operations with and for Voith customers.
OnPerformance Consulting + OnCumulus.Suite
Prevent, predict and optimize

After recognizing and learning the nature of an event, the Voith OnPerformance. Lab Hydro supports plant operators with next steps and action items. With the OnPerformance Consulting package, Voith provides decisive information to derive smarter recommendations and decisions.

Furthermore, the OnPerformance.Lab Hydro experts compile a quarterly report (also if no critical events happened) that is based on inspection and maintenance reports, including data on visual inspections, operations and monitoring.

In addition, OnCumulus.Suite gives a visualization and analysis of all connected signals, plus a checklist application.

With over 100 years of hydro experience, Voith delivers critical and actionable information to help our customer predict and prevent dangerous conditions of both machines and plants to optimize availability and use of resources.

OnPerformance.Lab Hydro makes plant operations safer and more efficient

The OnPerformance.Lab Hydro combines hydro domain know how with state of the art data analytics. We offer remote diagnostics and connect hydropower plants to develop value added software tools with and for our clients to support optimizing operations.
Data Processing...
Customer 1

Data Processing...
Customer 2

Voith Cloud

Encrypted
OnCare.Acoustic

Highest security standards

With OnCare.Acoustic, Voith offers an IIoT offering that meets the highest privacy, security and compliance industry standards and best practices, such as CSA, NIST, OWASP. Although hydropower plants are critical infrastructures, they are not always monitored. If an event occurs, the OnCare.Acoustic software sends information about the anomaly one-directional and via an analogue connection and galvanic separators or physical data diode into the secure cloud. Voith cybersecurity experts then ensure end-to-end security at all times. Voith supports local control of the data through providing data centers in every region.

Cloud-based application

Further insights with the cloud

As part of the OnCumulus offering, OnCare.Acoustic customers gain new additional possibilities. Using OnCare.Acoustic and other applications (like OnCumulus.Suite, OnCare.Health or OnCare.Asset) on the same cloud-based technical platform, customers benefit from bridging information and data views cross-site and cross-app. As a result, customers can leverage untapped correlation possibilities for more advanced insights and transparency. External information sources like energy prices, weather data, or connections to smart grids can be easily integrated and correlated with existing operational data.
The national Power Company of Iceland, Landsvirkjun and Voith have launched a joint pilot project on intelligent noise analysis in hydropower plants. Voith is installing the acoustic monitoring system OnCare.Acoustic in the Budarhals hydropower plant in Iceland that detects turbine noise that deviates from normal conditions to prevent potential shutdowns in good time. In addition, the continuous analysis of machine data is designed to facilitate an optimized mode of operation and the intelligent scheduling of maintenance work.

**Identifying turbine damage in good time**

“Using artificial intelligence, the system will complement the monitoring of the power plant and preventive maintenance undertaken by personnel and identify potential machine damage in good time.” says Berg. To this end microphones will be mounted at specified locations in the power plant and will record all ambient noise to store it in the Voith Bluebox for preprocessing. The final data interpretation will be done on the special Voith platform OnCumulus.

For calibration purposes, the system records all acoustic signals in an initial learning phase. In doing so it complies with strict data protection guidelines. The data collected is then compared with that of other hydropower plants. Due to the combination with the operating data OnCare.Acoustic learns which noises correspond to normal machine behavior. In a second learning phase, the system is capable of immediately recognizing deviations from the typical noise pattern. In this case the system sends out a warning and at the same time notifies one of the power plant operator’s service technicians.
“We are installing a system in the Budarhals power plant that permanently evaluates the acoustic condition of the machines.”

Bastian Berg, project manager and specialist in automation and data analysis at Voith Digital Solutions

Data-based service for optimized operation and maintenance

In the pilot project at the Budarhals power plant in Iceland, Voith is testing a new service model for its noise pattern analysis for the first time. The system uses a data-based approach and is intended to help power plant operators to optimize maintenance and operation.

“After the system is installed in the power plant we expect between 10 and 15 unknown ambient noises every day in the initial phase. These first have to be analyzed manually and documented,” explains Bastian Berg. “The system learns continually and becomes more and more intelligent over time.” To keep the customer’s work to a minimum, Voith is offering a 24/7 service for this pilot project, in which the unknown noise is evaluated by a Voith expert very quickly. If the noise suggests a critical or atypical machine status, the customer’s control room is informed immediately.

As the pilot project proceeds, the system should work more and more autonomously and identify more noises. In combination with various KPIs, the data collected is then investigated and analyzed for complex correlations by the Voith experts and a team of data analysts.

The results are then provided as a regular report to the power plant operator, allowing operation and maintenance to be optimized. The content of the report is adapted to customer needs on an ongoing basis and the added value verified together with customer. “In future we will be able to use our noise pattern analysis to tell the operators of hydropower plants the ideal time for replacing mechanical components, for example. Maintenance work and forthcoming repairs can therefore be planned transparently and very efficiently,” says Berg.

About the Budarhals power plant

The Budarhals facility was officially opened in 2014 and has an installed output of 95 MW. It has a capacity of around 585 GW hours per year. Voith has equipped the plant with two modern, environmentally friendly Kaplan turbines with water-filled impellers and cutting-edge generators with specially developed brushless and Bluetooth thyristor-controlled excitation systems. Apart from the main components of the electromechanical equipment and the control systems, Voith also supplied the crane systems for the plant’s powerhouse. With this current pilot project Voith is successfully continuing its long tradition of doing business in Iceland. As far back as 1912, the company built the first complete turbine installation in the Fjardarsel power plant. This system has a capacity of 550 kW, is driven by a horizontal Francis turbine and is the oldest power plant in Iceland still in operation.