Understanding the voice of your machine
OnCare.Acoustic
Energy production is a highly digitalized and automatized industrial sector. High innovative technologies are used in all areas: e.g., production planning, operation and maintenance. During the past decades, digital technologies have driven the development of more intelligent control systems and increased the safety of the power plants.

State-of-the-art monitoring systems are nowadays crucial for operation. Their main role is the early recognition of machinery faults, sending relevant information to the maintenance team with the aim of reducing plant operational and maintenance costs. They rely on precise data acquisition and thresholds that indicate when the plant enters a potential dangerous operation zone.

Warnings and alarms, which are triggered by the system, are used in control loops to protect the machine. Moreover, the operation teams use this information for maintenance decisions. Monitoring and automation systems generate large amounts of data, which provides a detailed long-term history of the operation of the machine. Currently the algorithms behind those systems are not designed to learn from history, though historic data could offer new insights in the condition of the machine.

Additionally, hydropower plants nowadays must operate with higher flexibility, since they are used to compensate for the strong fluctuation of wind and solar energy production.

This evolution of the energy market increased the complexity of decision making in operations. Optimal scheduling of maintenance actions becomes more and more difficult. Therefore, energy producers are demanding better tools for maintenance and production planning, and also to avoid unplanned shutdowns.

OnCare.Acoustic addresses these upcoming needs. It provides a step toward predictive maintenance, as acoustics serve as an early indicator for upcoming failures. It uses the stored history of sounds and operation data to assess whether or not the current sounds of the machine are normal.
OnCare.Acoustic
Your support to avoid potential deterioration

OnCare.Acoustic surveilles large spaces with many machines and systems simultaneously. Only a few sensors are needed to supervise a complete plant compared to traditional CMS (Condition Monitoring Systems) that rely on sensors mounted at dedicated machine parts. As a result, customers gain new and valuable information to optimize the operations of their power plants.

Supervise your power plants wherever they are

It is common for hydropower plants to be 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.

Without advanced analytics and monitoring systems, hydropower plant operators run the risk that possible dangerous conditions – especially with equipment that has no condition monitoring access or is not continuously surveilled – might stay undetected and therefore cause severe damages for equipment, plants and safety.
Recognize – Understand – Optimize
Modular bundles for individual requirements

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.

The four OnCare.Acoustic packages:

1. OnCare.Acoustic Anomaly Detection
2. OnCare.Acoustic Diagnosis Service
3. OnCumulus.Suite
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.
1 OnCare.Acoustic Anomaly Detection
Hear and recognize

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

Equipped with a sound recorder for acquisition, preprocessing and transmission of sound data, and a 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, thus having time to plan and take action before an event occurs.

It also helps by identifying the acoustic patterns of the hydropower plant, forming a visualization of the acoustic fingerprint.

2 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.

The Voith OnPerformance.Lab 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 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 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.
OnCumulus.Suite already provides the first possibilities to benefit from data intelligence. The user centric application design effortlessly delivers the real-time information by which a user can make the right decisions.

- Pre-structuring the available data using visualization and analytical functionalities
- Easy-to-use tools: analyzer, coordinator and cockpit

OnPerformance.Consulting
Prevent, predict and optimize

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

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

With nearly 150 years of experience in hydropower technology, Voith delivers critical and actionable information to help our customers predict and prevent dangerous conditions of both machines and plants to optimize availability and use of resources.

OnPerformance.Lab makes plant operations safer and more efficient

The OnPerformance.Lab combines hydropower 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.
OnCare.Acoustic

Cloud-based application
Further insights with the cloud

As part of the OnCumulus offering, OnCare.Acoustic customers gain new possibilities. Using OnCare.Acoustic and other applications (like OnCare.Health, OnCumulus.Suite 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 and connection to smart grids can be easily integrated and correlated with existing operational data.

OnCare.Acoustic

Highest security standards

With OnCare.Acoustic, Voith provides an IIoT solution that meets the highest privacy, security and compliance industry standards and best practices, such as CSA, NIST and 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 via an analogue connection and galvanic separators, or optionally a 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.
The National Power Company of Iceland Landsvirkjun and Voith have launched a joint 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 deviating 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 Bastian Berg, project manager at Voith Digital Ventures.

To this end, microphones were 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.
"Voith machines and systems in Budarhals are running really well since commissioning. We trust Voith machines, and thus we really do not expect from OnCare.Acoustic to find problems in your reliable machines. We have very high expectations from OnCare.Acoustic to help us understand and know our machines better."

Georg Pór Pálsson, Plant Management, Landsvirkjun

Data-based service for optimized operation and maintenance
At the Budarhals hydropower plant in Iceland, Voith implemented this service model for its noise pattern analysis. The system uses a data-based approach and is intended to help power plant operators optimize maintenance and operation.

"In the current learning phase, we are getting several warnings each day, which are analyzed and categorized by our OnPerformance.Lab," 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 diagnosis service for this project, in which the unknown noise is evaluated by Voith’s OnPerformance.Lab very quickly. If the noise suggests a critical or atypical machine status, the customer’s control room is informed immediately.

As the project proceeds, the system works more and more autonomously to 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 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.