CVA

Digitalised hydroelectric power plants

Using the power of water efficiently

The energy company CVA relies on condition monitoring solutions from ifm

The energy company Compagnia Valdostana delle Acque (CVA), based in the Italian Aosta Valley, generates electricity from renewable sources, in particular by harnessing the power of water. The energy is generated mainly in the region's 32 hydroelectric power plants with a total capacity of over 900 MW, to which more than 800 MW of wind and photovoltaic capacity will be added by 2027. To ensure reliable operation of all remote-controlled power plants, the company relies on sensors and software from the automation specialist ifm.

Since its foundation in 2001, CVA has generated an average of around three billion kilowatt hours of electricity per year. The hydroelectric power plant with the highest annual production is the Valpelline power plant, which was built in the 1950s and is fed by the Place Moulin reservoir. A 155-metre-high dam closes the lake, which has a usable capacity of 93 million cubic metres of water. Due to the 1,000-metre difference in altitude between dam and power plant, the water reaches the turbines through the pipeline at a pressure of 100 bar.

Systemic network

The hydroelectric power generated in this way is sufficient to drive two 65-megawatt turbines that produce up to 330 gigawatt hours per year. These performance data make the Valpelline power plant important not only for supplying energy to the population in the Aosta Valley, but also for Italy's strategic energy plans: the fact that it can be started up in the event of a blackout make it one of the power plants that would help restore Italy's 220-kilovolt grid in such a scenario.

No possible malfunction must go undetected

All the more reason for CVA's engineers to guarantee the functionality of this and other CVA power plants at all times, as **Antonino Sannolo**, who is the engineer in charge of the Electromechanical Engineering Division of the Operations Department, points out. *„Among other things, our department is responsible for the maintenance of around 70 hydroelectric power generators. To be able to plan maintenance work accurately, we need to know the condition of the plants at all times. For this purpose, we carry out non-destructive tests on the main mechanical components, as well as thermal inspections, electrical protection measures, electrical checks on the generators and vibration tests on the turbine supports. Any developing fault going undetected could lead to machine failure and therefore economic loss."*

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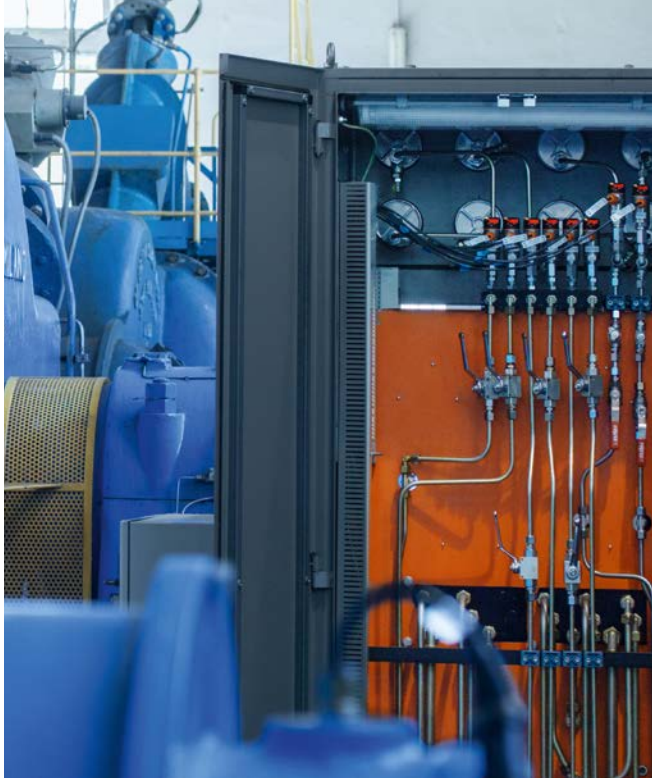
Condition monitoring through retrofitting: numerous sensors on turbines and power generators record the vibration behaviour of rotating components as well as the temperature, pressure and flow of coolants.



Some of CVA's hydroelectric power plants are almost 100 years old, others are difficult to access and all are scattered throughout the Aosta Valley.

Control and monitoring system standardisation

The main challenge of these tests lies in the geographical location of the hydroelectric power plants, which cover the entire Aosta Valley - an area of around 3,200 square kilometres.

„The generators are also not always easily accessible and some of them were built in caves in the mountains," explains **Sannolo**. *„With the help of companies such as ifm, we are now in the process of digitalising all of our plants in order to reduce the monitoring effort and the need for on-site inspections."*

In this respect, the existing control and monitoring systems of 22 hydroelectric power plants in the Aosta Valley are to be upgraded in a standardised way and made centrally available at IT level. In line with this goal, the Valpelline power plant has already been equipped with vibration sensors from ifm in order to keep a close eye on the maintenance requirements of the turbines and power generators at all times. Additional sensors monitor the pressure and temperature of the coolant.

The cooling circuit and water supply are also monitored

CVA is also already using state-of-the-art digitalisation solutions in several of its plants. At the Covalou site, for example, many important plant data are recorded by ifm sensors and transmitted to the IT level in order to ensure the operation of the 41-megawatt hydroelectric power plant built in 1926. In addition to temperature and pressure, the coolant flow is also monitored here. Combined with the data from the vibration sensors, a precise overview of the plant's condition can thus be obtained.

IIoT platform: centralised data analysis and alarms

CVA also relies on state-of-the-art systems at the IT level. One example of this is moneo, ifm's IIoT platform. It not only enables central parameter setting of IO-Link infrastructures and the use of transmitted sensor data for process optimisation. **moneo|RTM** also evaluates the data from the vibration sensors and alerts the plant operator if pre-set thresholds are exceeded.

„With moneo, we are able to collect a wide range of data that allows our technicians to analyse all vibration trends in real time," explains **Sannolo**. *„Over the past few years, we have developed a new analysis method that essentially consists in reducing on-site condition checks to a minimum, using them only when the online test systems indicate a fault."*

Long-term goal: predictive maintenance

Integrating all this data into a centralised system allows CVA's technicians and engineers to track and compare all information more easily at any time. *„We transfer all this sensor information into a database. In the long term, we want to create genuine predictive maintenance. We believe that the starting point for this ambitious goal is the implementation of a good vibration analysis."*

With the **moneo|Industrial AI Assistant**, ifm already offers the possibility of using artificial intelligence to monitor the health status of plants very precisely and to react even earlier to imminent damage. To do this, the tools use historical data to learn the normal state of the plants. Drawing on this knowledge, SmartLimitWatcher can precisely monitor the dynamic oscillation behaviour, while PatternMonitor examines individual values of relevant data – such as temperature, pressure or flow – for rising or falling trends, increasing volatility or jumps.

Reliable sensors even in challenging environments

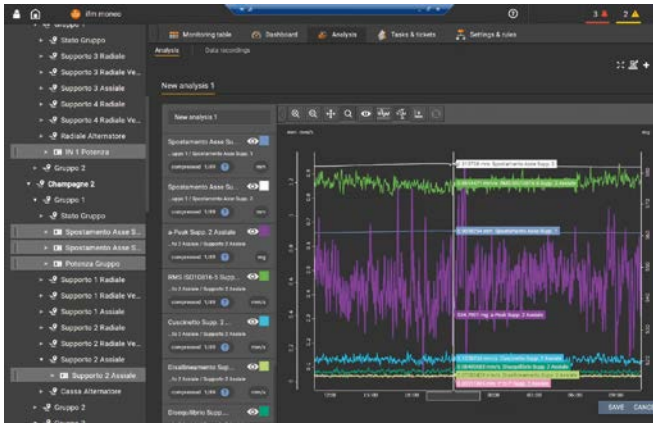
„Overall, we are very satisfied with the products from ifm. During the tests and in operation, we have found that they are suitable for use in industrial environments such as ours," summarises **Manuel Bonjean**, contact person for the automation of CVA's hydroelectric power plant.

„The sensors work perfectly in humid environments, such as those found in our hydroelectric power plants, and also in the very low temperatures that often prevail in Alpine winters. The solutions from ifm enable us to monitor our systems increasingly better. Moreover, we have also been able to standardise the sensor technology used in all our hydroelectric power plants, which has significantly reduced the number and variance of spare parts in stock. This relieves our budget and makes maintenance planning much easier for our maintenance department."

Antonino Sannolo adds: *„At first we only bought components from ifm. When we then realised that we could also obtain a turnkey system from them, as well as the expertise for IT-based vibration analysis, we decided to work even more closely with ifm and to carry out the installation and commissioning on site together. The fact that we can still rely on their expertise and support even after all the systems have been implemented, is certainly something that not every system supplier can offer in this form."*

Conclusion

With the help of effective, integrated digitalisation solutions, ifm is supporting the energy company CVA in operating the plants that are necessary to supply the population and companies in the Aosta Valley with sustainably generated electricity - reliably and permanently.



The data from all ifm diagnostic electronics is collected centrally at the IT level, where it is analysed with moneo, the IIoT platform from ifm.