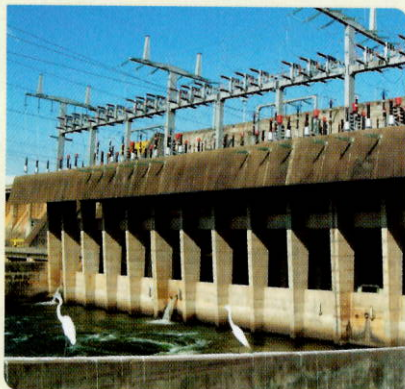


HYDROPOWER – Clean Energy Generation With Tradition



Hydroelectric power plants depend on high investments and become profitable only after decades. Thus, it is understandable that these types of power plants are planned and built for a long lifetime. Only high-quality and reliable machine parts and sensors are used.

A distinction is made between running water, storage power and pump storage power plants. The differences in height between the upper and lower reservoir as well as the volumetric flow quantities in the turbine are decisive for the electricity output. With the hydrostatic submersible pressure transmitter PS3407, ifm electronic offers the ideal prerequisites for water level measurement with long-term stability.

What type of turbine is selected depends on local factors such as water quantity and height of fall. The Kaplan turbine is used for great heights of fall and volumetric flow quantities, the Francis turbine for average heights of fall and volumetric flow quantities and the Pelton turbine for great heights of fall and small volumetric flow quantities.

The mechanical energy of the turbines is transferred to the generator by means of a shaft. Slide bearings ensure that there is almost no rotational loss.

This is where the temperature sensors come in. The temperature of the bearings is an important sign of a 'friction-free' and therefore low-loss transmission of energy. The slide bearings are supplied by a central lubrication block. The temperature of the bearings and coolants is recorded via the temperature control monitor TR2432 as well as the type TTxxx temperature sensors Pt1000 and is provided to the PLC as a scaled 4...20mA analogue signal. This way, viscosity and lubricity of the coolant can be monitored. In automation and process technology, monitoring and control of temperatures is one of the most important measuring tasks. The correct temperature often influences the quality and efficiency of the corresponding processes. Critical states are to be prevented. This is achieved by compact temperature switches and transmitters as well as by cable and probe sensors, which are connected to an external control monitor.

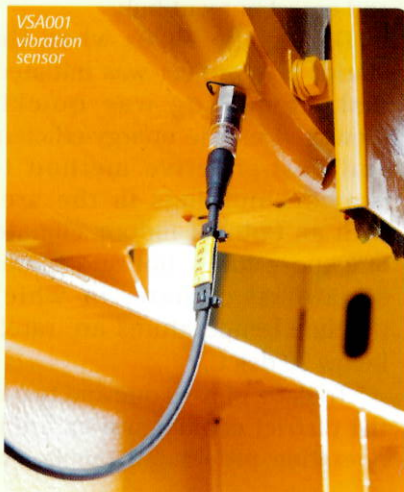
ifm electronic gmbh, a company with tradition, develops, produces and supplies suitable sensors.

Apart from measuring the temperature, it is of course necessary to continuously monitor the level in the supply tank of the central lubrication block in order to avoid insufficient lubrication. In addition to the central lubrication block, the hydraulic power pack plays an important role. It is used for servo-hydraulic adjustment of the guide vane apparatus, eg: in Francis turbines. Here as well, continuous availability of sufficient hydraulic fluid quantities must be ensured. Especially suitable is the LK3xx, which is working on a capacitive basis. For continuous level measurement the level is detected continuously, converted into an electrical signal and indicated. Depending on the type, the units have freely programmable switching outputs or an analogue output for further processing.

For capacitive measurement the tank and the material form an electrical capacitor. The capacity changes with the level and is converted into a level measurement by a microprocessor.

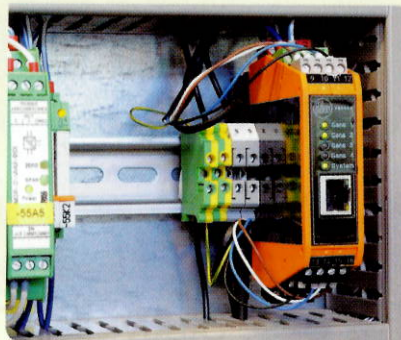
This is widely used with a great variety of aggregates in different application areas, for example in the machine tool industry. The electronic sensors of ifm do not require any mechanical components and are thus especially robust, reliable and long-term stable. Unlike with mechanical components, deposits or 'wear and tear' do not lead to error messages. Regular maintenance and cleaning are not necessary. Even critical process conditions such as emptying a hydraulic tank or the unintentional overspill of a tank are monitored by level sensors.

Apart from slide bearings, depending on the type of generator, rolling element bearings are used. This is where the modern rolling element bearing diagnosis with ifm vibration sensors helps to establish a condition-based maintenance. The diagnostic system octavis offers a user-friendly and reliable way of diagnosing early wear and tear of the bearings as well as the damage progress.



When bearings are subject to wear and tear and damage is caused, the friction increases. Heat loss occurs and the bearing damage – depending on how far advanced it is – can lead to a blockage of the shaft. In turn, this can immediately lead to a destruction of the entire periphery and thus to increased repair costs.

ifm customers have been asked why they use the ifm diagnostic system. They have told unisono that the system of ifm electronic – the type VSA001 vibration sensor and the VSE002 evaluation unit – stands out due to its excellent price/performance ratio compared to competitors' products. So, condition monitoring is no longer a matter of price.



VSE002 evaluation unit – LEDs indicating the state of the rolling element bearings on site. Pre-alarm and alarm are signalled via switching outputs. The trend is stored in the unit with a time stamp.

Another benefit of the ifm system, which has been highlighted and distinguishes it from competitors' units, is that the parameter setting software is easy to use while at the same time allowing extensive diagnosis. efactor octavis is a vibration monitor which not only detects vibration data, but also carries out signal analysis and machine diagnosis directly on the machine. The machine condition is determined right on the site of measurement and forwarded to the PLC or to SCADA software via alarms or as condition values. The main requirements for modern machine monitoring are fulfilled: compatibility, modularity and transferable configuration. If the damage is not detected in time, the costs are usually not just incurred by the generator component, which must be replaced and can amount to several €10,000 in case of a total failure, but rather by mounting, transport and down-times as well as the resulting deficit in generated and sold electrical energy.

Conclusion

Reliable sensors and evaluation systems of ifm ensure a minimisation of down-times – thus, investments pay off quickly and hydroelectric power plants can produce clean energy on a long-term basis.