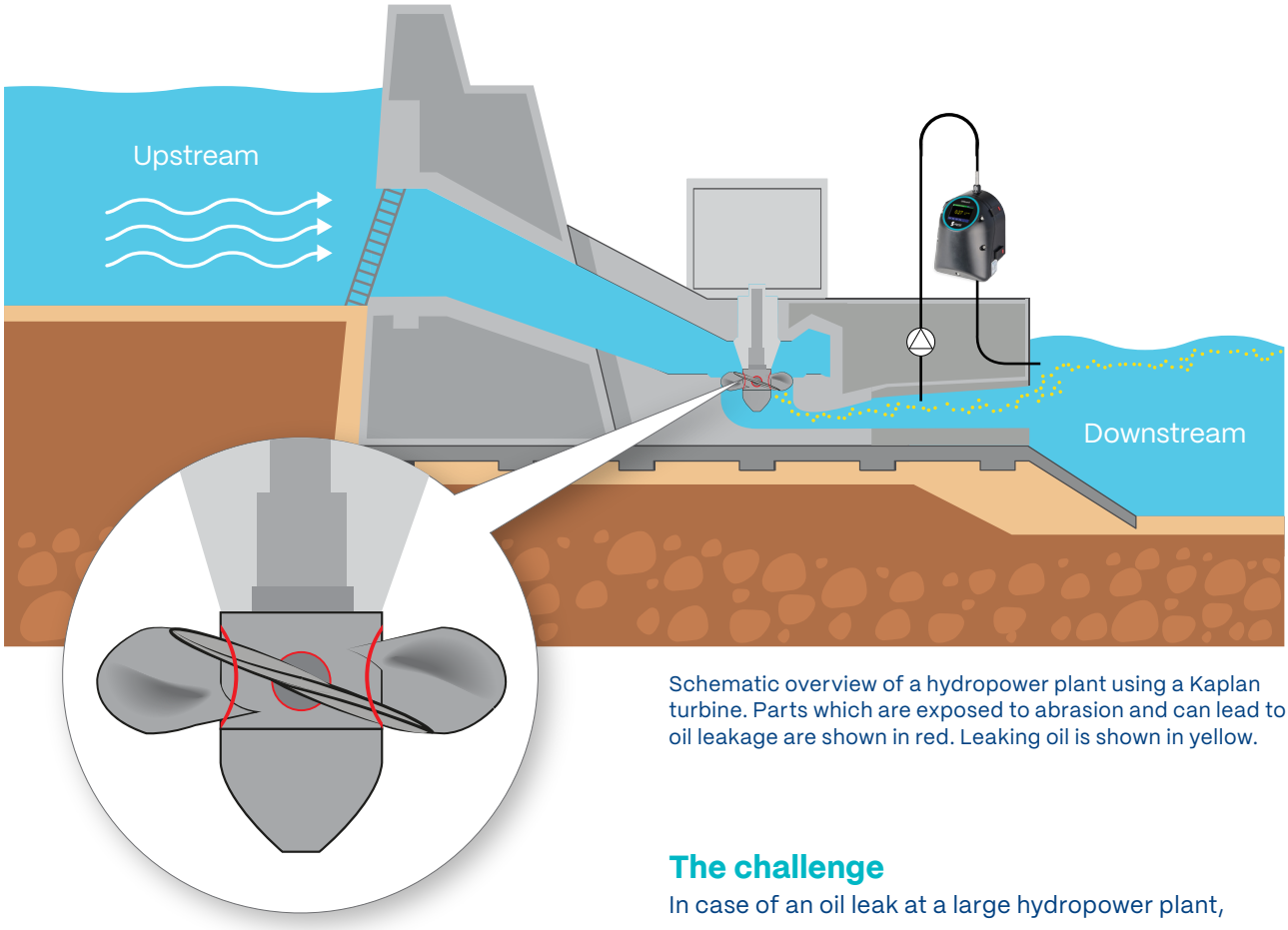
sigrist photometer

APPLICATION NOTE

Detecting oil leaks from turbines

Where electrical energy is produced by a hydropower plant, rotating parts are exposed to water. These rotating parts are lubricated by grease or lubricating oil. Wear and abrasive particles in the turbined water such as sand attack the bearings. This circumstance is a potential source of oil leaks, which poses a risk to the aquatic environment or drinking water supplies downstream of the turbine.



Schematic overview of a hydropower plant using a Kaplan turbine. Parts which are exposed to abrasion and can lead to oil leakage are shown in red. Leaking oil is shown in yellow.

The challenge

In case of an oil leak at a large hydropower plant, several litres of lubricating oil may be released into the environment. Beside threats to the environment, broken bearings reduce efficiency during operation and therefore reduce the produced energy.

Depending on the turbine, different components are affected by oil leaks:

- Kaplan turbine: hydrodynamic bearing, adjustable runner blades
- Pelton turbine: jet deflector, nozzle needle, shut-off device
- Francis turbine: hydrodynamic bearing, adjustable guide vanes, hydraulic servos

The solution

With the **OilGuard 2 W A**, Sigrist offers an instrument for continuous monitoring of water in hydropower applications. It can be used to detect oil traces from petroleum-based lubricants. This allows hydropower plant operators to monitor turbines during operation without a need to carry out laboratory tests or a shutdown of the plant.

The continuous measurment of oil traces allows the hydropower plant operator to quickly identify an oil leak. The operator is able to initiate immediate measures and prevent further damage to the turbine. Such rapid and appropriate measures also minimise the amount of contaminated water released into the environment and can prevent difficulties with the water protection authorities or possible claims for compensation from the public. In most cases of a shutdown, the loss of energy produced and damage to the environment exceeds the cost of the measuring device.

The continuous monitoring of oil traces also provides operators valuable information about the condition of the turbines in operation. For instance, it allows to plan upcoming maintenance work or better estimate the addition of lubricant.

Technical details

The Sigrist OilGuard 2 W A is a continuously operating instrument that reacts reliably and quickly to the smallest traces of oil. The instrument measures the fluorescence* properties of hydrocarbons in petroleum-based lubricants, fuels and oils when they are mixed with the water. Due to this measuring principle, the measurement is not negatively affected by turbidity. Thanks to the non-contact free-fall measurement, the OilGuard 2 W does not suffer any falsification of measured values as a result of window contamination. In addition, the integrated automatic calibration function checks and recalibrates the device fully automatically during measurement operation. If the device detects a measurement error, it automatically issues an error message. This offers the user maximum safety and maximum device availability.

Further applications

- Detect oil leaks in the drainage water of power station central and reservoirs
- Detect traces of oil in the drainage water of waste disposal sites
- Detect oil leaks in snowmaking systems
- Detect traces of oil in drinking water reservoirs

* Other sources of fluorescence in the water have an influence on the measurement and require additional evaluation.

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