Sediment Monitoring

With flow measurement RISONIC *modular*

Benefits

- continous online monitoring
- cost efficient
- protection of equipment (turbine)
- protection against flooding

Applications in:

Hydro Power
Water Supply
Irrigation
Sewage Water

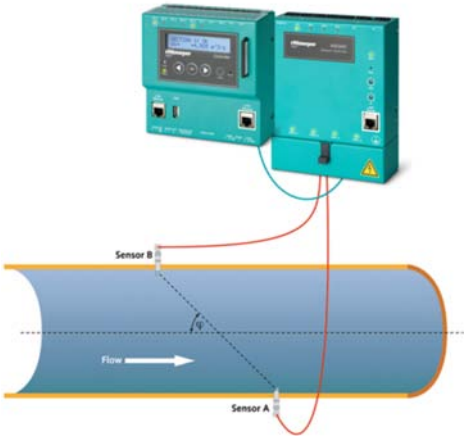
Cost-efficient monitoring

When it comes to hydro power plant operation, maximum productivity and assured revenues come first. Therefor, it is essential to detect potential reasons for equipment damage at an early stage. This protects operators from the high costs due to power generation outage and the time-consuming and expensive replacement of damaged turbine parts. Sediments floating in the water are one of these potential risks for water turbines. They can scuff turbine parts and ultimately lead to a complete outage in the worst case.

Monitoring sediment is important for the management of water resources, too. Sediment monitoring data can be used to determine effectiveness of sediment reduction actions in the watershed and guide adaptive sediment management.

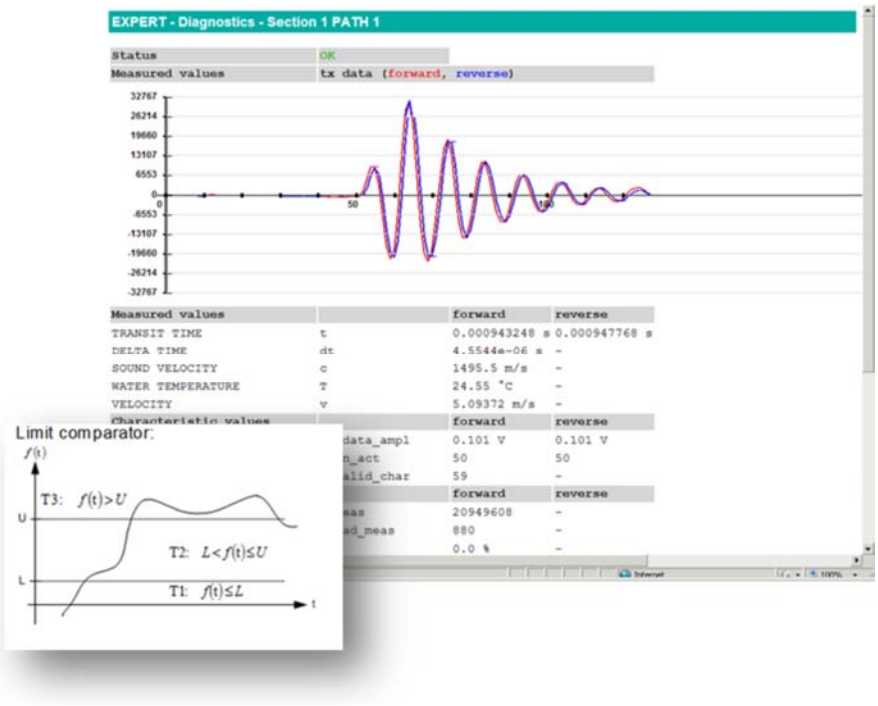
Research at the Swiss Federal Institute of Technology in Zurich (ETH Zürich) and the University of Lucerne have shown that the ultrasound pulses can also be used to monitor the amount of suspended particles in the water. This feature has many technical, economical and ecological importance for the operation of a hydropower plant as it can reduce turbine scuffing and storage sedimentation.
In addition to closed pipe systems, this feature can also be used for sediment management programs for open channels such as canals and rivers.

Description



The flow measurement is based on the acoustic discharge measurement (ADM) method. Sensor A and B alternately send and receive an ultrasonic waveform. The measured transit time difference of the two waveforms is directly proportional to the mean path velocity. From the mean path velocity in conjunction with the pipe geometry the flow can be determined.
If there is suspended sediment in the water, the acoustic signals get attenuated. Normally, this existing information from the measurement is not evaluated. RISONIC *modular* enables this evaluation and provides a powerful and easy way to monitor suspended sediments in the water. Individually galvanically isolated I/Os and communication ports allow the system to send alarms via SMS using an external GSM/GPRS modem.

The key of the new feature is that there exists a site specific correlation table between the signal attenuation and the sediment concentration. To create this table, initial measurements of the suspended sediment in the water have to be done. With every later measurement, the sediment concentration and the signal amplitude is stored in the conversion table and the monitoring will be more accurate.
Based on the correlation, 3 thresholds values can be defined for the RISONIC *modular* to send alarms if the sediment concentration is too high.



The new feature comes for free, no special hardware or software is required. The only thing that has to be done is a simple configuration setup utilizing the 3 level window comparator process rules, based on sediment measurements.

The windows limit comparator is configured to monitor the received signal strength. As the silt level increases the signal will be attenuated. Two thresholds are defined. Above the upper threshold, area T3, indicates normal silt levels. Between the upper and lower threshold, area T2, indicates high levels of silt and a warning is issued. Below the lower threshold, area T1, indicates dangerous silt levels and an alarm is issued to initiate a turbine shutdown procedure, for example

The threshold levels can be determined by:

- A reference instrument such as a laser refractometer
- Operator experience
- Offline silt analysis

By using the RISONIC *modular*, the abrasion of turbines based on sediment concentration can be reduced in an easy and cost-efficient way.

BERTSCHI Instrumentos
CARLOS BERTSCHI S.R.L.
Av. Roque Sáenz Peña 943 EP, C1035AAE Buenos Aires
Tel.: +54 11 4326-2405 rotativas Fax: +54 11 4326-2738
instrumentos@bertschi.com.ar www.bertschi.com.ar
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