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Application note

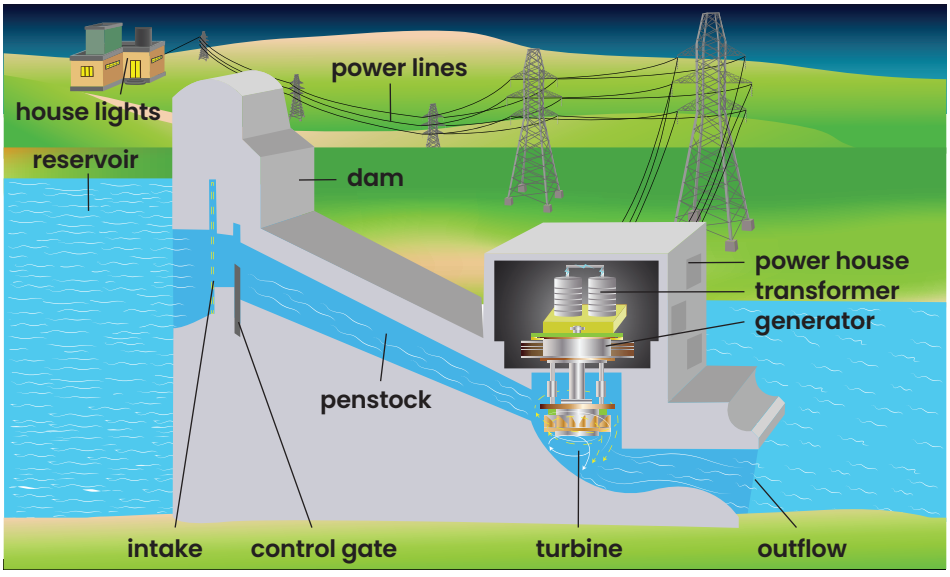
Clamp-on water flow measurement on 5200mm penstock in a hydroelectric power plant

Benefits

- Very cost effective
- Acceptable accuracy on large pipes
- Ability to assess water turbine efficiency and ensure mechanical and flood protection at high flowrates
- Easy to set up and operate
- No process shutdown
- No downtime and no periodic maintenance nor calibration required

Summary

Hydroelectric power is one of the renewable energy sources forming an essential part of the world's future energy mix. It harnesses the power of moving water to produce electricity. As water flows down through the dam its kinetic energy is used to spin a water turbine. Penstocks are the pipes that carry water down from the hydroelectric reservoir (the dam) to the turbines inside the actual powerhouse.



This hydroelectric power plant (HEPP) located in south-east Turkey has an installed capacity of 142 MW and an annual capacity of 382.6 GWh. The plant's management team wanted to track and monitor their water consumption and their turbine efficiency so that they could better control the water level and move into a more sustainable operating model. They did not have any flow measurement on the penstocks.

Application

Pipe size:	5200 mm (17 ft), thickness 25mm (1″)
Material:	Carbon steel
Water Velocity:	0 – 10 m/s (0 – 33 ft/s)
Water Temperature:	5 – 30°C (41 – 86°F)

Challenge

Measurement on such large water lines is difficult and therefore the customer wanted to have a field test and be confident that the measurement will be reliable and accurate.

Most ultrasonic manufacturers advised the customer that clamp-on is not a suitable solution due to the very large pipe size and long path length, even with single traverse installation.

Solution

Panametrics' skilled local Channel Partner met with the plant management and installed the Aquatrans AT600 with CRS 401 clamp-on transducers. The meter was installed in a single traverse. Although the set up was challenging, the highly trained Channel Partner had overcome several similar challenges and was certain that Panametrics flowmeter technology would be effective.

The meter readings were monitored for a month to ensure sufficient data sets were available for the customer to be able to draw meaningful conclusions.

The customer also asked for references on similar applications. Panametrics' large installed base in hydroelectric power plants helped in closing the deal quickly.

Result

The customer found the measurement results very positive and as per expectations. It purchased four AT600 units to install on its four penstock pipelines.

As a result, the customer is now accurately monitoring the efficiency of its turbines and is able to optimize production depending on the flow rate/dam level. In addition, the customer can now optimize the availability and connectivity of the plant to the main power grid and therefore increase the profitability of the plant.

Panametrics, a Baker Hughes business, provides solutions in the toughest applications and environments for moisture, oxygen, liquid and gas flow measurement.

Experts in flare management, Panametrics technology also reduces flare emissions and optimizes performance.

With a reach that extends across the globe, Panametrics' critical measurement solutions and flare emissions management are enabling customers to drive efficiency and achieve carbon reduction targets across critical industries including: Oil & Gas; Energy; Healthcare; Water and Wastewater; Chemical Processing; Food & Beverage and many others.

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