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Electricité de France Acquires a New Acoustic Scintillation Flow Meter

To measure flow conditions associated with the rehabilitation of Unit No. 1 at the 150-MW Kembs hydroelectric station, plant owner Electricité de France (EdF) recently purchased a portable acoustic scintillation flow meter (ASFM) Advantage System from ASL AQFlow, Inc., a provider of acoustic flow meters in Sidney, British Columbia, Canada. EdF plans to use it for baseline measurements, turbine acceptance, and to ensure that the plant operates as efficiently as possible.

The Kembs plant, located on the Rhine River in eastern France, 20 kilometers downstream from Basel, began operation in 1932, and a major refurbishment program is underway to increase efficiency and power output. The rehabilitation includes a new 5-blade runner for Unit No. 1, with an expected 17 percent improvement in power output. The unit is scheduled for commissioning in 2007.

Marie Delagarde, a hydraulic engineer with EdF, says the utility chose the AQFlow system because of the project's low-head turbine with short intakes.

"ASL AQFlow specializes in flow measurements at low head, short intake hydro plants, which are among the most difficult flow measurement challenges," says Colleen McQuade, marketing coordinator at ASL AQFlow.

Kembs has a 13.5-meter head. Each of its six 25-MW turbine-generator units (two Kaplan units and four Helice, fixed-blade propeller units) has two 17-meter-long intake bays.

"A simple way to measure flow in these conditions is with the ASFM mounted on a frame and lowered down the stop log slot just downstream of the trash-rack," says Jan Buermans, sales engineer with ASL AQFlow. "The turbine can stay in service and does not need to be dewatered for flow meter installation."

In addition, the system purchased for Kembs includes two innovations. The first is a revised algorithm, which resulted from AQFlow's continuing study of factors affecting ASFM performance. As a result of these studies, the guidelines determining the suitability of an intake for ASFM operation have been revised and clarified.

"These studies have resulted in a new version of the instrument's flow algorithm, with improved performance in regions of strong turbulence and unsteady flows," McQuade says. "While Kembs has no strong turbulence or unsteady flows, Unit No. 1 does have skewed flow because it is located nearest the western riverbank."

This improved algorithm and a second improvement that allows ASFM operation over a greater range of path lengths were included in the product sent to Kembs.

Before purchasing the Advantage ASFM, EdF leased a 2-bay, 2-paths-per-bay ASFM Advantage system installed at Kembs in June 2006 for a one-week test. The purpose was to establish performance of Unit 1 and to determine the suitability of the AQFlow ASFM for EdF. The ASFM had four acoustic paths – two mounted on each of the two open frames fitted into the stop-log slots. Operators collected data at 13 frame positions in the intake, with data from two bays collected at one time. They then moved the frames to the remaining two bays.

This first set of flow measurements set a base-line for the unit performance. Once the refurbishment work is completed, a second set of flow measurements will establish the improvement in performance. No comparison method was used at this site due to the plant type (low-head, short intake).

“The system worked well for determining relative flow,” Delagarde says. “It is sufficient for our needs at Kembs.”