Lom Pangar is a new dam under construction in Cameroon. Its aim is mainly flow regulation of the Sanaga in order to improve and secure hydropower production of downstream facilities.

To reduce impact on water quality and especially on dissolved oxygen, an aerating weir is going to be implemented downstream of the dam. It will be used for the 25-100 m³/s flowrate corresponding to hydropower restitution from lower intakes in the reservoir. Minimum targeted downstream oxygen concentration is 5 mg/l and upstream oxygen concentration can be assumed equal to 0.

Regarding the aerating structure design, the objective is thus to reach an aeration efficiency at 20°C equal to at least 0.55.

Physical Model

Aerating structure geometry considered: 3 m high, 157 m wide weir with a smooth upstream face inclined by 26.5°, a 3-m long horizontal broad crest and a downstream face made of six 50 cm high and 1.87 m long steps (15° slope).

Model scale: 1:1 scale to avoid scale effects on the oxygen transfer mechanisms and thanks to the limited chute of the prototype.

Test performed: 10 min. long tests with 4 successive discharge levels

Chemical dissolved oxygen removal technique has been applied upstream and dissolved oxygen concentration has been measured continuously on several steps using 6 optical oximeters.

Results: Oxygen concentrations higher than the minimum target value are reached downstream of the proposed structure in the range of relevant discharges.

Preliminary studies and site selection

Number of preselected sites: 4 based on geological, environmental, socio-economic and cost criteria.

Final selection: the most upstream site.

Reasons of site choice: water aeration on a longer section of the river; and location close to the dam site with therefore easier monitoring conditions and sanitary impacts and easier management of dam staff.

Types of structure considered at this stage: a weir with one or two vertical chutes and a stepped spillway.

First analysis conclusions: Stepped weir is better for technical reasons including availability of materials on the dam work site and easier decommissioning.

In case of a stepped spillway, nappe flow is the flow regime providing most effective aeration (Baylar et al., 2007). Application of formulae from the literature to the discharge range and geometry of the project leads to choose 50 cm high steps to create this flow regime.

Final design and Works planning

For 100 m³/s discharge, 6 steps are necessary to reach the target aeration efficiency. In order to limit hydraulic impact on the upstream bridge, no additional steps can be done and the crest is therefore levelled 3 m above the downstream water level.

The final design of the aerating weir consist in a rockfill weir with concret steps and concrete-rockfill crest and upstream and downstream faces.

The first partial filling of the reservoir is presently ongoing. The construction of the structure is planned during the next low flow period, between January and April 2017, for the second filling of the reservoir when the lower dam outlet will be activated and low water quality is expected.

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