LABORATOIRE DE CONSTRUCTIONS HYDRAULIQUES

ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

Power intake of Deriner Dam- Turkey
(2000)

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Project Descriptions

Deriner Hydro Power Project is related to a 257 m high double curvature arch dam with a crest length of 700 m. The dam is equipped, with high capacity spillways which allow the evacuation of an inflow flood of more than 10'000 m^3/s (PMF). A power intake tower on the right bank, with dimension of (H x B) = 24.05 m x 22.0 m connected to a vertical shaft and a horizontal reinforced section, supplies the powerhouse comprising 4 units with vertical axis turbines (flow discharge: 360 m^3/s, installed capacity: 660 MW). The restitution is located immediately downstream of the dam. The intake structure is illustrated with Figures 1 and 2.

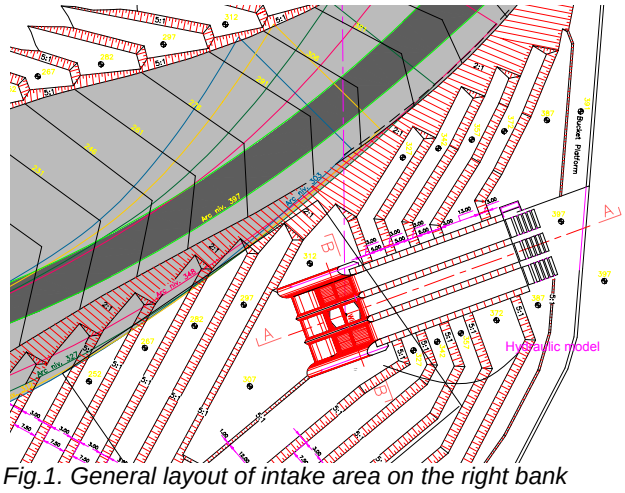

Fig.1. General layout of intake area on the right bank

In order to check the good performance of the water intake and to define the main operating conditions, the Laboratory of Hydraulic Constructions (LCH-EPFL) was asked to perform hydraulic model tests for the planed water intake structure. Designer of the project is Stucky Engineers Ltd at Lausanne, Switzerland.

Fig.2. Front view of the intake model 1:20

Hydraulic Model Tests

The purpose of the study was to check the hydraulic behavior of the water intake under extreme operating conditions. The model study comprised the following tasks:

- Vortices formation
- Pressure measurements at different locations along the intake and head losses calculation
- Eventual modification of the design of the structure

Formation of Vortices

Formation of vortices in the model was investigated at different conditions of discharge and reservoir level. Observations were done on duration of at least 30 min in each case. From these series of tests, it could be concluded that there is no critical situation regarding the vortex formation at all. Even with a ~20 % higher discharge than the designed one and for levels lower than the minimum operation condition, fixed at 347.83 m a.s.l., no air entraining vortices could be observed (Figure 3).

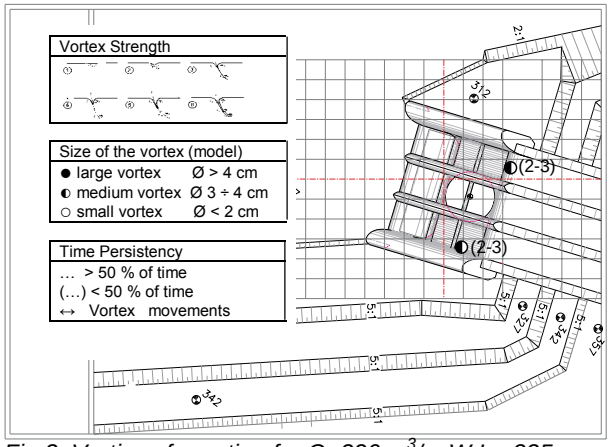

Fig.3. Vortices formation for Q=320 m^3/s; W.L.=335 m a.s.l

Pressure measurements

Static and dynamic pressure measurements were performed at minimum operation level of 347.83 m a.s.l. for the design discharge of 320 m^3/sec in 14 representative points distributed along the intake walls at significant locations. From the pressure measurements (Figure 4), it could be concluded that there is no risk of underpressure and the very low head losses confirm the good design of the intake bellmouth structure.

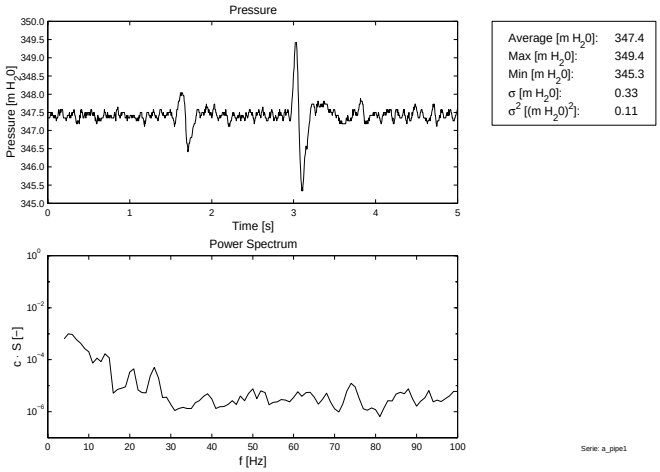

Fig.4. Example of dynamic pressure measurement at the intake wall and power spectrum