Renewal of the power station Rüchlig in Aarau (2010)

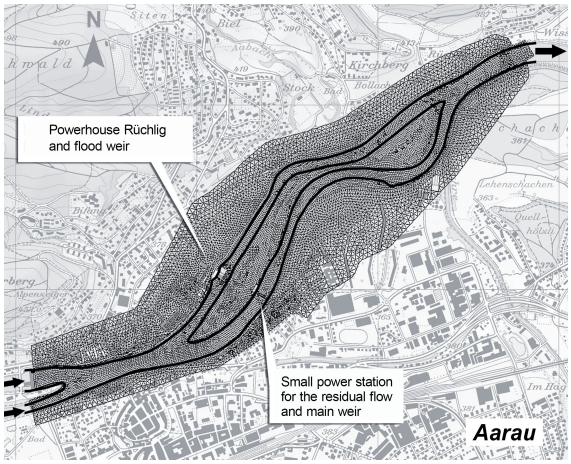

Fig.1: Grid for the numerical simulation


Fig.2: Hydraulic model of the power plant with its two turbines on the left and the flood weir on the right at a scale of 1:30

The power station Rüchlig is situated on the river Aare in Aarau. It is operated by the Nordostschweizerische Kraftwerke AG NOK. The powerhouse and the main weir are separated by a small island called Zurlindeninsel. The concession corridor of the power station Rüchlig is 2.9 km. Its backwater regulation depends on the discharge. A water level-discharge-relation at the upper concession border must be maintained.

In connection with the imminent renewal of the concession, it is intended to renew the existent power station Rüchlig, improve the flood protection in the city of Aarau, and increase the residual flow. The existing powerhouse with 6 machine groups will be replaced by a new powerhouse on the left hand side of the power channel with two units. On the right hand side a gated flood weir will be built. In the future the flood protection will be improved by discharging a much higher flow than the former design flow of 340 m^3/s through the power channel during a flood event. Furthermore, the project intends to construct a small power station for the residual flow in the old course of the Aare.

The VAW was commissioned with the accomplishment of experiments on a numerical and a physical model.

Numerical model experiments

The numerical model includes the whole concession distance and will provide information on the expected behaviour of the flow during normal operation and in case of a flood. New water level-discharge-relations and net heads will be determined. For flood events the freeboard and bed shear stress in the channel are examined. Furthermore, measures for the flood protection during construction are investigated.

The model is calibrated on the basis of measured water level-discharge-relations at six different measuring points.

The calculations are executed with the program BASEMENT. BASEMENT is developed at the VAW and is used for the simulation of instationary flow in open channels. For generating the grid the program SMS (Surface-water Modeling System) is used.

Physical model experiments

The physical model of the powerhouse simulates 450 m of the channel including the flood weir and the powerhouse at a scale of 1:30. In a second model the main weir and the small power station are modelled at a scale of 1:40. The boundary conditions are based on numerical examinations.

Main focus is on the design of the intake and outlet structures, the dividing pier and the stilling basin. Additionally the flow resistance and the channel bed stability are investigated.

Keywords:	channel power station, intake, weir, stilling basin, dividing pier, bed stability, hybrid investigation, flood protection
Commissioned by:	Nordostschweizerische Kraftwerke NOK
Project status:	Completed 2010

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