

## Power Plant for Residual Flow in Dietikon / Switzerland Hydraulic Design of the Intake Structure (2003)

At the River Limmat in Switzerland the Electricity Company of the State of Zurich (EKZ) operates a hydroelectric power plant. The water is diverted by a separate channel to the power house and given back to the river some distance downstream of the facility. The plant was built in 1931/32 and has recently been refurbished. With the Kaplan turbines an amount of approximately 20 Mill kWh can be produced per year. The design discharge is 100 m<sup>3</sup>/s.

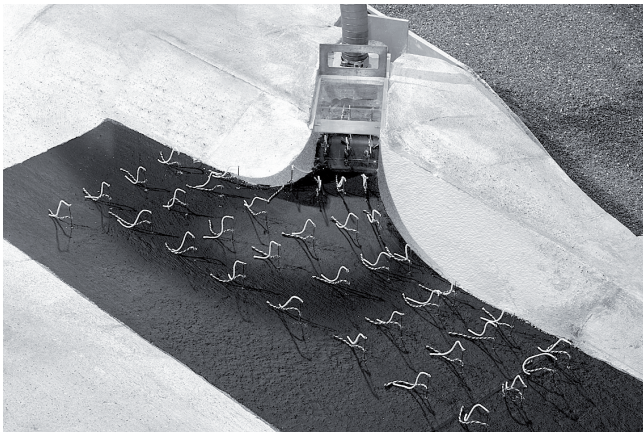


Fig. 1: Intake structure 1



Fig. 2: Intake structure 2

In 2011 the concession guaranteeing the right of utilization for the waterpower expires. As a result of a new federal law concerning the protection of the watercourses, enhancement of the residual flow downstream of the weir is inevitable. As this discharge is not available any more for energy production at the power station EKZ analyzed the efficiency of an additional small power house making use of the residual flow. This new power house will be located at the dam separating the channel from the downstream face of the weir. It will be equipped with a vertical-axis Kaplan turbine being laid out for a design flow of 12 m<sup>3</sup>/s.

To limit the variations of velocity up to 20 % from the mean value an optimized hydraulic intake structure had to be developed. Additionally, the inlet construction should cause advantageous flow conditions in order to minimize energy losses in the channel and at the new power plant. Therefore EKZ assigned the Laboratory of Hydraulics, Hydrology and Glaciology (VAW) with the evaluation of several intake structures in a hydraulic model (scale: 1:40).

Model investigations showed that altogether an intake with side walls that ascend continuously with the embankment is favorable (Fig. 1). Other constructions with vertical side walls up to the water surface (Fig. 2) and better fluidic attributes are causing a more balanced velocity distribution but also significantly higher energy losses in the channel.

Keywords:	Power Plant for Residual Flow
Commissioned by:	Elektrizitätswerke des Kantons Zürich, EKZ Nordostschweizerische Kraftwerke, NOK
Project status:	Completed 2003

