Project: DOWNPULL FORCES ON HIGH HEAD LEAF GATES (scale 1:25)

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Client: VA TECH HYDRO GmbH & Co

Objectives: Determination of downpull forces on typical tunnel-type gates

Development of a PC-program for the determination of hoist forces

Abstract
Research and a series of model studies were performed at the Institute of Hydraulic Engineering to determine hoist forces on some standard high head leaf gates. Generally, the dimensioning of the hoist equipment is significantly influenced - beside the dead load of the gate and friction forces - by the magnitude of the acting vertical hydrodynamic force downward on the gate. This force also called downpull is substantially influenced by the deflection of streamlines along the bottom side of the gate, resulting in a pressure drop in this region. Furthermore, it is also affected by the water head in the gate well in interaction with gate gaps. The only reliable way to determine hoist forces on a specific gate type is possible by means of hydraulic experiments. Therefore model experiments in a scale of 1:25 were used to evaluate the hydrodynamic performance on various designed gate structures. Various parameters like upstream and downstream levels, opening ratios etc. were investigated. Obtained test results serve as data basis for a specially developed PC-program for the determination of hoist forces on standard high head gate types in dependency of numerous geometric and hydraulic constraints.

Experimental hydraulic investigations on upstream open and closed standard leaf gate types

References: