Project: TRANSIENT BEHAVIOR OF DIFFERENT THROTTLE TYPES IN A STRAIGHT PIPE
Researcher: Prenner
Supporter: Institute of Hydraulic Engineering
Objectives: Analysis of pressure wave transmission and reflection of different throttle elements

Abstract
In complex water supply systems of high-head plants with throttled surge tanks, turbine, pump and valve regulation procedures cause time-dependent pressure and flow fluctuations in the conduits. Understanding of the unsteady hydraulic resistance behavior of a throttle element is of great importance for the dynamic calculation of the entire pressure duct system. Under circumstances higher-frequency pressure waves can pass through the pressure tunnel and may cause massive damage to the concrete tunnel lining. Resulting repair works and stoppage of the power plant can cause considerable financial losses. In order to ascertain the unsteady behavior of miscellaneous surge orifices during pressure wave transmission, investigations on a straight pipe model were conducted at the Institute of Hydraulic Engineering in the frame of a basic research study. Thereby, several throttle types with different throttle ratios were tested under various steady basic flow conditions with single pressure waves. Additionally, a numerical analysis was carried out by the method of characteristics (MOC) to verify the suitability and limitation of the application of a steady throttle headloss coefficient in the common unsteady calculation.

Experimental and numerical investigations of different throttle types

References: