

Fish Guidance Structures with Horizontal Bars

Hydropower plants (HPPs) and dams can block or delay up- and downstream fish migrations and thus cause a decline in species population. Downstream fish passage through turbines or over spillways may increase fish mortality during downstream migration periods. Therefore the implementation of protection systems stopping fish from entering turbine intakes has a high priority in regard to ecologically upgrading HPPs. For that reason VAW conducts research on fish guidance structure (FGS) with horizontal bars to adapt and advance them as to safe fish passage and a successful economical implementation (Fig. 1).

The goal of this thesis is to determine a head loss estimation equation accounting for a wide range of geometric FGS parameters and to quantify the flow field around selected FGS configurations. Water depth and velocity measurements will be conducted for a geometrical scale $\lambda = 2$ in a 0.6 m wide, 0.5 m high and 8 m long laboratory flume. The experimental program includes FGS configurations with the horizontal angle between FGS and flow direction, $\alpha = 15^\circ$, 30° and 45° and the distance between the bars $b = 0.005$, 0.0075 and 0.010 m. Additionally, the effects of bar shape, bottom and surface overlays and vertical support bars on the head loss will be investigated. Acoustic Doppler Velocimetry (ADV) and Ultrasonic Distance Sensors (UDS) will be used to measure flow velocities and water depths, respectively. The results of this thesis will contribute to a hydraulically efficient and fish-friendly design of guidance structures.



Fig. 1: FGS with horizontal bars at Herting Hydropower Plant, Norway (Photo: Olle Calles)

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Notes:
Experimental work,
Communication is in English,
Thesis can be written in German or English