

Hydraulic-structural design of fish-friendly guidance screens at large hydropower plants

Hydraulisch-konstruktive Bemessung von Fischleitreechen an grossen Wasserkraftwerken

Hydropower plants and dams can block or delay up- and downstream fish migrations and thus cause a decline in species population. To counteract this problem, the implementation of protection systems has a high priority in regard to ecologically upgrading hydropower plants (HPPs). For that reason VAW conducts research on 'fish-friendly' guidance screens (FGS), which consist of a horizontally angled bar rack with vertically-oriented bars, in an effort to develop a better understanding of their hydraulic characteristics, influence on safe fish passage, and economical feasibility.

FGSs may have dimensions of some 100 m in length and several meters in depth and hence pose a challenge for a robust and cost-efficient design. The proposed project addresses this challenge by studying: (I) hydraulic and structural design of a FGS with/without bottom overlay, skimming wall, and adjacent downstream bypass for existing run-of-river HPPs, (II) head loss comparisons with conventional intake trash racks using published formulae from the literature, (III) total energy production losses caused by both head-losses and required fish passage bypass flows, (IV) plant operation strategies to address floating debris problem, (V) structure costs considering unit prices of steel, armoured concrete, rack cleaning machine, etc., and (VI) fish guidance efficiency for a number of native fish species. Finally, the results of the project will contribute to a hydraulically efficient, structurally robust, and economically feasible FGS design.



Fig. 1: Example of a 'fish-friendly' guidance screens (FGS), Holyoke Canal, Connecticut River, USA (Source: VAW)

Contact: Dr. Ismail Albayrak
Hydraulic Structures Division
HIT F23, 044 632 97 44
albayrak@vaw.baug.ethz.ch

Notice:
Hydraulic and structural engineering
background required (Wasserbau und
Baukonstruktion),
Thesis in German or English,
For MA single work, for PA group work