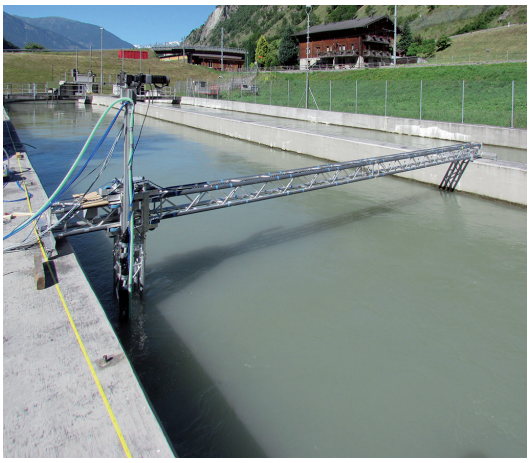
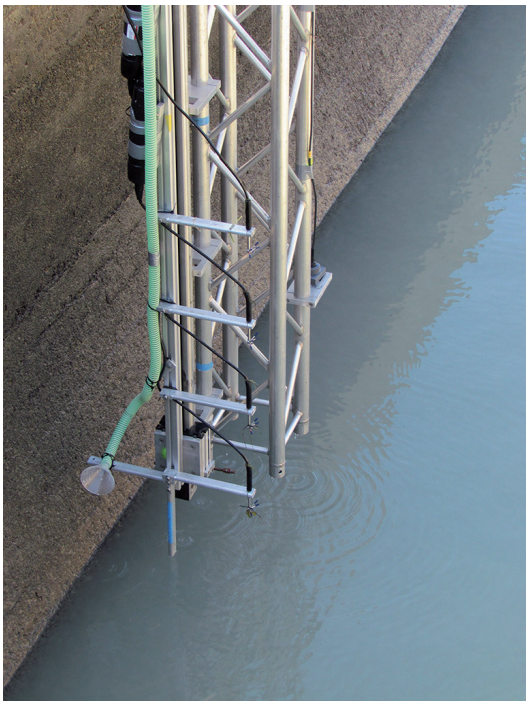
Adequate sediment handling at high-head hydro-power plants to increase scheme efficiency - Design optimization of Alpine desanding facilities



Measuring campaign at Mörel sand trap at KW Massaboden SBB (Photo: C. Paschmann, VAW)



Detail of ADV-Probes for velocity measurements and funnel for water sampling (Photo: C. Paschmann, VAW)

Operating high-head hydroelectric power plants under Alpine conditions may expose facility components to hydro abrasion due to mineral suspended sediments in the turbine water. Particularly, turbines can be affected by wear, leading to a considerable efficiency decline affiliated to power and financial losses. Therefore, high-head hydroelectric power plants are commonly equipped with desanding facilities to reduce the amount of suspended sediments.

Nowadays, climate change causing glacier meltdown entails increasing sediment yield from glaciated catchment areas into alpine waters. Additionally, experiences show that the settling efficiency of existent desanding facilities often is below expectations, frequently due to shortcomings of the geometrical design. Thus, the geometric optimization of existing and proposed facilities is of major importance.

The project's objective is to develop an enhanced guideline for the design of desanding facilities to improve the settling efficiency, putting an emphasis on the effects of various geometrical parameters as well as different headwork arrangements. For this purpose, the optimization potential is systematically investigated by means of a hybrid approach, modeling flow and settling processes by numerical simulations based on precedent field experiments.

The project is funded within the scope of the National Research Programme NRP 70 "Energy Turnaround" by the Swiss National Science Foundation. It started at the beginning of 2015 and will be completed by the end of 2017.

Keywords:	desanding facility, design optimization, hybrid approach, 3D numerical simulation, prototype field experiments
Commissioned by:	Swiss National Science Foundation (SNSF) / Project 153861

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