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

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.

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