Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Versuchsanstalt für Wasserbau,
Hydrologie und Glaziologie

Master's or Project Thesis
HS 2020

Lead: Prof. Dr. Robert Boes
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Partner: Hydro-Solar Water Engineering AG,
Ouvra Electrica Susasca Susch SA

Sediment load in 2020 in the small hydropower plant Susasca

Hard mineral particles transported in power waterways of medium- and high-head hydropower plants (HPPs) may cause considerable erosion damages on turbines. As a basis for optimized design and operation of such HPPs, a research project is conducted in the HPP Susasca, east of the Flüela pass in the Canton of Grisons, Switzerland. This small run-of-river HPP has an intake on the Susasca creek followed by two underground sand trap basins (Fig. 1). Over an elevation difference of 360 m, a penstock leads down to the power house with two Pelton turbines of 3 MW at the Inn river in Susch.

In the upper part of the catchment area, the Grialetsch Gletscher is on retreat (Fig. 2). According to the operator's experience, the sediment load has increased over the past years. This leads to more frequent flushing of the head pond and the sand trap basins as well as to increased turbine erosion. In May 2019, various instruments have been installed in the intake area to measure the suspended sediment concentration. Moreover, time series of measured water levels, discharges, sediment levels in the sand trap chambers etc. are available from the HPP's control system.

The primary goal of this thesis is to evaluate these data to quantify the water volumes and sediment loads in the creek and in the turbines in the year 2020. Furthermore, it shall be investigated how heavy rainfalls and the operation modes of the sand trap and the turbines affect the sediment load in the turbine water. In case of a master thesis, the sediment load shall be linked to the extent of turbine erosion and compared to other HPPs. Finally, recommendations on measures to mitigate the identified problems shall be elaborated.

Fig. 1: Intake of HPP Susasca (Source: Hydro-Solar Water Engineering AG)

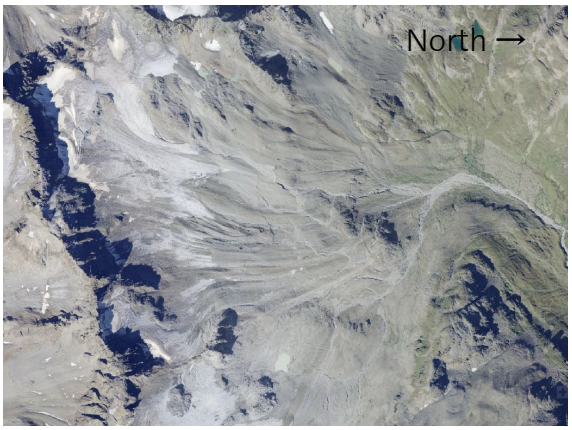

Fig. 2: Upper part of catchment area with high sediment yield (geoadmin.ch)

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Particularities: 1 student for Master Thesis, or up to 2 students for a Project Thesis; report in German or English