

**Project or Master thesis
FS 2020**

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Suspended sediment in the turbine water of HPP Fieschertal in 2019

Hard mineral particles transported in the water of rivers may cause considerable erosion damages on turbines of medium- and high-head hydropower plants (HPPs). As a contribution to optimize the design and operation of such HPPs, a multi-year research project is conducted at VAW to investigate the suspended sediment load (Fig. 1) and its consequences on Pelton turbines (Fig. 2).

In this thesis, data acquired at the HPP Fieschertal in the year 2019 shall be evaluated. The suspended sediment concentration (SSC) and the particle size distribution (PSD) have been measured at the penstock with a laser diffraction instrument. Moreover, turbidimeters, an acoustic method and vibrating tube densimetry were employed. The temporal variation of SSC and PSD in the turbine water shall be investigated, and linked to meteorological and operation conditions (e.g. rain intensity, air temperature, headwater level). Based on the results, recommendations for the suspended sediment monitoring and the operation of the HPP shall be formulated. For the treatment of the minute-by-minute measurement data, basic knowledge of suitable software (e.g. Matlab oder Python) are an advantage.

This case study offers the opportunity to get some insight into fine sediment management at HPPs, corresponding real-time measuring techniques and data treatment. These topics are expected to become more important in the future, both in Switzerland and worldwide.



Fig. 1: Wysswasser (left), downstream of HPP Fieschertal, at the confluence with the Rhone river, August 2010 (Foto: VAW)

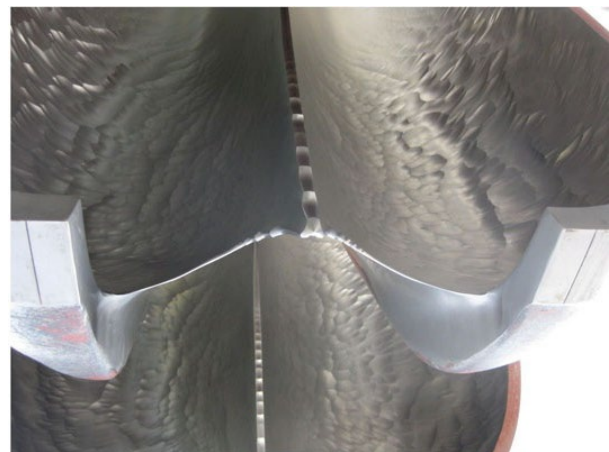


Fig. 2: Example of erosion damages on the runner buckets of a Pelton turbine (on display at Emosson dam, Foto: VAW)

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Particularities:

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