

**Master's thesis or Project work  
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# **Turbine erosion and efficiency reduction 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. For optimized design and operation of such HPPs, there is a need for more detailed field data on the extent of turbine erosion and corresponding reductions in turbine efficiency. Therefore, the sediment load, erosion on the turbine parts and the efficiency changes are monitored at HPP Susasca. This small run-of-river HPP is located east of the Flüela pass in the Canton of Grisons, Switzerland. From the intake on the Susasca creek (Fig. 1), a penstock leads down to the powerhouse with two Pelton turbines of 3 MW at the Inn river (Fig. 2). Operation data are available since the commissioning of the second turbine in 2015.

In the first task of this thesis, the erosion on the buckets of the Pelton turbine runners is quantified by applying an image analysis tool on systematic pictures taken over the years. In the second task, the changes in turbine efficiency are evaluated over the years based on operational data (discharge, electric output, etc.). For the first and second task, existing Python scripts can be used and potentially further developed. Finally, characteristic geometric values describing the erosion status of a runner are correlated with the efficiency reductions. The findings shall be compared with data from other HPPs reported in literature. This project offers the possibility to get insight in a topic of increasing importance based on a real case, and to contribute to the efficient use of the hydropower potential.



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



Fig. 2: Power house of HPP Susasca in Susch (Source: zek 2016)

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**Remarks:**

up to 2 students for a Project work or  
1 student for a Master's thesis;  
report in German or English; visit of the HPP  
and possibly field work can be organized