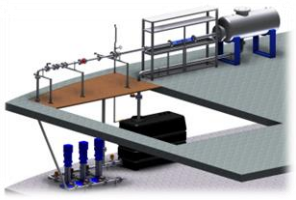
Our Competences in Hydroelectricity

In the heart of the Europe's water tower, The University of Applied Sciences of Western Switzerland – Sion (HES-SO // Valais-Wallis) dedicates an increasing part of its resources to renewable energies, in particular to the hydroelectricity.

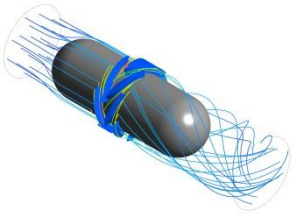
Applied Research and Development

Numerical simulations of flow and experimental measurements of different hydraulic systems of large- and small-power, in particular into the hydropower plants, starting from the water intake up to the tailrace channel: sand separators, penstocks and pipes, valves, turbines, pumps, diffusers:

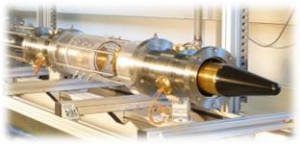
- Flow analysis using numerical simulation
- Development of new technologies for small-hydro applications
- Design of electrical driving systems
- Performance measurements
- Monitoring



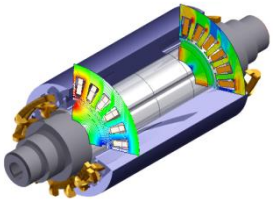
Hydraulic Test rig for small-hydro applications



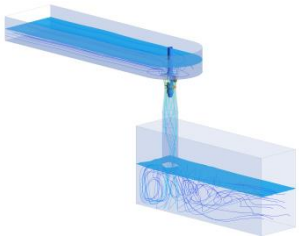
Numerical simulation of flow into a counter-rotating microturbine



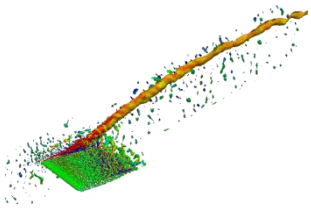
Counter-rotating micro-hydro turbine - Bulb version



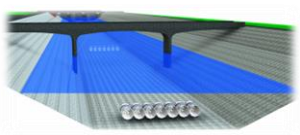
Electrical generator of the counter-rotating microturbine



Numerical simulation of flow into a full picoturbine



Numerical simulation of a Kaplan turbine tip vortex



Development of an isokinetic turbine for rivers

Labview interface for the monitoring of the microturbine

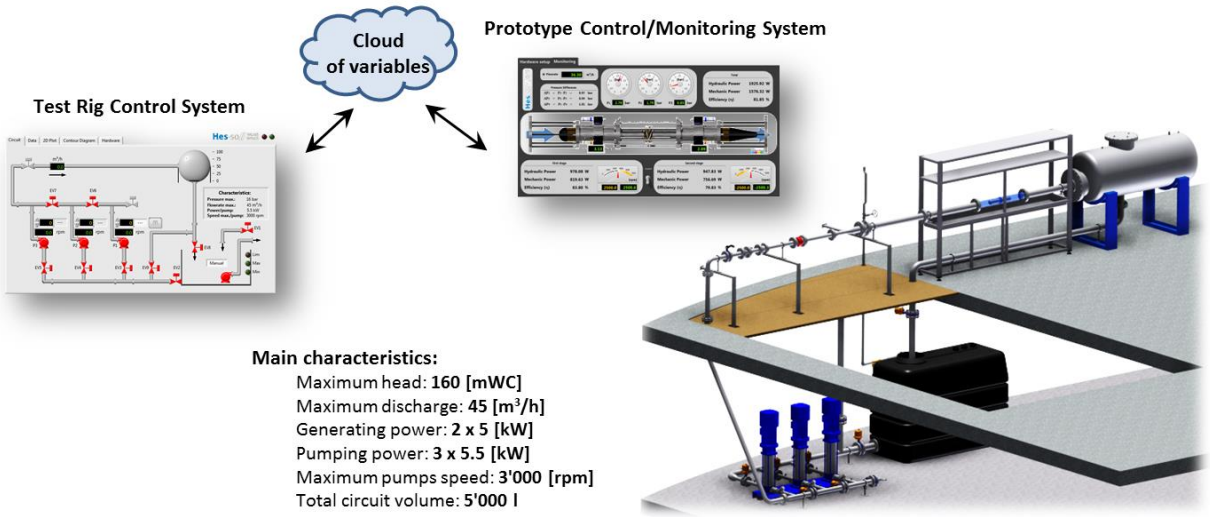
Teaching and training

- Reinforcement of the teaching of our future batchelor engineers into the renewable energy domain, in particular in the hydroelectricity, within the new "Energy and environmental techniques" branch
- Course of specialisation in hydraulics http://www.weiterbildung-hydro.ch/

Experimental Infrastructure

A new universal test rig has been installed in the hydraulic laboratory to assess the hydraulic performances of different types of small-power axial and radial-axial turbines and/or pumps (less than 15 kW), valves as well as other components of hydraulic systems, following the IEC* standard recommendations. Built on two floors of the hydraulic laboratory, the closed-loop circuit is supplied by three recirculating multistage centrifugal pumps (with variable speed and a power of 5.5 kW each) connected in parallel. The three pumps can deliver a maximum discharge of 45 m^3/h and a maximum pressure of 160 mWC. The pressurized reservoir placed downstream the test section allows simulating different implantation levels of the model and therefore recovering the cavitation performances as well.

The operation of the test rig is controlled with an automatic regulation system through a customized Labview® interface that allows for real-time measurement and display values of pumps speed, flow discharge, testing head, water temperature and Thoma number. The full capabilities of a National Instruments cRIO 9074 are used to run an autonomous regulation system based on real-time measurements in order to keep constant the value of the desired parameters (e.g. testing head, discharge, pumps speed, Thoma number, et al.). The communication between the hydraulic test rig and further measurements/monitoring systems (e.g. testing model control system) is based on a wireless architecture. In addition, the test rig control system manages a dedicated cloud of variables and makes them available for client systems, and ensures safe data centralization and storage on model testing.



Hydraulic test rig of the HES-SO Valais // Wallis - Sion

* International Electrotechnical Committee, 1999, "Hydraulic Turbines, Storage Pumps and Pump-Turbines – Model Acceptance Tests", International Standard IEC 60193, 2nd Edition