

Mhylab Laboratory Experimental Test Rig

An expert Laboratory

Using the experience it has acquired in performing laboratory tests, Mhylab is offering model tests for third parties.

Facility

Mhylab small hydro laboratory is based in Switzerland. Its test rig, dedicated to the development and model tests of hydraulic turbines, is located within Montcherand hydropower plant.

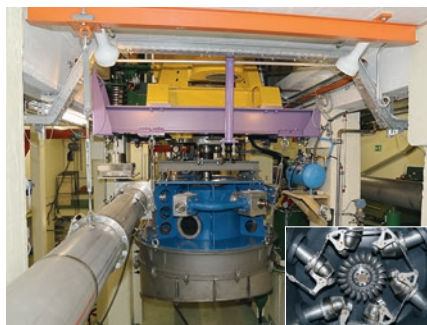
The modular test rig can be adapted in order to fit the following types of turbines:

- Pelton • Francis • Kaplan • Diagonal • Propeller



Depending on the turbine to be tested, two operating mode are possible:

- **Open circuit mode for impulse turbine testing:** the test rig is directly connected to the power plant penstock, the operating head is that of the hydropower plant, with a maximal head of 95 m. The maximal discharge is 80 l/s.
- **Closed circuit mode for reaction turbines testing:** the test rig is filled with the water coming from the penstock of the hydropower plant. The head is adjusted up to 50 m, using two 115 kW centrifugal pumps.



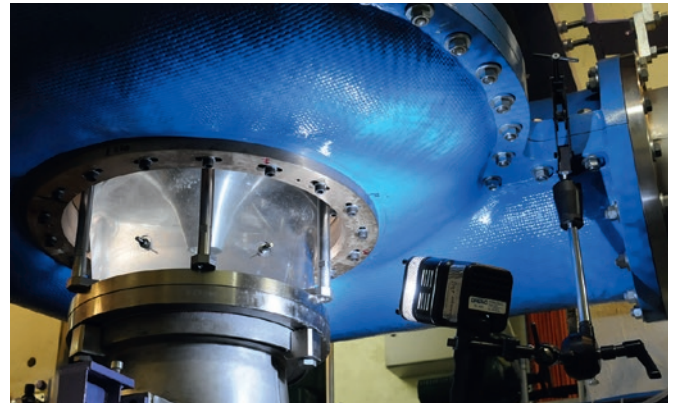
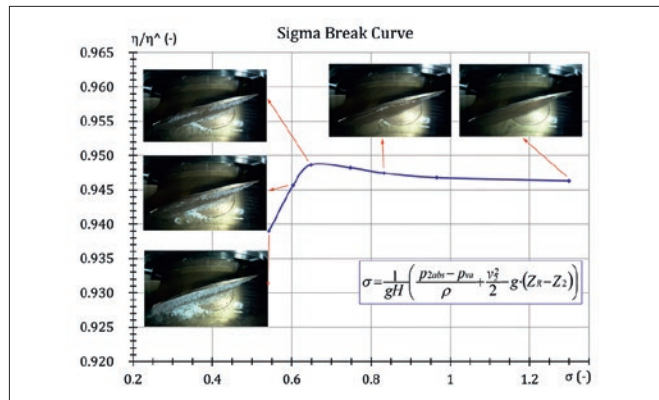
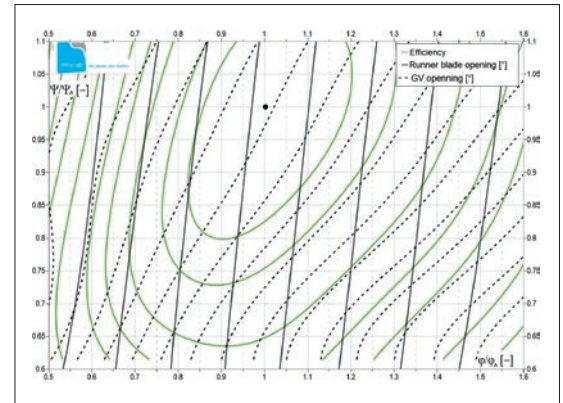
The characteristics of the test rig are summarized in the following table:

Specification	Closed circuit	Open circuit
Maximum head (m)	50	95
Maximum discharge (l/s)	450	80
Pumps power (kW)	2 x 115	–
Generator power (kW)	85	
Maximum speed (rpm)	2600	
Efficiency measurement accuracy	≤ 5 ‰	≤ 7 ‰



Model test scope of work

- Efficiency measurement
- Complete Hill Chart characterization
- Rope free zone limits and inter-blades vortices identification
- Inlet and outlet cavitation observations
- Sigma break curves measurement with photos and sketches
- Runaway speed determination
- Pressure pulsation measurements
- Guide vane torque measurements
- Runner blade torque measurements



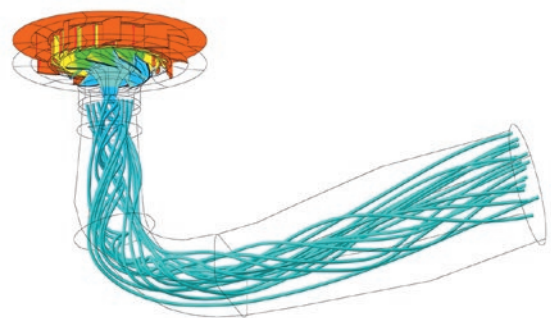
Measuring Equipment

- **Internal mechanical torque** is measured by a dynamometer following the basic primary measurement method as described in the IEC 60193;
- **Rotational speed** is measured with an electromagnetic pick-up sensor placed opposite a 120-tooth sprocket target wheel mounted on the dynamometer shaft;
- **Discharge** is measured by means of 3 nozzles and a diaphragm defined by the EN ISO 5167;
- **Specific hydraulic energy** is determined, as described in the IEC 60193, by measuring the pressure difference between the high and the low-pressure reference sections of the turbine;
- **Water temperature** is measured by means of a PT100 IEC B sensor.

The calibration of the measuring equipment follows the recommendations of the international standard IEC 60193.

Hydraulic Design Support

Mhylab is your partner for the design and development of hydro turbines. Based on our successful experience, we are able to propose you our approach based on the combination of CDF analysis/optimization and model tests. We can guide you through the development steps for a fast and satisfactory result.



About Us

Mhylab is a competence center for small hydro, proposing tailor made solutions for turbine manufacturers, independent operators, consulting engineers, utilities, local authorities and non-governmental organizations. As a non-profit-making foundation, Mhylab is independent

of all manufacturers and industrial groups. Its services guarantee you objective and optimum consideration. Above all, it is also the intelligent solution for instilling authenticity and effectiveness into the expression "sustainable development".