The only means to accurately define and optimise the efficiency of plants and assemblies are specific efficiency measurements.

With its expertise in thermodynamic efficiency measurements the Institute of Hydraulic Fluid Machinery (HFM) at the Graz University of Technology – as an independent research institution – is able to offer operators of hydro power plants and industrial clients an accurate tool for the analysis of turbine, pump and pump turbine efficiencies. Highly precise and reliable measurement results provide the basis for acceptance and approval measurements, plant evaluations, optimisations and the calibration of integrated flow rate measurement equipment. Improvements in plant efficiency provide higher profits, lower costs and competitive advantages.

Univ.-Prof. Dr. Helmut Jaberg, TU Graz
Head of the Institute of Hydraulic Fluid Machinery (HFM) and Head of the study programme ‘Master of engineering – hydropower’
Independent expertise in measurements

The Institute of Hydraulic Fluid Machinery (HFM) at the Graz University of Technology with its many years of experience is one of the leading experts for hydraulic issues in application-oriented mechanical engineering: turbines, pumps and pump systems.

As part of the Graz University of Technology we are a totally independent institution. Benefit from our know-how and get a neutral, unbiased and reliable assessment of your plant.

Measurements according to IEC standards

All our efficiency measurements are based on internationally acknowledged IEC standards (International Electrotechnical Commission).

- Field acceptance tests to determine the hydraulic performance of hydraulic fluid machinery (turbines, pumps) are realised according to the standard IEC 60041.
- For measurements on small hydro power plants additionally IEC 62006, especially developed for such purposes, is applied.

Our measurement system conforming to the applicable standards comprises an online visualisation device to indicate the efficiency development during the measuring process thus providing the highest levels of traceability and accuracy. The downtime of a plant necessary for the implementation of the measurements can be minimised and expensive follow-up measurements can be avoided.

Targets

The identification of efficiencies is an essential part during the analysis and optimisation process of existing hydropower or industrial plants as it provides the necessary data for an exact determination of a plant’s profitability (RoI – Return on Investment).

- Verification (review/authentication) of plant specifications guaranteed by a manufacturer by means of acceptance/approval measurements
- Identification of decreases in efficiency and of necessary maintenance, repair and replacement works
- Verifications before and after comprehensive revision and repair works
- Inventory of the current situation in order to set out optimisation potential
- Inspection and calibration of integrated measurement equipment
- Trouble shooting in the event of oscillations, pressure fluctuations and noise emissions
Plant efficiency

By means of the so-called thermodynamic method, the absolute efficiency of a plant can be accurately defined within the performance range of kilowatt sizes up to multi-digit megawatt sizes.

Method

The measuring procedure is based on the flow losses in a turbine or pump. The minimum increase of the tail water temperature can be measured within a range of a thousandth of one degree Celsius. As the maximum error in measuring the temperature difference is 0,001 °C, efficiency can be determined with an uncertainty of only 0,4%.

Preparation and measurement campaign

The planning and the performing of the measurements are realised together with the client whereas the determination of the point of connection for the sensors is essential for measurement accuracy. All necessary fixtures, installations and auxiliary devices can be designed and manufactured by our institute.

Analysis

The first evaluation of the measurement results is already carried out on site. The final measurement report consists of measurement logs, graphical presentations of the measurement results, such as e.g. the hydraulic turbine efficiency in reference to the performance or the flow rate, or considerations on systematic and random errors at certain measuring points.