ANDRITZ Hydro

Service and Rehabilitation

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ANDRITZ HYDRO

Modernization and renewal

About 50% of the primary and secondary technologies installed in hydropower plants all over the world are more than 40 years old. Therefore, the market is increasingly being driven by modernization and upgrading of existing hydropower plants.

The ANDRITZ GROUP is a global market leader for electromechanical equipment and services for the hydropower, pulp and paper, metals, and other industries (solid/liquid separation, feed and biofuel). The group is headquartered in Graz, Austria and has a staff of approximately 17,000 worldwide. ANDRITZ operates more than 180 production sites, service and sales companies around the world.

In a world trying to reduce emissions of greenhouse gases and pollutants, ANDRITZ HYDRO supports its customers, environmental efforts by providing technologies that maximize the generation of energy from hydropower.

Hydropower is by far the most important renewable energy resource. According to the IEA (International Energy Agency), only a third of hydropower potential has been developed. A large number of new hydropower projects are to be expected in the future.

The ANDRITZ HYDRO Service & Rehab Division is specialized in optimization of existing operations and maintenance of hydropower equipment. The division supports the customers in reaching their goals — maximization of energy production yield, increase of competitiveness, and generation of sustainable value.

All individual customer requirements are supplied with individual solutions meeting the technical, economic, and legal requirements. The range of products and services includes components and spare parts supply, complete automation packages, installation services, short-term repairs and modifications, inspections and overhauls, residual life analysis, risk assessment, feasibility studies, training, rehabilitation, modernization, and upgrades.

Highlights

- More than 170 years of experience in turbine design, including over 30,000 units with more than 300,000 MW installed
- More than 120 years of experience with electrical equipment
- Complete range up to 800 MW/unit
- Leader in service and rehabilitation
- World leader for small hydropower plants

Service and rehabilitation

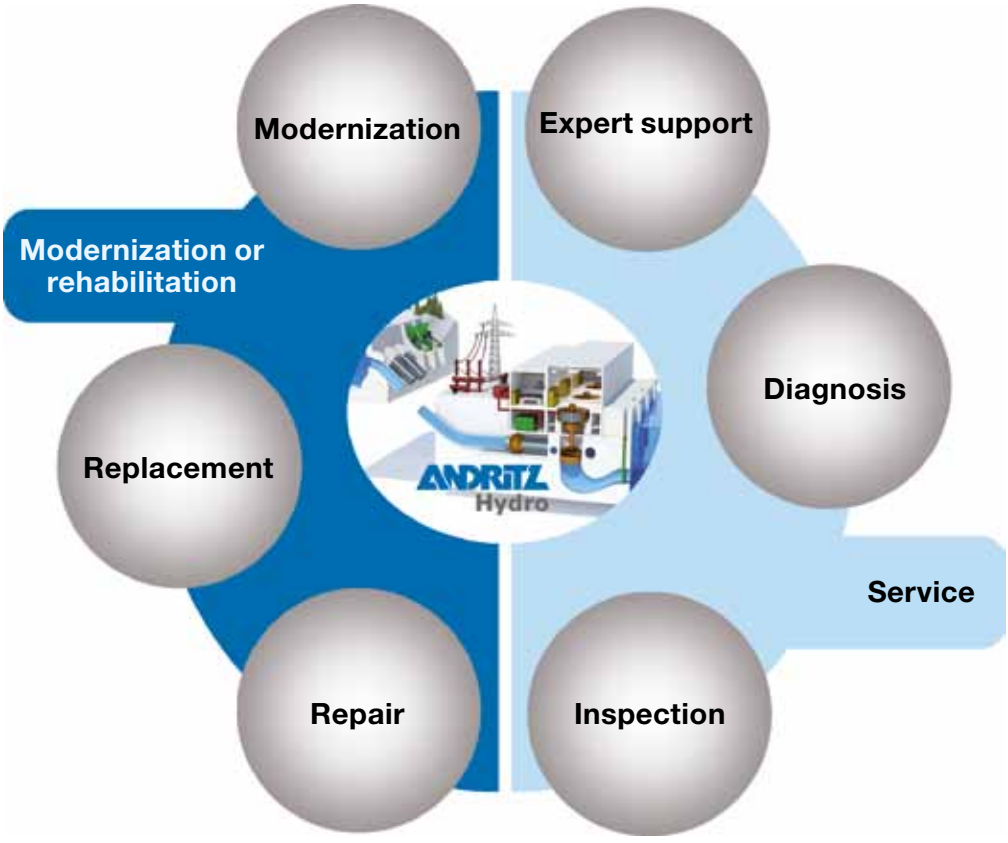
Life-cycle service

We develop service and rehabilitation solutions to achieve maximum customer benefit and return on investment, based upon energy market development, customer goals and plant conditions. Service leads to higher profitability and value through the continuous improvement of the asset management. Rehabilitation leads to higher profitability and value through a single intervention, extending the residual life and/or implementing state-of-the-art technology.

Highlights

- Technological leadership
- Customer orientation
- Proximity to our customers
- Long-term experience
- Understanding of generation process
- Process oriented project management
- Competent supplier of core components
- Water to wire system competence available
- Worldwide qualified supplier base

ANDRITZ HYDRO is a full life-cycle service provider in hydropower



Products and services

Turbines

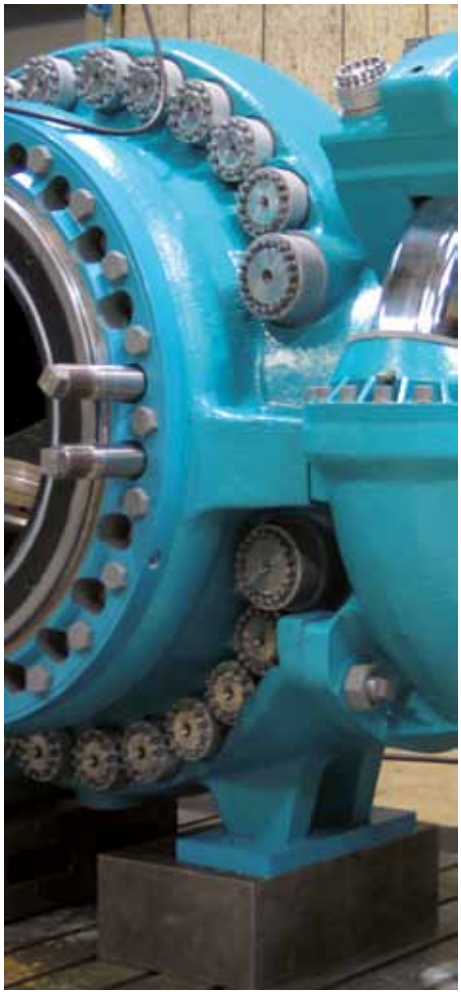
- Pelton turbines
- Francis turbines
- Kaplan turbines
- Bulb turbines
- Pump turbines
- Pumps
- Major turbine overhaul
- Modernization of own fleets equipment as well as other original equipment manufacturers
- Implementation of new health/safety/environmental requirements

Generators

- High voltage synchronous generators (vertical or horizontal type of all speeds)
- Modernization/replacement of active parts such as:
  - stator windings (coils or bars)
  - poles
  - pole winding or
  - pole winding re-insulation
  - new stator core
- Modernization of own fleets equipment as well as other original equipment manufacturers
- Implementation of new health/safety/environmental requirements

Research and development

- Hydraulic, mechanical, and electrical design optimization
- Transient hydraulic and electrical system simulation
- Secondary equipment
- Measurement technology at site and in the laboratories
- Fingerprint measurements and root cause analysis
- Coating technology
- High-end simulation methods and software packages
- Powerful computing centers
- Bearing test rig
- High voltage test center
- Hydraulic laboratories (Austria, Brazil, Canada, Finland, and Switzerland)



Automation
- Automation and control
- Mechanical protection
- Electrical protection
- Excitation system (static/brushless)
- SCADA system
- Online monitoring and diagnosis system
- Power plant management (including third party modules)

Electrical equipment
- Customized solutions and services for all electrical systems in the power plant
- Complete product range — from low voltage up to high voltage switchyards, including auxiliary equipment

Valves
Rehabilitation of:
- Spherical valves
- Butterfly valves
- Relief valves
- Ring sleeve valves
- Gate valves

Penstock and gates
Rehabilitation/modernization of:
- All types of gates (roller, flap, radial, or sliding) including electrical and hydraulic equipment
- Trashracks
- Stoplocks
- Penstocks
- Draft tubes

Services
- Spare parts management
- Minor/major overhaul
- Inspections
- Field services
- Repairs
- Maintenance
- Plant assessments
- Expert support
- Feasibility studies
- Risk assessments
- Training
- Life-cycle analysis
- Fault analysis and trouble shooting

Preserve your assets

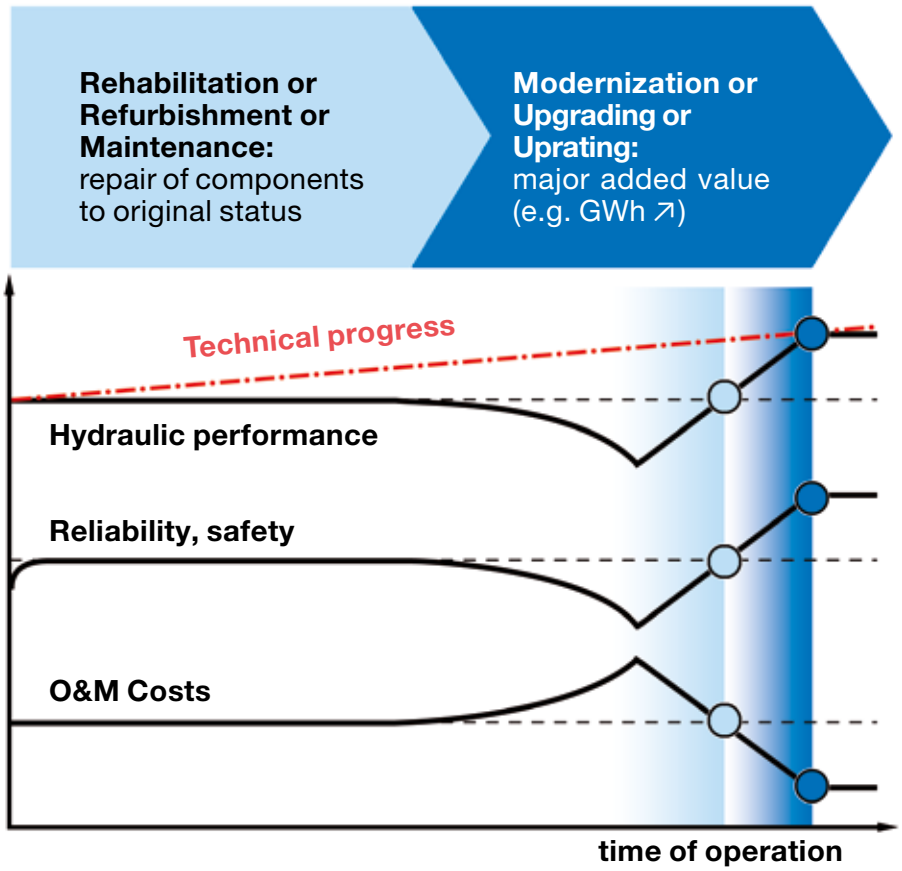
Rehabilitation, upgrading, and modernization

Hydropower currently meets about 16% of the world's electricity needs. Most mid-term scenarios predict that power needs will be primarily met by a combination of various new, renewable, and fossil fuel resources. According to current forecasts, awareness of global warming will lead to continuous growth of the demand for hydropower – the best proven and most developed form of renewable energy. Up to now only about 30% of global hydropower resources have been developed.

On the other hand, about 50% of the primary and secondary equipment/systems installed in hydro power plants all over the world is more than 40 years old. Control and operation requirements of hydro plants are continuously growing to meet modern grid requirements. Rehabilitation of existing power plants is essential for future grid stability. Our customers place great importance on sustainability. Their sustainability strategies are based on installation of modern, environmentally friendly technologies and processes. No matter how different the individual customer requirements, they are always combined with individual solutions meeting the technical, economic, and legal requirements of their markets.

Highlights

- Improved power generation through optimal utilization of available water resources
- Increased revenues from power generation
- Reduced service and maintenance costs
- Reduced risks of standstill and unplanned maintenance
- Improved/maintained reliability and availability of the plant
- Life-cycle analysis due to changed operating conditions
- Improved health and safety on plant
- Compliance with environmental regulations secured



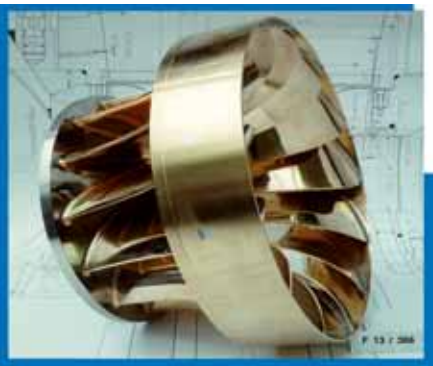
The “Three-Phase Approach”

As a result of the long-term operation of hydro-electric power plants (HEPPs) the reliability, availability, hydraulic performance, and consequently the earnings are decreasing and the operation and maintenance (O&M) costs are increasing. When specific components of HEPPs are near the end of their service life, modernization of the entire plant becomes inevitable.

Modernization is a very complex issue, and the aging of the various plant components and systems depends on environmental and ambient conditions. Based on many years of experience and work, ANDRITZ HYDRO has developed a structured process for assessing and modernizing HEPPs in the most economic way. This systematic approach ensures tailor made solutions which guarantee the maximum benefit for the owners.

Highlights

- Damage analysis
- Natural frequency analysis
- Rotor dynamics
- Optimization of power plant



Diagnosis:

Register, assess, and weigh up all project-related parameters

Analysis:

Develop and evaluate suitable modernization scenarios

Therapy:

Implement the optimum modernization solution

Modernization process

Research and Development

ANDRITZ HYDRO has more than 170 years of experience with the design and development of hydropower technology. Due to the changing market conditions, customer requirements, and technological developments, there are still many challenges for Research and Development (R&D), comprises turbine technology, generator technology, automation, and pump technology.

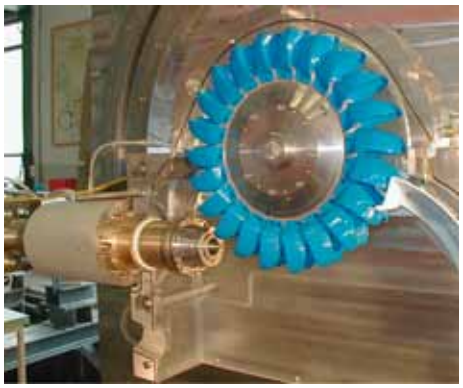
Flexibility of operation and robustness of the electromechanical equipment over a long life-cycle are today's major challenges. Therefore, the research activities of ANDRITZ HYDRO are targeted at the integrated optimization of hydraulic, mechanical, and electrical performance. This is achieved by developing and applying new numerical simulation methods and by measurements, both on the test rigs and on site.

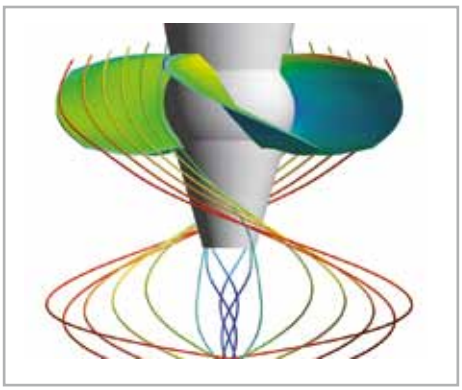
ANDRITZ HYDRO has various laboratories and test rigs available, like coating test rigs in its wear lab, the hydraulic test rigs in its hydraulic laboratories, as well as a high voltage test rig and a bearing test rig. Simulations are carried out for fluid dynamics, mechanics, heat transfer, and electro-magnetic processes as well as dynamic behavior of the hydraulic-electrical system as a whole, with the most modern software and high performance hardware. R&D in the automation business is integrating the most recent technologies of the IT and telecommunication industry. ANDRITZ HYDRO's Computer Aided Engineering (CAE) together with its excellent measurement technology guarantees successful product development and brings our customers great benefits.

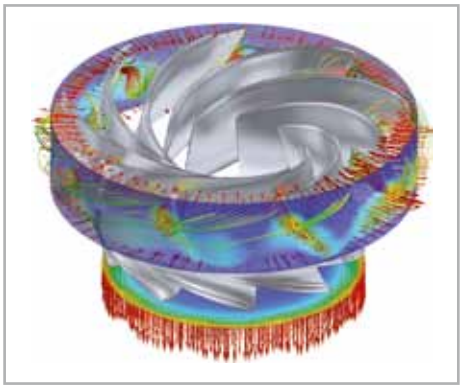
For refurbishment projects, the interdisciplinary approach of ANDRITZ HYDRO's R&D Department is especially important. We provide a thorough analysis of the existing machine and various modernization scenarios, enabling an optimal solution to be developed.

In order to meet future challenges, the R&D of ANDRITZ HYDRO is dedicated to new products, new product properties, as well as manufacturing methods.

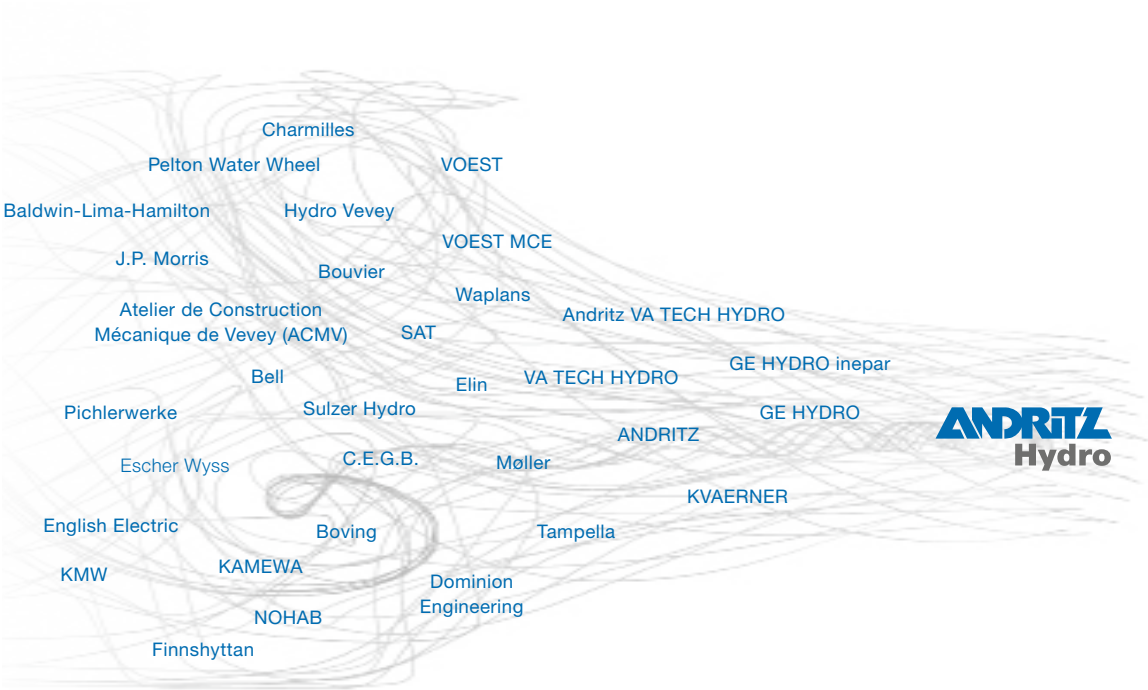
Research in the fields of coating and materials technology, fluid dynamics, structural mechanics and electrical design, that takes place in universities, is being directly utilized through research cooperation with partners all over the world.

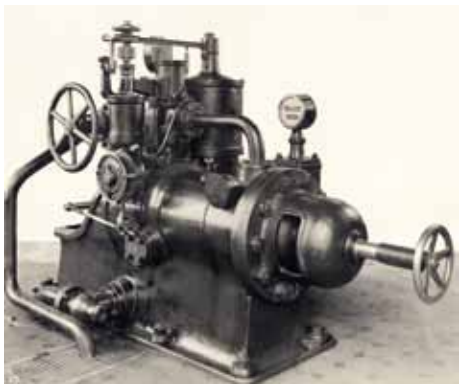






170 years of history





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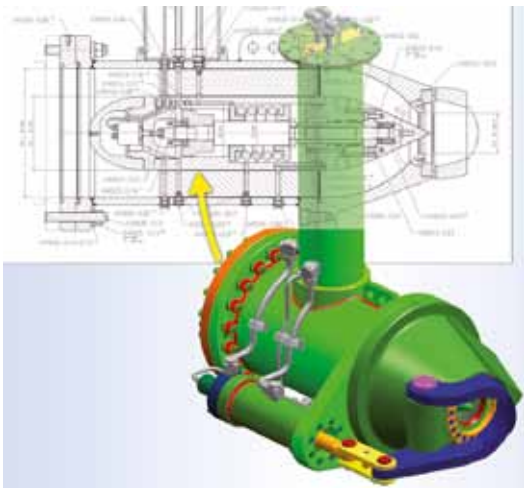


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