

Small Hydro solutions from one single source





**Voith Hydro – Innovation
with experience**



The application of renewable energies for eco-friendly power generation is a key concern of worldwide energy-political strategies. In this context, small hydropower stations are gaining more and more importance. With our experience and know-how we can help you to unlock the potential that lies in the development of this form of energy generation economically and, at the same time, with minimum impact on the environment.

Voith Small Hydro

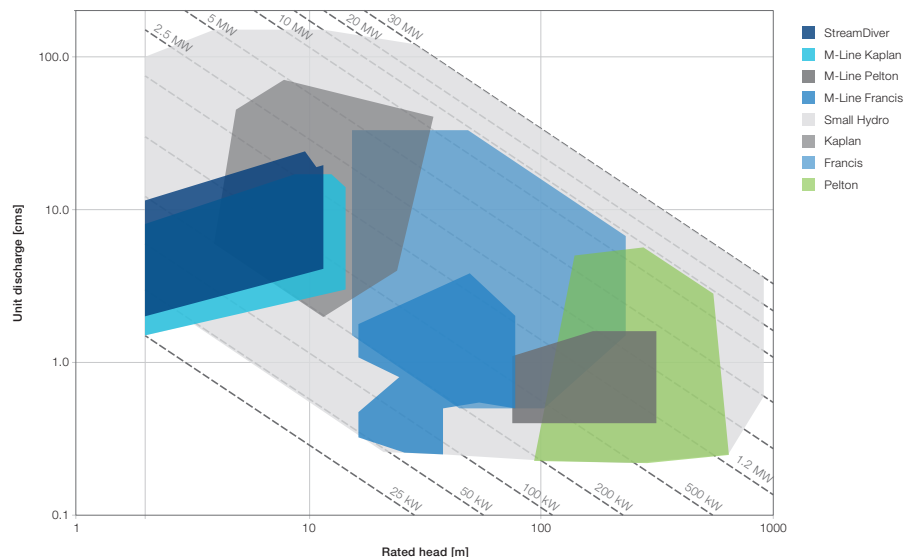
Voith Small Hydro in Austria complements the portfolio in the range up to 15 MW and combines comprehensive expertise in turbine and model development as well as service offerings for small hydroelectric power stations under one roof. The extensive experience in this field makes Voith Small Hydro a reliable partner in the small hydroelectric power industry.

Our corporate philosophy

Investment in research and development are the foundations of the success of our company – now and in the future. Our activities are firmly oriented on the existing and future requirements of our customers.

Flexibility when dealing with individual customer demands, on-schedule delivery and services across the entire service life of any power stations are our highest priority. Therefore, we make an active contribution to eco-friendly generation from hydropower.

Application range Voith Small Hydro



Competence in Small Hydro

We develop solutions that enable high efficiency in generating electricity from hydropower for our customers.

Efficient solutions for small hydropower stations

Our innovative, standardized concepts ensure the highest possible degree of economy of the delivered equipment. Our optimum price-performance ratio results from the application of state-of-the-art technologies and our targeted orientation on the specific requirements of the operators of small hydropower stations:

- Clearly defined scope of delivery
- High availability
- Trouble-free operation
- Low operating costs
- Fast pay-back period

Our range of products and services:

- Standardized turbine concepts up to individual solutions
- Economical, constructive solutions with high operating safety
- Integrated designs with optimized interfaces
- Solutions that keep construction costs at the lowest possible level
- Concepts with high efficiencies and corresponding performance guarantees
- Maximum reliability due to strict quality controls
- Eco-compliant solutions
- Competent commissioning of all systems
- Training of operating and service personnel
- After sales service

Our solutions combine all requirements on:

- Maximum safety and high availability
- Long service life and continuous further development
- Proven solutions and innovative technology
- Clear standards and maximum flexibility



Research and development

The name Voith Hydro has always been synonymous with comprehensive research and development activities in the small hydro market.

The Voith Hydro research and development department has been developing solutions for hydropower for more than 100 years as a pioneering institution in this particular field.

The solutions and expert know-how of this research laboratory are available to all units as “Central Technology” within a global network.

Since 1908, the Brunnenmühle has been Voith Hydro’s world-wide research and development center for hydropower. The Brunnenmühle applies the highest standards to all model tests carried out on its premises. It is considered a guarantor for the development of state-of-the-art research and development tools and processes – not just for large turbines but also for small hydro.

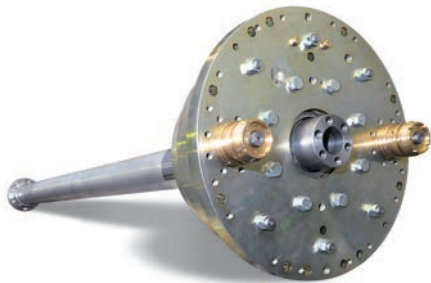




Excellent specialized knowledge and long-term expertise

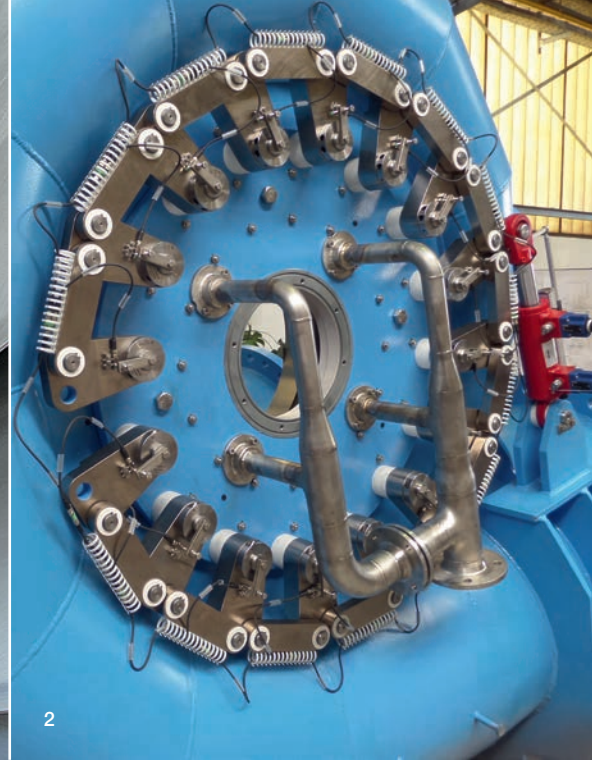
The long-standing experience and high craftsmanship of our employees ensures that we always meet our own strict quality standards and those of our customers. The Voith team is firmly committed to innovative development technologies and the highest level of precision.

The highly qualified team at Voith Hydro ensures the precise implementation of developed concepts through expertise and many years of experience – starting from the careful selection of the best materials to internal quality controls and professional on-site assembly.



Voith Hydro is certified in the principles of the quality management system ISO 9001:2000. Specially trained and audited employees are responsible for ongoing quality assurance.

All products are controlled on the basis of strict quality standards – which can always be expanded in accordance with customer requests. The consistent adherence to the quality regulations of the latest EN, DIN and IEC norms is a matter of course for us.



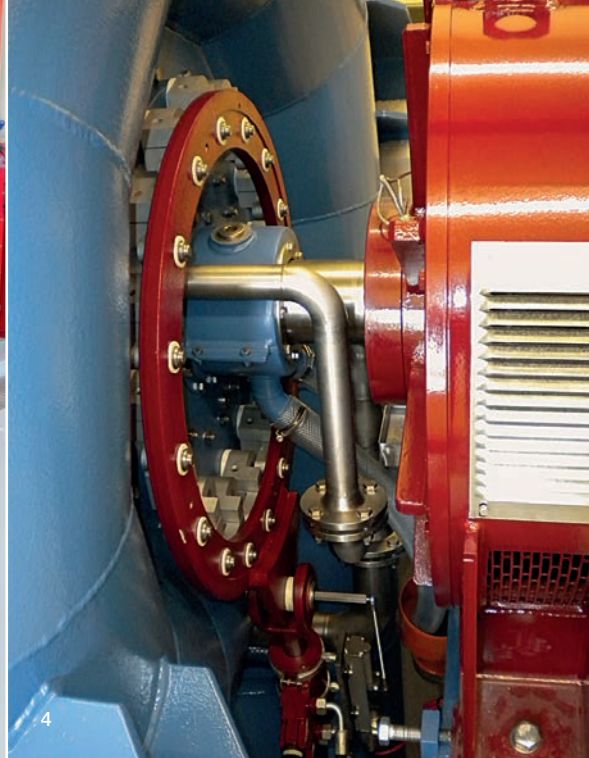
Francis turbines

Reliable turbine for low to medium heads.

Francis turbines are primarily used in run-of-river power stations and pumped storage power plants with medium flow volumes. They stand out with their optimum efficiency and high speed ranges.

Voith Hydro develops and produces Francis turbines as spiral turbines, which can be used both in horizontal and vertical designs.

The runner is often installed directly to the generator shaft, which results in optimum compactness and low maintenance requirements.



- 1 Francis runner – latest design
- 2 Works assembly
- 3+4 Installed power station

Francis turbine



Technical information

Types

- Spiral turbines for medium to large heads
- Designed as horizontal or vertical shaft spiral case turbines

Output

up to 15 MW

Heads

up to 250 m

Runner diameter

up to 2.5 m



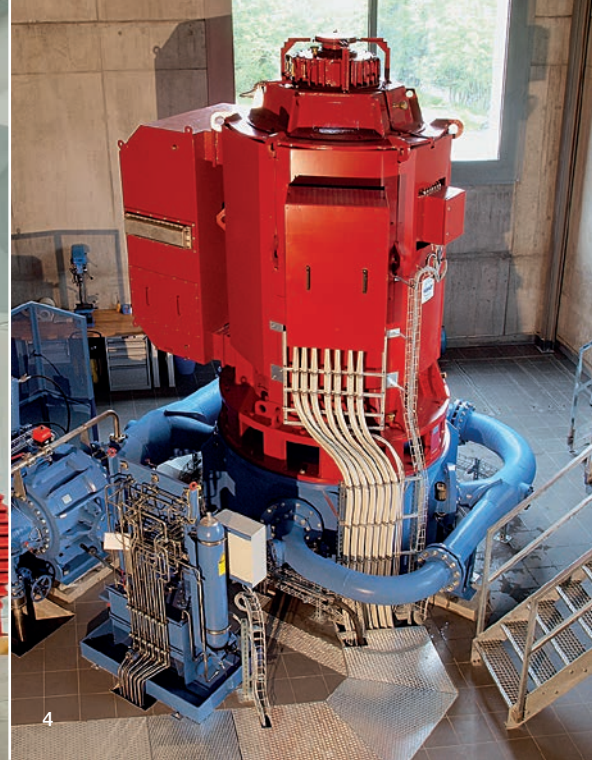
Pelton turbines

The ideal turbine type for large heads.

Pelton turbines are mainly used for applications with large heads and low water volumes. This turbine type can achieve optimum efficiencies even with fluctuating water supplies, since the number of nozzles can be individually adapted.

Pelton turbine buckets are frequently subjected to load changes and abrasion. To achieve the highest resilience of the turbine buckets, we rely on specially milled Pelton runners as well as elaborate manufacturing processes such as hard coating, with special attention to quality and precision.

Be it horizontal or vertical design, one or up to six nozzles, internal or external control, Voith Hydro develops and designs the Pelton turbine that is most suited to individual requirements – and ideally complies with the existing operating conditions.



- 1 Pelton runner
- 2 Horizontal Pelton turbine
- 3 Installed, horizontal Pelton turbine
- 4 Installed, vertical Pelton turbine

Pelton turbine



Technical Information

Types	Horizontal or vertical construction with one to six nozzles
Output	up to 15 MW
Heads	up to 1 200 m
Runner diameter	up to 2.5 m



Kaplan turbines

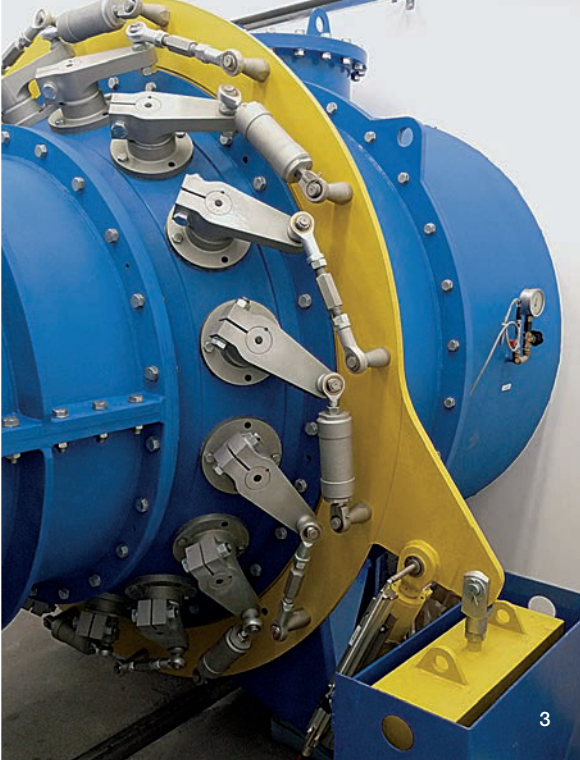
The optimum turbine for low-pressure applications with high water volumes.

Based on the Francis turbine, Victor Kaplan designed the Kaplan turbine between 1910 and 1913, which was first utilized by Voith Hydro in 1922. It is primarily installed in plants with low heads and larger water volumes. This turbine type can also be applied as a run-of-river power station.

Since the guide vane and the runner can be controlled separately, Kaplan turbines are able to utilize even strongly

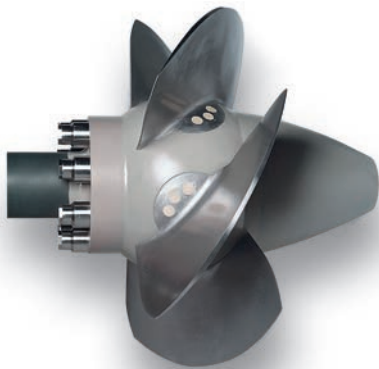
fluctuating water supplies. This control technology ensures very high efficiencies.

Voith Hydro supplies Kaplan turbines in vertical design in concrete with a steel spiral or as horizontal bulb turbines in a wide variety of shapes with three, four, five or six blades. The drive to the generator occurs preferably via a direct connection or, in certain cases, via flat belts or gearboxes.



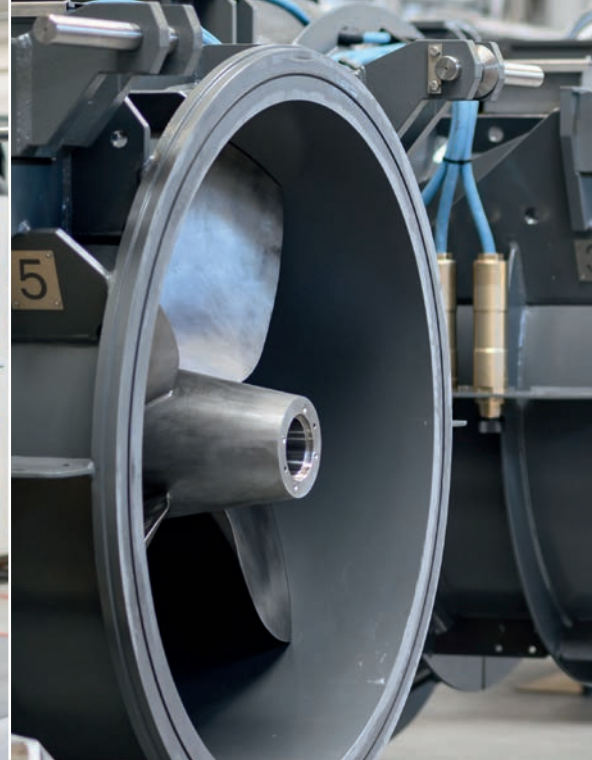
- 1 Kaplan runner
- 2 Commissioning of a hydropower station
- 3 Bulb turbine
- 4 Finished hydropower station

Kaplan turbine



Technical Information

Types	Bulb turbines, vertical Kaplan turbines and Kaplan spiral turbines
Output	up to 5 MW
Heads	up to 35 m
Runner diameter	up to 3 m



StreamDiver

Innovative turbine technology setting new economical and ecological standards.

All over the world there are run-of-river schemes with low heads whose high energetic potential could thus far not be utilized. The StreamDiver ideally meets the demands for economy and ecology needed by these plants.

The innovative technical concept of the StreamDiver ensures minimum maintenance and service work. As it can be directly installed into a weir system, its installation can even render conventional power station structures unnecessary. Construction technology and peripheral equipment can thus be reduced to an absolute minimum.

The StreamDiver is a compact turbine and can be used for modular extensions as a minimum-flow turbine or as an alternative to existing small hydro power stations.

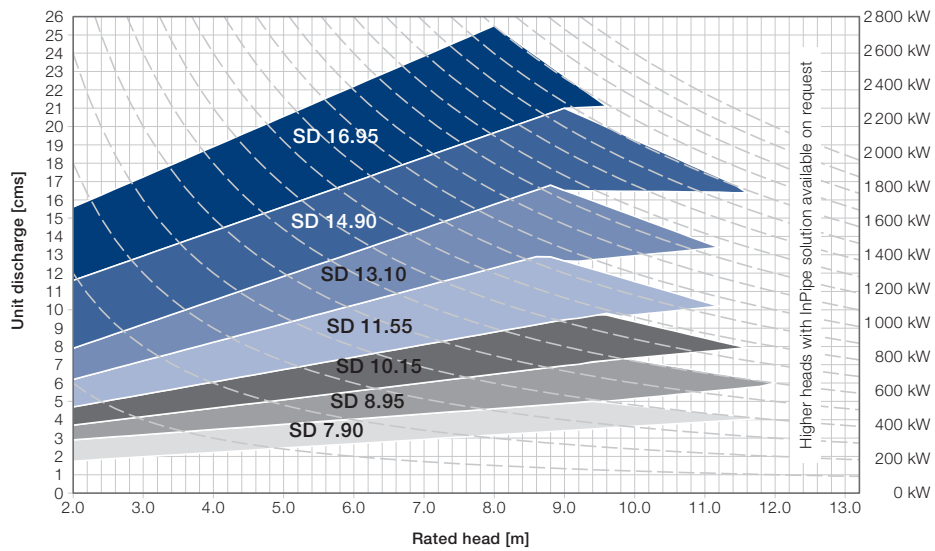
Apart from economical aspects, the development of the StreamDiver focuses strongly on ecological considerations. The bearings of this new development are water-lubricated. As a result, the compact turbine can be operated without any oil or grease.

Advantages of the StreamDiver

- + Shortened project time compared with conventional solutions
 - + Reduction of construction costs up to 40 %
 - + Easy integration into existing weirs or dams
 - + Minimal operating and maintenance costs
 - + Ecologically advantages due to water-lubricated bearings and thus oil and grease-free operation
 - + Water-flooded generators, no leakage risk
 - + Submerged installation, low visual and acoustic disturbance
 - + Can be assembled very quickly due to underwater plug and suspension
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Application areas of the StreamDiver modules

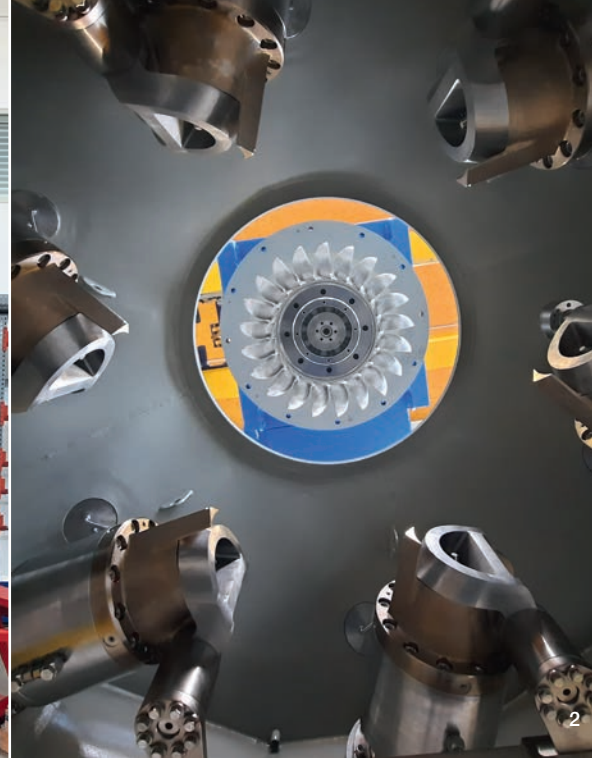


M-Line – Modular line for Small Hydro solutions at Voith Hydro

In many respects Small Hydro requires smart and innovative as well as holistic concepts to find the best solution for a specific site and save time and costs on all aspects of the project.

The M-Line is defined as a simplified, largely standardized turbine-generator unit including auxiliary systems. The system is pre-assembled and delivered to the power station as a compact, 'ready-to-use' unit. This allows quick installation and commissioning on-site. In combination with the electrical equipment, the M-Line thus represents a comprehensive 'water-to-wire' system – compact and reliable.

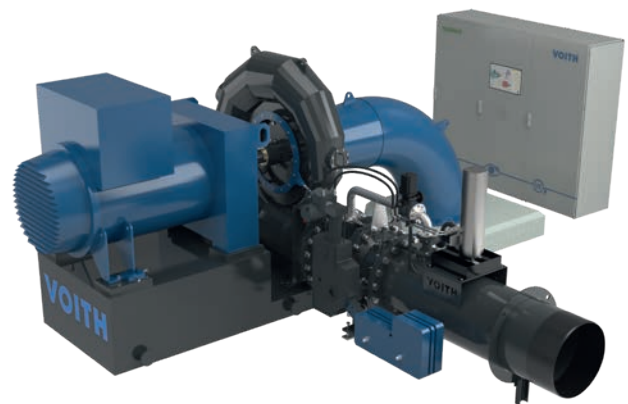
The turbine hydraulics used are equivalent to those in larger hydropower stations, ensuring excellent performance and high investment security. All components and manufacturing processes naturally undergo our stringent quality control.

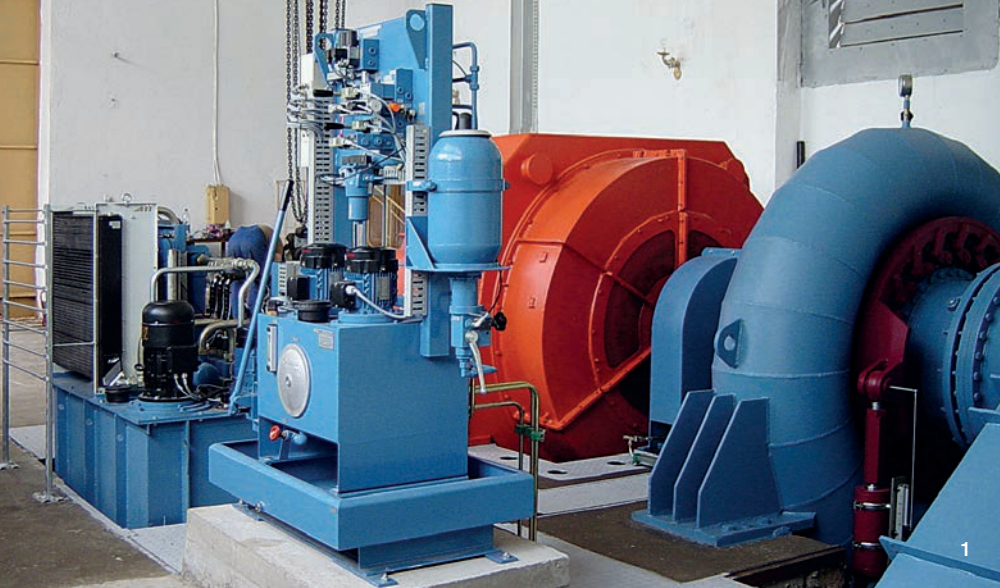


Advantages of M-Line turbines

- + Short delivery time
- + Proven Voith Hydro quality
- + Easy viability check via application diagram
- + Minimum power house dimensions
- + Simplified power house design that saves building costs
- + Reduced installation and startup times using pre-assembled modules
- + e-BoP will be included

M-Line Francis





Service, maintenance and upgrades HyService

For Voith Hydro, customer service does not end with the handover of the power station. We accompany you with our service specialists across the entire life cycle of your power station.

HyService covers the full service of everyday operation, annual maintenance, provision of original spare parts and fast assistance in the event of failures. We know that standstill of a hydropower station means financial loss. Therefore, we react promptly, flexibly and efficiently whenever required in order to keep downtimes as low as possible.

The latest control systems from Voith Hydro allow remote diagnosis of your power station. For older plants we recommend retrofitting a remote maintenance module. If failures cannot be externally eliminated despite these facilities, our service technicians are quickly on site, in order to ensure that operation can be resumed as soon as possible.

Depending on their construction and operating conditions, power stations have life cycles spanning many decades. Therefore, Voith Hydro also offers individual service for general overhauls of older plants. A conversion to lubrication-free bearings, the restoration of the original hydraulic contours and special coatings, for example, can significantly increase life cycles and efficiencies.

A performance and efficiency analysis by Voith Hydro will point out existing potentials and improvement possibilities.



- 1 Automation of Francis spiral turbine
- 2 Power station modernization
- 3 Spare runner

We are regularly informed about the latest developments in the field of hydropower. And of course we utilize this expertise also for small hydropower stations.

Voith Hydro service offers comprehensive solutions from maintenance in current operation to emergency services and upgrades. With our range of services, we ensure productivity for your small hydropower stations.

Historic display instruments



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