

Voith Hydro Shanghai Your Reliable Partner for Complete Hydropower Solutions

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A Voith and Siemens Company

VOITH
Engineered Reliability





PART OF THE VOITH GROUP **3**
 One of Germany's most renowned companies

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 Introducing our values and strengths

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 Delivering customized solutions for hydroelectric power

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Three Gorges, San Xia



Part of the Voith group

Voith Hydro Shanghai is part of one of Germany's most renowned companies in the engineering industry.

Voith Hydro Shanghai

The Shanghai operating unit is Voith Hydro's largest manufacturing base in the eastern hemisphere. It was established in 1994 by Voith, Siemens and Shanghai Electrical Corporation. Today, Voith Hydro Shanghai is a complete full-line supplier for hydropower plants. We do not only offer engineering, production, assembly and commissioning, we also provide a life-cycle partnership including maintenance, upgrading and modernization. Our portfolio covers the development and manufacturing of a wide variety of turbines and generators.

Voith Hydro

Voith Hydro is a group division of Voith. With over 5,000 employees and an order volume of more than one billion Euro per year, Voith is one of the world-wide leading suppliers in the hydropower industry. As a result of being an integral part of Voith Hydro, we are able to utilize the comprehensive technological know-how of the group. Long-standing experience and continuous investments have resulted in advanced excellent products for the hydropower plants of our customers.

Voith

The Voith group is one of the biggest family-owned companies in Europe and counts as a market-leader in engineering. It sets standards in the markets energy, oil & gas, paper, raw materials and transportation & automotive. Founded in 1867, Voith today employs more than 43,000 people, generates € 5,7 billion in sales and operates in about 50 countries around the world. Over a period of more than 145 years, the company has been writing engineering history.

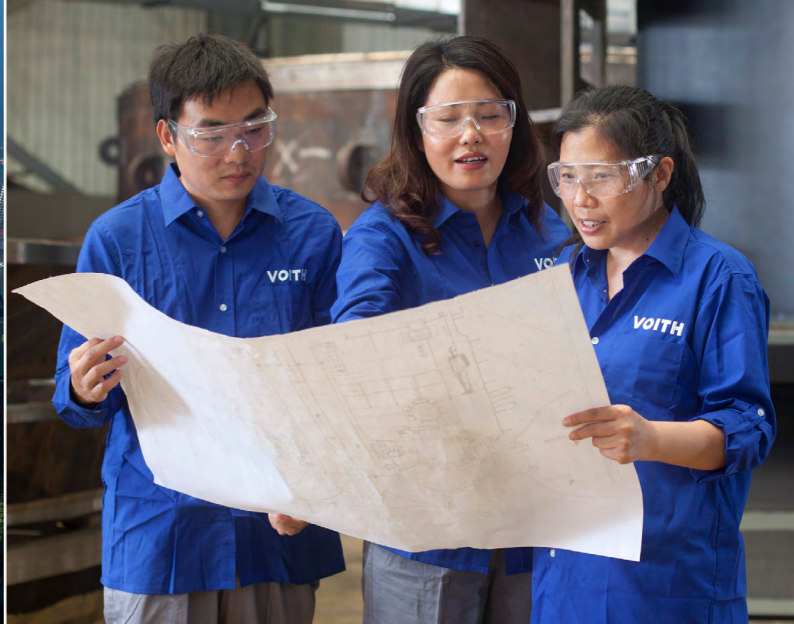
Philosophy

Our guiding principles give us a stable framework for successful operations - in the past, now and in the future.

Our goal is to be our customers' preferred business partner and we intend to set benchmarks in our industry. Engineered Reliability is our guiding principle. It summarizes our set of values and encompasses our aspiration to contribute to the positive, sustainable development of societies and national economies. We intend to achieve this by offering reliable and high-quality

technologies. We are proud of always acting in a fair and open way and with integrity towards our employees, partners and customers. Our values, with trust at their heart, form the basis of our activities just like our long-term strategies. Based on these 2 pillars, we intend to further expand the engagement in our markets. Our Safety Policy is a crucial element in the supply of our products

to our customers, therefore we sustain the balance of the state-of-the art technology with highest demands in safety. At the same time, sustainability is a key part of our business strategy. We aim to give equal importance to economic, ecological and social aspects into our company management and operational processes.



Our offer to you

We develop solutions for highest efficiency in hydropower generation.

Everything from a single source

Our innovative concepts ensure the highest possible degree of efficiency of the delivered plants. Our optimum price-performance-ratio results from applying state-of-the-art technologies. We target at the right solution for the specific requirements of hydropower plant operators.

We offer additional advantages

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

Competences and capabilities

- Complete electromechanical equipment, installation and services for hydropower plants
- Francis, Pelton, Kaplan, bulb turbines, pump-turbines, both standardized and customized
- Pumped storage, radial, semi-axial and axial-flow pumps
- Generators and motor generators
- Complete automation systems and governors
- Excitation systems
- Computer supervisory and monitoring system
- Shut-off valves

Advantageous conditions

Voith Hydro Shanghai gains its strength from several key factors.

Location

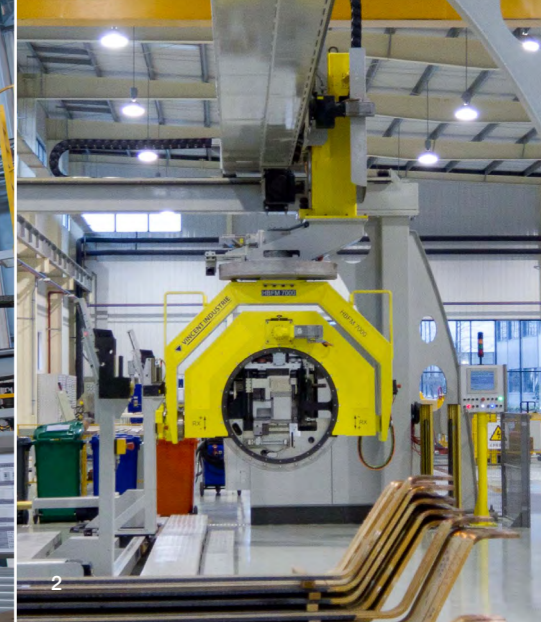
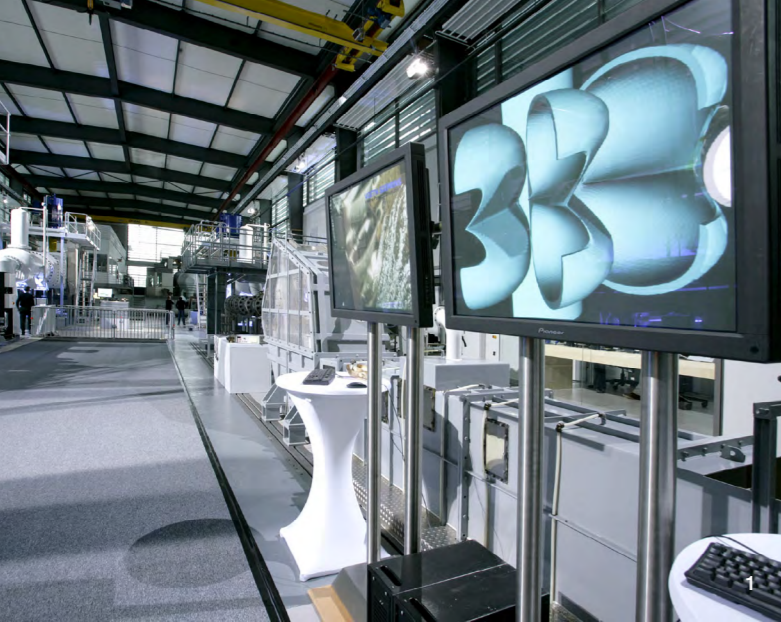
Voith Hydro Shanghai is located beside the Huangpu River, 700 metres away from our own harbor which is equipped with a crane with a lifting capacity of 600 tons. This ensures that any large components of the turbines and generators, including the stay ring, head cover, rotor center and stator frame can be transported by ship. This significantly reduces the difficulty of transport and increases time-efficiency.

People

The success of our company relies on the excellent education and the high level of expertise of our employees. We see them as the most valuable asset. Our staff is committed to achieve their fullest potential in an open working atmosphere. This promotes a highly motivated personnel of hydro professionals contributing to the success of your project.

Training & Development

We strive to create a pleasant working environment and encourage a diversified workforce. To keep employee satisfaction high, we formulate individualized career development planning for our staff. Voith Hydro Shanghai provides systematic training and development courses and programs pertain to the needs of employees at different levels. We support staff on further studies by education assistance programs and offer various job rotation opportunities in different countries or regions.



1 Center of Excellence, Brunnenmühle, Germany
2 Voith Hydro Shanghai Engineers

1 Vertical Machining Center
2 Stator Bar Bending Machine

Research & Development

With our worldwide network we benefit from collaborative processes and a mutual product know-how.

Our Brunnenmühle: engineering center of innovation

Voith Hydro Shanghai has established VHEC Shanghai, one of the locations of VHEC International (Voith Hydro Engineering Center International). This international network consists of centers of excellence in the Brunnenmühle, Heidenheim (Germany), São Paulo (Brazil), Västerås (Sweden), York (USA) and Shanghai (China). Due to the increasing complexity of the hydropower business, customer wishes are becoming more challenging. Voith meets this demand through innovation and improvement. The Brunnenmühle is synonymous with hydraulic fluid machinery and generator electro-magnetic development and optimization at its best. Today, the R&D center embraces an incredible range: product development, improvement in model and field testing, control and monitoring, material property investigations and delivery of mechanical and

electrical designs. Our best engineers work on optimal and most effective solutions to ensure the best possible results for our customer's requirements, products and processes.

Our experts are available in Shanghai

As an important facility of VHEC International, VHEC Shanghai works jointly with other facilities on the research and development of new opportunities and the system engineering of power units for the markets of Voith Hydro Shanghai.

As the center of main inlet valve competence, VHEC Shanghai additionally performs the system engineering of main inlet valves for the markets of Voith Hydro Shanghai and also for international markets of other operating units in cooperation with VHEC Heidenheim.

First-class production facilities

High quality mechanical and electrical components for projects are manufactured by Voith Hydro Shanghai.

Key facts

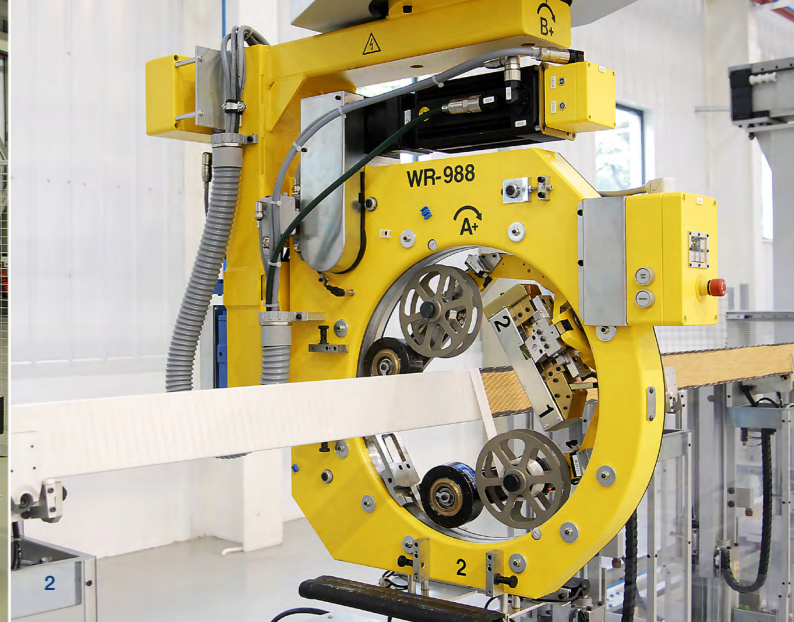
Start of operations: 1997

Area: 47,000m²

Optimal manufacturing conditions

The state-of-the-art manufacturing facilities of Voith Hydro Shanghai are equipped with the most advanced machine tools. Its vast manufacturing capacities and capabilities are second to none. As an extension to Voith Hydro's workshops in Shanghai, site workshops can manufacture large runners directly at the project site.

Voith Hydro Shanghai, the group's largest manufacturing base in the eastern hemisphere, has access to a company specific unified platform of systems and tools. We can thus profit from the know-how of other operating units within the Voith group.



1 Shaft Manufacturing Cell
 2 5 Axis Milling Machine
 3 Vertical Machining Center

1 Pole Coil Brazing Machine
 2 Insulation Taping Machine

Mechanical manufacturing

Key facts

- 20,000 m² of heavy production area.
- More than 400 highly trained & qualified employees.
- Manufacturing capacity for turbines & generator parts of up to 600 tons weight.
- Manufacturing capability for domestic and international markets.

The Voith Hydro mechanical workshop in Shanghai with 600 tons of lift capacity is equipped with advanced machinery including 14 meters diameter CNC Vertical Machining Centers, 5 Axis Milling Machines, large Horizontal Boring

Machines and Horizontal Lathe. It has the capacity and capability to produce medium and large components for turbines and generators of up to 1,000 MW per Unit.

Electrical manufacturing

Key facts

- 3,000 m² of production area under controlled temperature.
- More than 50 highly trained and qualified employees.
- VPI-Insulation technology up to 25 KV.
- Advanced electrical test facilities.
- Certification for domestic and International markets.

Voith Hydro Shanghai's electrical workshop with 3,500 m² provides perfect working conditions for its highly qualified operators. It is equipped with state-of-the-art machinery such as pole coil brazing machines, CNC taping & bending machines, and VPI systems up to 25 KV.

The facility includes a closed air-condition system to ensure the first-

class quality of the insulation process. Voith Hydro Shanghai is able to provide design, supply and site services of turbines and generators as well as auxiliaries which meet the highest quality standards.

With the opening of this workshop, the supply of electrical components at Voith Hydro Shanghai has been fully localized.



Francis turbines

The classic turbine for wide head ranges and large flow applications.

From the beginning, Francis turbine development has been synonymous with Voith. Francis turbines are primarily used in run-of-river power stations and water storage power plants with large flow volumes. They are characterized by their optimal degree of efficiency and

wide speed ranges. Their special hydraulic characteristics result in comparatively high-speed compact units, right up to the largest capacities. Voith Hydro develops and produces Francis turbines as spiral turbines, which can be used in horizontal as well as in vertical con-

struction. The runner is often directly attached to the main shaft which ensures ideal compactness and little maintenance requirements.

Technical details

Types:	Spiral turbine for medium and high heads. Usage in horizontal or vertical shaft.
Power:	up to 1,000 MW
Head:	up to 540 m
Runner size:	up to 10,700 mm



Pelton turbines

The ideal turbine type for high heads.

Pelton turbines are mainly used for applications with high 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. In order to achieve maximum robustness of the runner buckets, we use specially milled Pelton runners and complex production methods, for example hard coating. Be it horizontal or vertical design, one or up

to six nozzles, internal or external control: Voith Hydro develops, designs and produces the Pelton turbine that is most suited to individual requirements – and ideally complies with the existing operating conditions.

Technical details

Types:	Horizontal or vertical construction with one to six nozzles.
Power:	up to 280 MW
Head:	up to 1,300 m
Runner size:	up to 4,400 mm





Kaplan turbines

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

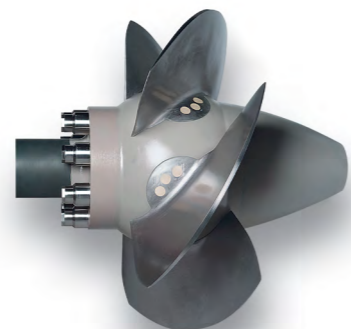
Victor Kaplan designed the Kaplan turbine between 1910 and 1913, with Voith constructing it for the first time in 1922. It is primarily installed in plants with low heads and large water volumes. This turbine type can also be applied as a run-of-river power plant.

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 with concrete or

a steel spiral as well as horizontal bulb turbines in a wide variety of shapes with three, four, five or six blades.

Technical details

Types:	Pipe turbines, vertical Kaplan turbines and Kaplan spiral turbines
Power:	up to 300 MW
Head:	up to 45 m
Runner size:	up to 11,500 mm



Pumped storage plant units

Customized units for your project.

Reversible pump-turbine

With a wide range of specific speeds, pump turbines can be installed at sites with heads from less than 50 to more than 800 meters, and with a unit capacity ranging from less than 10 to over 500 MW.

Variable-speed technology

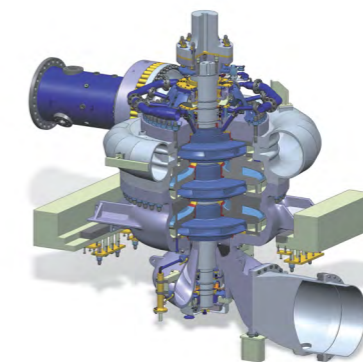
The variable speed technology uses asynchronous motor-generators or synchronous motor-generators with a frequency converter to vary the rotational speed of the pump-turbine. Thus, the turbine operating range can be extended, the pump capacity can be adjusted to using just the currently available amount of energy. This technology stabilize the grid efficiently.

Storage pumps

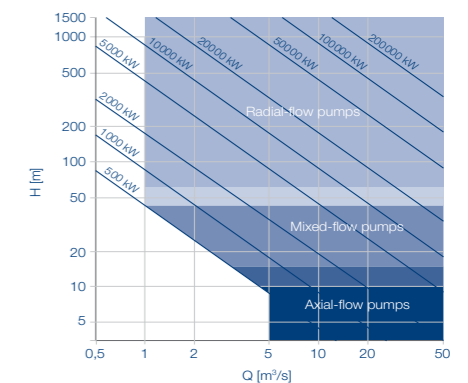
Pumps for storage application are mainly of the radial flow type. Depending on the application conditions, the construction can be single- and double-flow or single- and multi-stages.

Torque converter

The torque converter provides the most time-efficient start-up and shut-down of a storage pump. Within seconds the storage pump can be connected or separated from the shaft system.



Storage Pump, 3D model



Application range



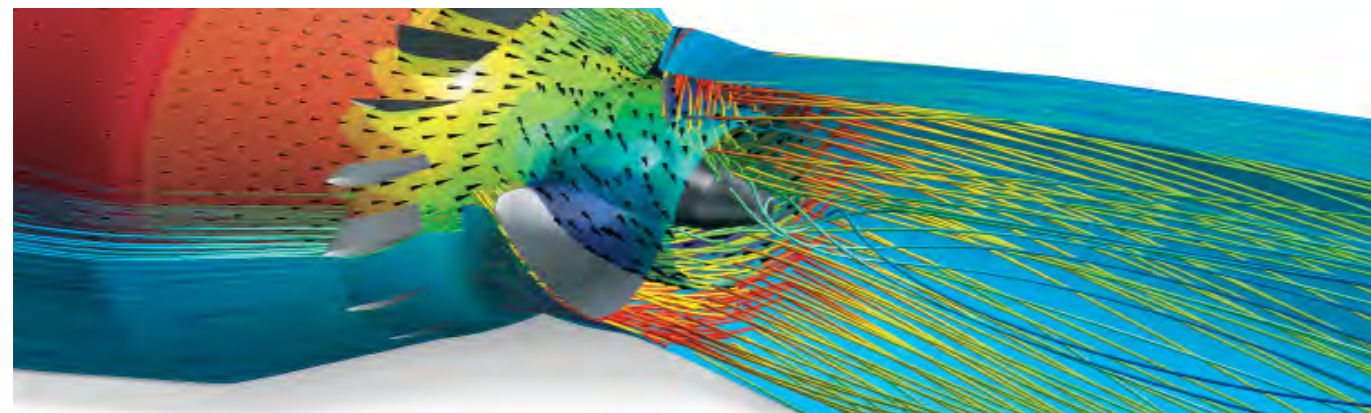
Bulb/Pit/S-Turbines

Strong reliability and exceptional service.

Higher full-load efficiency and higher flow capacities of bulb and pit turbines can offer many advantages over vertical Kaplan turbines. In the overall assessment of a low head project, the application of bulb/pit turbines results in higher annual energy generation and lower rel-

ative construction costs. Pit turbines with a speed increaser located between the runner and generator are used for projects with heads lower than 10 meters. While the bulb turbine is the most common solution for high outputs at low head sites, S- and pit turbines are

frequently favored for economic solutions in small hydro applications with outputs up to 10 MW. On a case by case basis, according to the specific requirements, it will be determined which hydroelectric equipment is favorable for the respective project.



3D model of bulb turbine

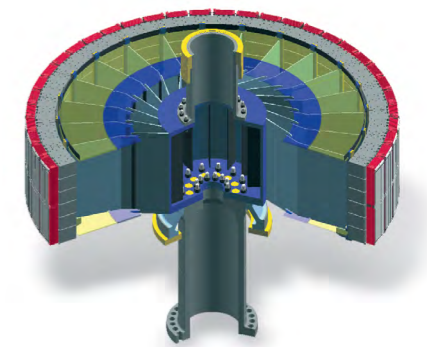
Generators

For well over a century, Voith has been supplying the world's largest and most powerful hydroelectric units.

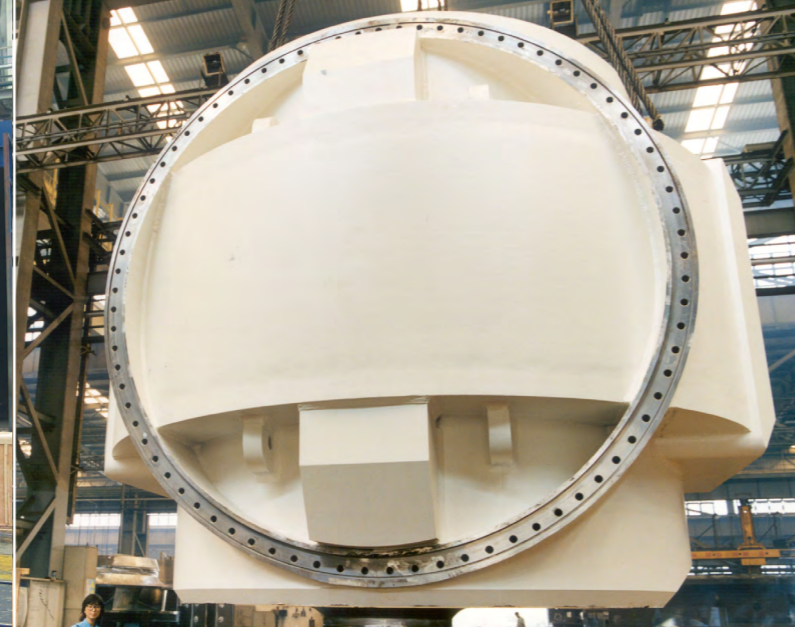
Voith has vast and diverse references in hydroelectric units and has designed the world's largest and most powerful air-cooled hydro generators of Xi Luo Du (China) rated at 855.6 MVA. Voith also designed the world's largest and

most powerful directly water-cooled units at Itaipu (Brazil/Paraguay) rated at 823.6 MVA and the 840 MVA units at Three Gorges (China). All Voith generators are designed and manufactured with the latest state-of-the-art technol-

ogy including the use of Vacuum Pressure Impregnation (VPI) for the stator bars and coils. Rated voltages up to 25 kV are part of our standard production.



3D model of rotor



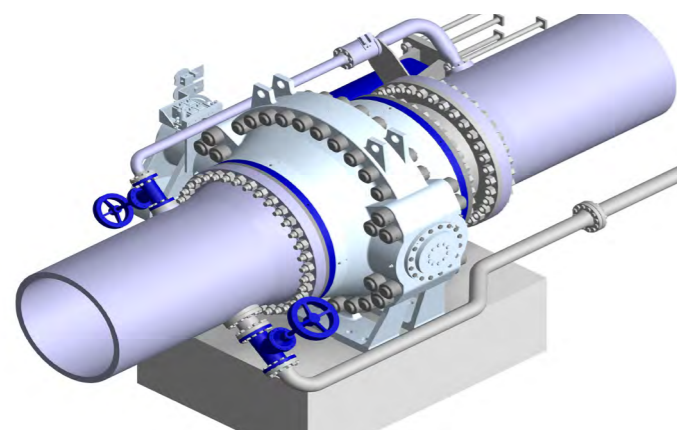
Valves

A main component to guarantee safe and stable operation of your hydropower plant.

Voith started designing mechanical-hydraulic control equipment for water turbines as long as a century ago, because extreme adjusting forces and short closing times cannot be coped with by purely mechanical means. Over 30% of the shut-off valves supplied by

Voith are spherical valves. Voith has manufactured approximately 1000 spherical valves for hydraulic applications such as guard valves, Francis turbine and Pelton turbine inlet valves and pump or pump/turbine shut-off valves. In order to conduct regular

maintenance or outages of units, the inlet valve is used to cut off the water inside the penstock. With the help of the inlet valve, the water streams can be closed to avoid unexpected accidents and to thus protect the power plant in case of emergency.



3D model of spherical valve



3D model of butterfly valve

Automation system

We offer hydropower automation from a single source to ensure complete service and seamless availability for your hydropower plant and all its components and systems.

Tailor-made to meet individual demands: Hydro automation is not an off-the-shelf product but is a tailor-made product to meet individual demands. For best-in-class automation system design, it is crucial to have comprehensive knowledge of all plant equipment and processes as well as excellent engineering expertise and experience. Moreover, seamless integration of all plant systems and plant-related func-

tions are a prerequisite. Our mission is the optimized, integrated overall system. We plan, build, install and commission complete automation systems for hydropower plants of any type and size. Furthermore, we optimize the overall system to achieve highest availability and efficiency at the best cost. We also unite seemingly contradictory requirements like standard and flexibility.

Our scope of supply

- HyCon Control System
- Turbine Governor
- HyCon MD Monitoring, Analysis, Diagnostics
- HyCon Optimization Modules
- Excitation - Thyron
- Protection System
- Telecommunication and Access Security



Environmentally-friendly turbine design

Voith Hydro technology is dedicated not only to using, but also to preserving the earth's sustainable resources.

Throughout Voith Hydro's unparalleled industrial experience of more than 140 years, the organization has been working to minimize the impact of hydro-power on the environment. Specifically, ensuring safe fish passage has been one of Voith's industry goals for the last

50 years, leading the company to conduct analytical and physical modelling in its laboratories. The goal for these efforts is to reach fish passage levels similar to those that existed prior to hydro-power installation at a given site, while minimizing cost and efficiency loss. To

address water quality issues, Voith has developed state-of-the-art aerating turbine technologies to improve dissolved oxygen levels with minimal impact on energy generation. Moreover, oil-free turbines now prevent from the risk of pollutants release into the water.

Our scope of supply

Minimum gap runner:	Improved fish survival and positive impacts on turbine efficiency
Oil-free hubs:	Eliminates risk of oil flowing and the need to pressurize the hub
Aerating turbine:	Most efficient aeration solution
Alden turbine:	Fish survival rates of 98% to 100%



Alden runner model

Internationally certified standards

For the execution of our projects we act according to global certifications and standards. We improve our procedures and safety measures continuously.

The project management teams of Voith Hydro Shanghai contribute professional experience to a project. Cross-trained engineers, with experience in design engineering, manufacturing and field supervision are committed to smoothly manage your project. An independent certificate by an authorized body guarantees that Voith Hydro Shanghai is operating according to a well-established system and managed in a systematic manner. This implies that all our projects are handled with care and professionalism. Our global certification

is based on well-known international standards for quality management (**ISO 9001**), environmental protection (**ISO 14001**), as well as occupational health and safety (**OHSAS 18001**). All Voith Hydro locations are in complete compliance with these three standards, and handle all processes in an identical way. Our certifications are an important driver to us and safeguard constant and reciprocal conditions for our processes. This guarantees a stable quality level in all phases and fields of our activities.





Plant under construction, Xi Luo Du, China



Life-spanning support for your project

Turnkey hydropower plants

Everything from a single source: from customized design and high-quality production to the commissioning of hydropower plants, Voith Hydro Shanghai offers the complete solution for your project.

A successful project requires more than first-class technical equipment. On-time and cost-efficient project implementation can only work through the best cooperation of all stakeholders. We offer not only high-quality manufacturing, but the complete engineering of power plants, including mechanical, electrical and automation systems. We also execute the assembly and commissioning.

By using us as a turnkey partner, a power company reaches its production goals faster and does not have to coordinate several contractors. Due to these advantages, the demand of our customers for these solutions is increasing. This is why Voith Hydro Shanghai, like all the Voith Hydro operating units, offers turnkey solutions for its customers. Right from the start we supply you with con-

cepts, design, production, quality control and project management up to assembly and commissioning. Thanks to decades of experience and the magnificent know-how of our project managers, we always find the appropriate complete solution even for specialized demands.

Service, maintenance and upgrade

Our service specialists support you during the entire life-cycle of your hydropower plant.

Our aftermarket business covers the full service of everyday operation, annual maintenance, provision of original spare parts and fast assistance. We react promptly, flexible and efficiently whenever required in order to keep downtimes to a minimum. Depending on the

construction and operating conditions, power plants have life cycles which span decades. For that reason, Voith Hydro Shanghai offers individual services for general overhauls of long-in-service plants. A conversion to oil-free bearings, the restoration of the original

hydraulic contours and special coating can, for example, significantly increase life cycles and efficiencies. A performance and efficiency analysis will point out existing potentials and improvement possibilities.



1 Wanjiazhai, Shanxi
2 Three Gorges, Hubei

3 Three Gorges, Hubei
4 Longkaikou, Yunnan

Milestones and Projects

- 1910** Shilongba, Yunnan:
First hydropower project in mainland China.
- 1938** Fengman, Jilin:
World's most powerful turbines and generators at that time.
- 1967** Gangnan, Hebei:
First pumped storage project in China.
- 1978** Majitang, Hunan:
First large bulb units in China. Three 18 MW Bulb units with runner diameter of 6.3 m.
- 1983** Lubuge, Yunnan:
First World Bank-financed hydropower project in China. Four 198 MVA vertical generator units with rated speed of 333 rpm.
- 1988** Mingtan, Taiwan:
Largest pumped storage project in Taiwan. Six 312 MW pump turbines under rated head of 401 m.
- 1991** Wuqiangxi, Hunan:
Five 248 MW Francis turbines with runner diameter of 8.3 m.

- 1992** Yangzhuoyong, Tibet:
Highest head pumped storage plant in China. Four 19.1 MW vertical radial pumps under 850 m head.
- 1992** Yuxi, Zhejiang:
Two 20.4 MW bulb turbines with runner diameter of 5 m.
- 1992** Jingnan, Guangxi:
Two 35.4 MW bulb turbines with runner diameter of 6.3 m.
- 1992** Shisanling, Beijing:
Four 220 MW pump-turbines under 430 m head.
- 1994** Guangzhou II, Guangdong:
World's largest pumped storage project. Four 300 MW pump turbines and motor generators with rated speed of 500 rpm.
- 1994** Voith Hydro Shanghai established by Voith, Siemens and SEC with 1/3 share for each. Name: Shanghai Hydropower Equipment Company (SHEC).

- 1995** Xiaolangdi, Henan:
First large-scale hydro project in China with comprehensive anti-erosion design features, ring gate and hard coating. Wide-head operation range with head variation ratio of 2.1 (Hmax/Hmin). Six 300 MW Francis turbines with runner diameter of 6.4 m.
- 1996** Wanjiazhai, Shanxi:
Two 184 MW Francis turbines with runner diameter of 5.85 m.
- 1996** Bailongtan, Guangxi:
Six 33 MW bulb units with runner diameter of 6.4 m.
- 1997** Three Gorges, Hubei:
The world's largest turbines and generators. Six 852 MW Francis units of VGS (Voith, Siemens, GE) with runner diameter of 9.7 m.
- 1998** Mianhuatan, Fujian:
Four 153 MW Francis turbines with runner diameter of 4.4 m.

- 1999** Xinanjiang, Zhejiang:
Modernization: Seven 92 MW Francis turbines upgrading from 72.5 MW.
- 1999** Liujiaxia, Qinhai:
Modernization: One 265 MW Francis turbine split structure, runner diameter 5.5 m.
- 2000** Voith Siemens Hydro Power Generation established. Merged by Voith (65%) and Siemens Hydro (35%). Name change to: Voith Siemens Hydro Power Generation Shanghai Ltd.
- 2000** Jiangkou, Chongqing:
Three 100 MW Francis turbines with runner diameter of 3.5 m.
- 2001** Pingban, Guangxi:
Three 138.5 Kaplan turbines, each with head of 34 m.
- 2001** Hongjiadu, Guizhou:
First in the "Power Transfer from West to East" project. Wide head operation range with variation ratio of 1.82 (Hmax./Hmin.). Three 200 MW Francis turbines with runner diameter of 4.24 m.



1 Tingzikou, Sichuan
2 Xiluodu, Sichuan

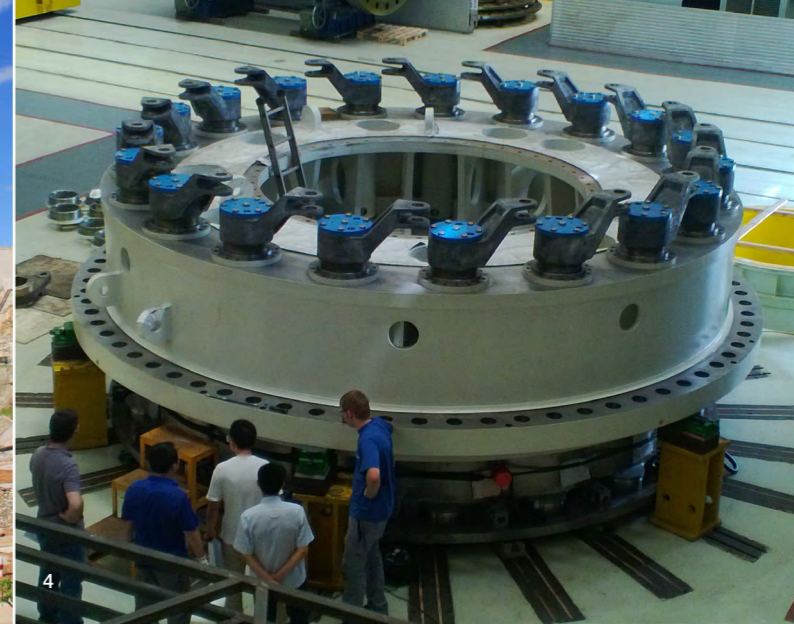
3 Laxiwa, Qinghai
4 Jinping II, Sichuan

- 2001** Jilintai, Xinjiang:
Four 128 MVA vertical generators.
- 2001** Xijing, Zhejiang:
Modernization: 67 MW Kaplan turbines uprating from 57.2 MW, runner diameter of 8 m.
- 2002** Baise, Guangxi:
Four 138 MW Francis turbines under 106 m head.
- 2002** Tai'an, Shandong:
Four 250 MW pump turbine units, Automation and BoPe&M package under head of 225 m and a rated speed of 300 rpm.
- 2003** Fuchunjiang, Zhejiang:
Modernization: Two 67.7 MW Kaplan runners uprating from 61.5 MW.
- 2003** Longtan, Guanxi:
Five 714 MW Francis turbines manufactured at site under a 140 m head.
- 2004** Zhanghewan, Hebei:
Four 278 MVA motor generators with rated speed of 333 rpm.

- 2004** Shuibuya, Hubei:
Four 460 MW Francis turbines under 150 m head with runner diameter of 6 m.
- 2004** Laxiwa, Qinghai:
Largest hydropower project in North China, on the Yellow River. Five 710 MW Francis turbines under a 205 m head with 6.9 m diameter of runner manufactured at site.
- 2005** Xiaowan, Yunnan:
Three 714 MW Francis turbines with Ring gate under 216 m head with runner with 6.6 m diameter manufactured at site.
- 2005** Silin, Guizhou:
Four 267 MW Francis turbines with 6.7 m runner diameter.
- 2005** Caojie, Chongqing:
Four 128 MW Kaplan turbines under 20 m head with 9.5 runner diameter .
- 2005** Jishixa, Qinghai:
Three 340 MW Francis turbines under 66 m head with 7.65 m diameter of runner manufactured at site.

- 2007** Jinping II, Sichuan:
Highest head mega turbine in China. Eight 610 MW Francis turbines under 288 m head with 4.86 m runner diameter.
- 2007** Tingzikou, Sichuan:
Four 280 MW Francis turbines under 73 m head with 6.64 m runner diameter.
- 2007** Nuozhadu, Yunnan:
Three 650 MW Francis turbines with Ring gate under 187 m head, runner with 7.25 m diameter manufactured at site.
- 2008** Longkaikou, Yunnan:
Five 400 MVA generators at a rated speed of 83 rpm.
- 2008** Dagangshan, Sichuan:
Four 663 MW Francis turbines under a 160 m head, with 7 m runner diameter.
- 2008** Xiluodu, Sichuan:
Three 784 MW Francis turbines under 197 m head. Three 855 MVA generators at 125 rpm.

- 2008** Liyuan, Yunnan:
Four 612 MW Francis turbines with Ring gate under 106 m head, runner with 8 m diameter manufactured at site.
- 2009** Name change to Voith Hydro Shanghai Ltd. Voith and Siemens shares remain the same.
- 2010** Yantan extension, Guangxi:
Two 342 MVA generators at a rated speed of 71 rpm
- 2010** Huanren, Liaoning:
Modernization: Two 75 MW MOD Francis runners under a 53 m head.
- 2011** Yangqu, Qinghai:
Three 408 MW Francis turbines under a 114 m head, runner with 6.2 m diameter manufactured at site.
- 2012** Hongping, Jiangxi:
Four 300 MW pumped storage units, Automation and BoPe&m package under head of 540 m and rated speed of 500 rpm.



1 Goldisthal, Germany
2 Waneta, Canada

3 Yeywa, Myanmar
4 Frades II, Portugal

International projects

- | | | |
|--|--|---|
| <p>1997 Goldisthal, Germany:
Two 302 MW pump turbines
Subcontractor: Equipment supply</p> <p>1997 Ghazi Barotha, Pakistan:
Five 295 MW Francis turbines
Subcontractor: Equipment supply</p> <p>2000 Itaipu II, Paraguay:
One 740 MW Francis turbine
Subcontractor: Equipment supply</p> <p>2002 M.E.S., Iran:
Four 243 MW Francis turbines
Subcontractor: Equipment supply</p> <p>2003 Omkareshwar, India:
Eight 65 MVA generators
Subcontractor: Equipment supply</p> <p>2005 Yeywa, Myanmar:
Four 200 MW Francis units with runner diameter of 5 m
Contractor: Turbine and generator units</p> | <p>2006 An Khe, Vietnam:
Two 80 MW Francis turbines with 357 m head
Subcontractor: Turbines</p> <p>2010 Ingula, South Africa:
Four 342 MW pumped storage units, Automation and BoPe&m package
Subcontractor: Equipment supply</p> <p>2011 Frades II, Portugal:
Two 380 MW variable speed pumped storage units, Automation, BoPe&m package
Subcontractor: Equipment supply</p> <p>2011 Bhasemy, India:
Two 27 MW generators
Subcontractor: Equipment supply</p> <p>2011 Feistritz, Austria:
Two 53 MW generators
Subcontractor: Equipment supply</p> | <p>2011 Waneta, Canada:
Three 120 MW Francis units, Automation, BoPe&m package
Subcontractor: Equipment supply</p> <p>2012 Nam Hinboun, Laos:
Two 15 MW bulb units, Automation, BoPe&m package, turbine runner diameter of 4.9 m
Contractor: E&M full package</p> <p>2012 Saratov, Russia:
One 10 MW Kaplan turbine with runner diameter of 5 m.
Subcontractor: Equipment supply</p> <p>2012 La Romaine, Canada:
Two 135 MW Francis units, Automation, BoPe&m package.
Subcontractor: Equipment supply</p> <p>2014 Tarbela, Pakistan:
Three 470 MW Francis turbines and generators, Automation systems, BoPe&m package.
Contractor: E&M full package</p> |
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