

Voith Hydro in India

Harnessing power from water



Over 140 years in hydropower

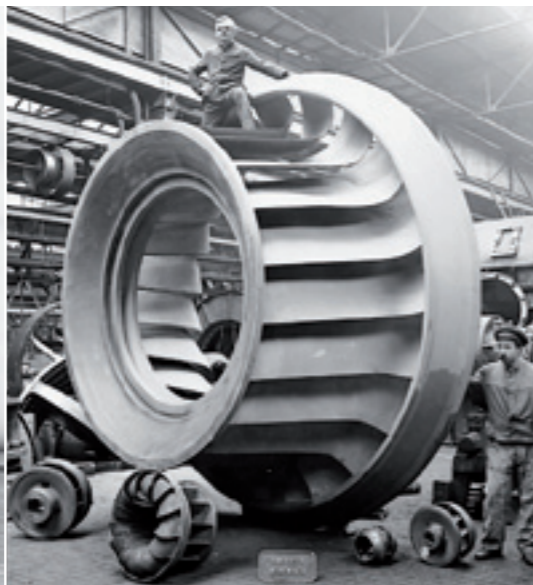
Hydropower is the largest source of renewable energy generation and storage, with 930 GW of globally installed capacity - and 80 percent share of all installed renewable energy sources. Voith Hydro, a Group Division of Voith, is a world-wide leader for equipment and solutions that harness energy from hydropower in a sustainable manner.

In 1962, Voith established its first production unit outside Europe by setting up a facility at São Paulo, Brazil. Today, Voith hydro has a global presence and employs more than 5300 employees worldwide.



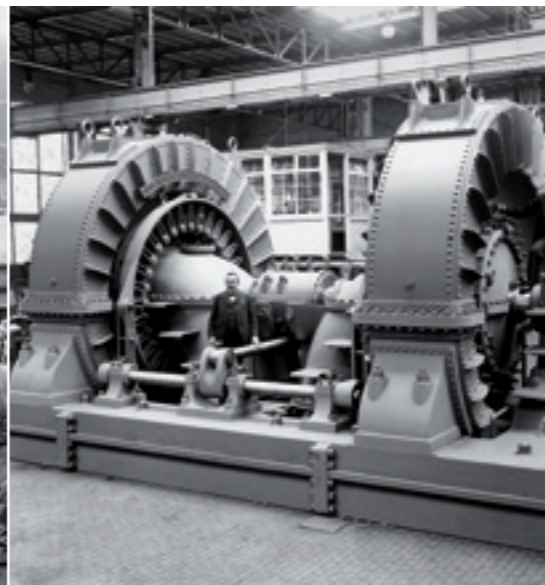
1879

In 1879 Voith designed and built its first turbine control system.



1893

From 1893 Voith embarked upon construction of turbines with the motto „Whoever wants to survive in the battlefield of competition, must be ahead in technology.“



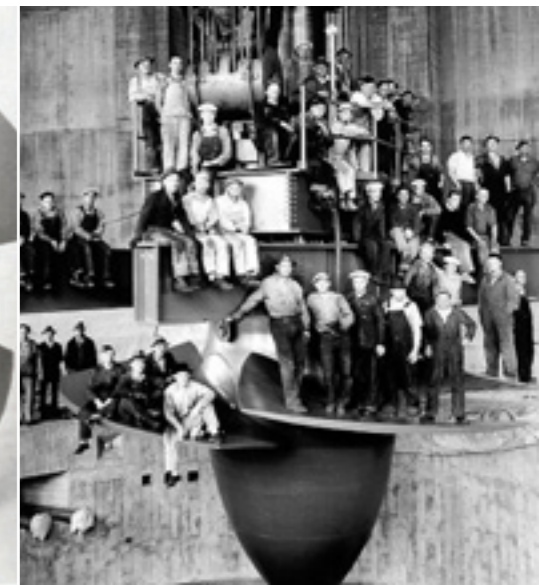
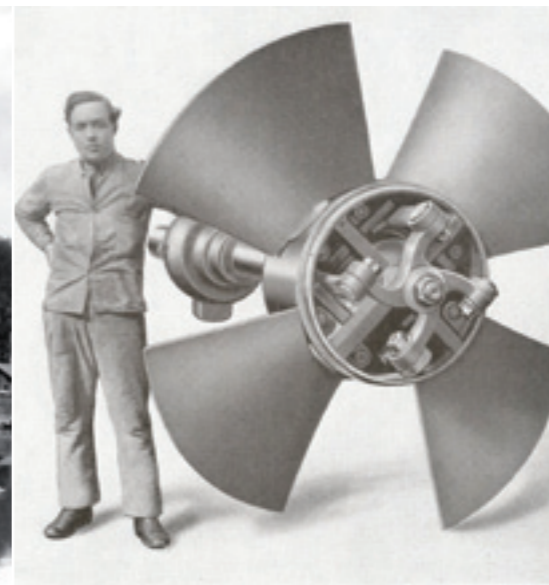
1903

In 1903 Voith received an order for the world's largest turbines: twelve Francis turbines, each rated at 12 000 HP, for the power stations at the Niagara falls in USA and Canada.



1908

In 1908, the first hydraulic test laboratory, the „Brunnenmühle“ was established in Heidenheim, Germany, marking another major milestone in the history of the company.



1922

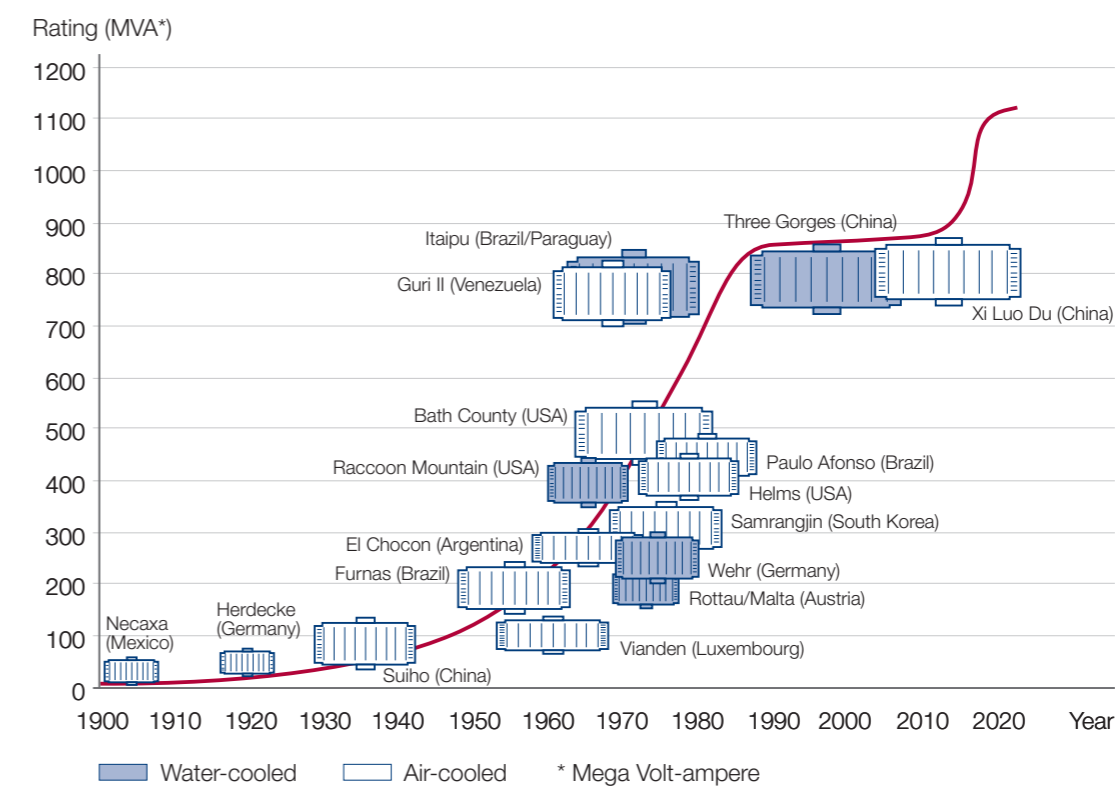
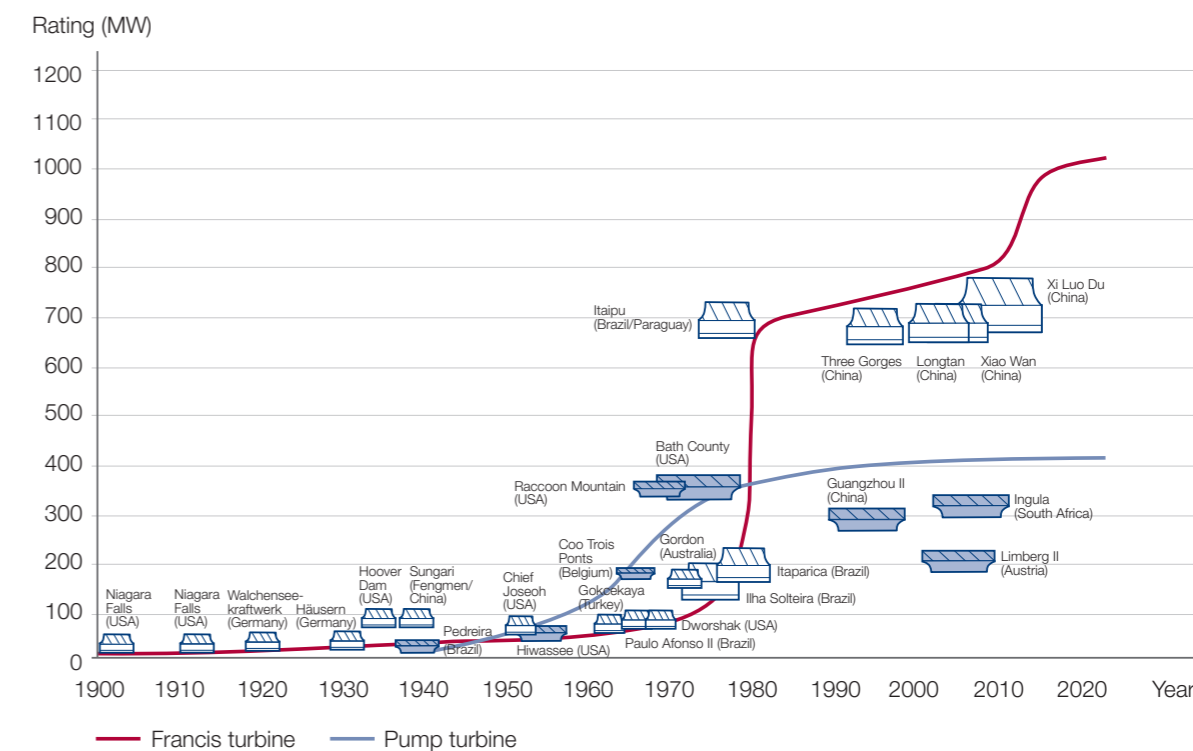
In 1922, the Kaplan turbine, named after its inventor Prof. Viktor Kaplan and rated at 1100 HP, was built for the first time.

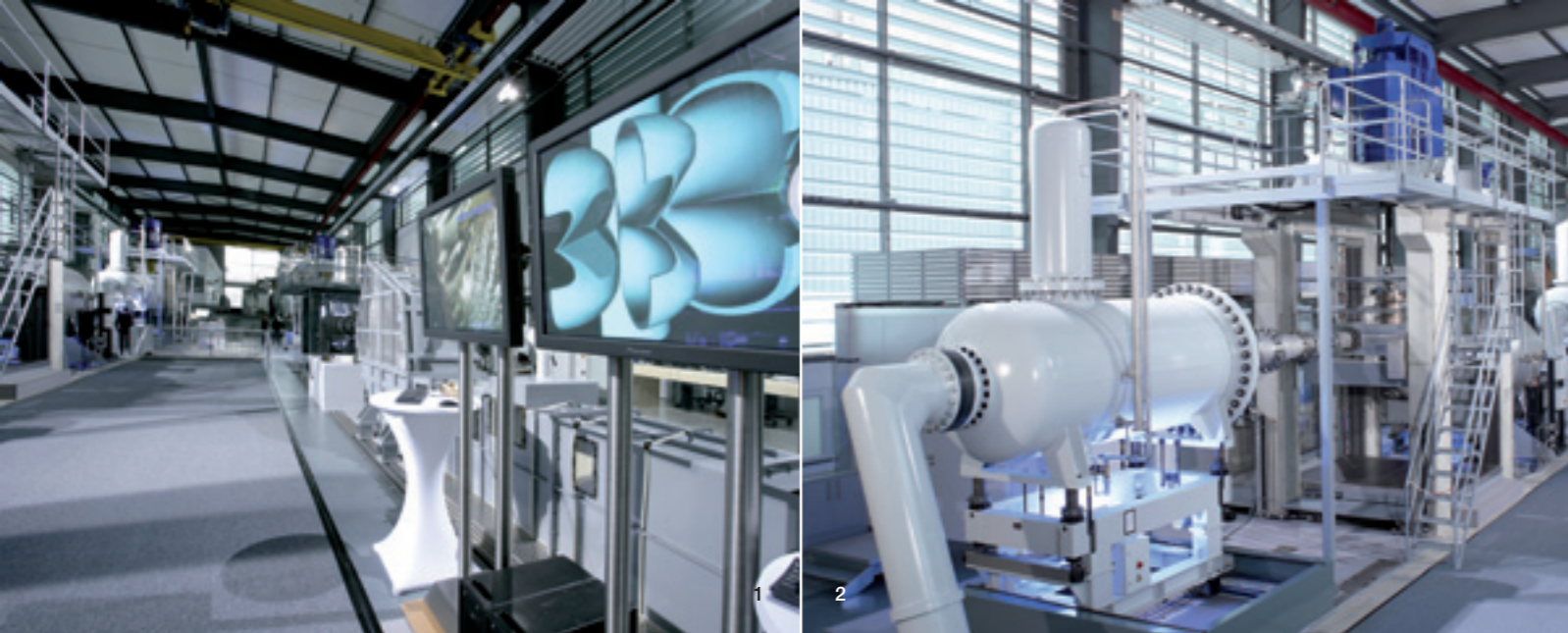


Pushing the frontiers of technology

Since 1870, Voith Hydro has been advancing the frontiers of hydropower technology. The company invests heavily in R&D and the focus of development work lies in developing powerful and efficient turbines and generators. We reached an important milestone by successfully installing a turbine with a generating capacity of 784 MW at the Xiluodu power plant on the Jinsha River in China in August 2013. We are well on our way in the development of the first one gigawatt generating unit.

History of our equipment





1-2 Test rigs at Brunnenmühle in Heidenheim, Germany

Research & Development

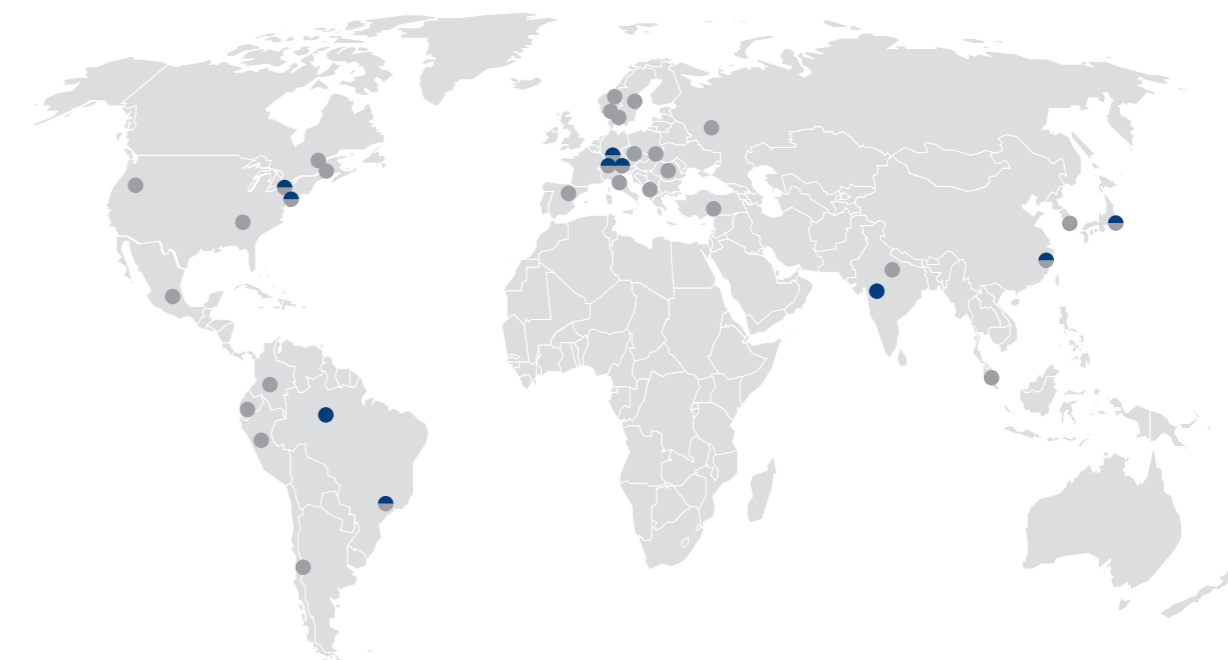
To sustain ever changing requirements of the market and in order to maintain a leading position in the hydropower industry, we constantly work on innovations and improvements. At our center of excellence, the Brunnenmühle in Heidenheim, Germany, our experts continuously work on innovations. Voith Hydro remains a fore runner in the cutting edge technology area of harnessing Ocean Energy.

Engineering at its best. The complexity of the hydropower business poses great challenges. To overcome this, at Voith we work on innovations and improvements. Due to our worldwide network of experts we benefit from collaborative processes and a mutual project know-how. Our R&D efforts are further supported by our R&D facilities in York (US), São Paulo (Brazil) or Västerås (Sweden). The use of competence as well as close association with business partners are fundamental operating principles of Voith Hydro.

The core of this network is the Brunnenmühle at the Voith Hydro headquarters in Heidenheim, Germany. Here, we drive forward and coordinate the development of hydraulic fluid machinery.

The R&D center embraces an incredible range of services: product development, improvement in model and field testing, advances for governors, control and monitoring, material property investigations and delivery of mechanical and electrical designs.

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



Voith Hydro - Global Presence

In 1962, Voith established its first production unit outside Europe by setting up a facility at São Paulo, Brazil. Today, Voith Hydro has truly a global presence and employs more than 5300 employees at more than 20 locations worldwide.

North America

- York (PA) USA
- Chattanooga (TN) USA
- Springfield (OR) USA
- Mississauga (ON) Canada
- Montreal (Brossard, QC) Canada
- Granby (QC) Canada
- Ciudad de Mexico Mexiko

Latin America

- São Paulo Brazil
- Manaus Brazil
- Lima Peru
- Santiago Chile
- Cuenca Ecuador
- Medellin Colombia

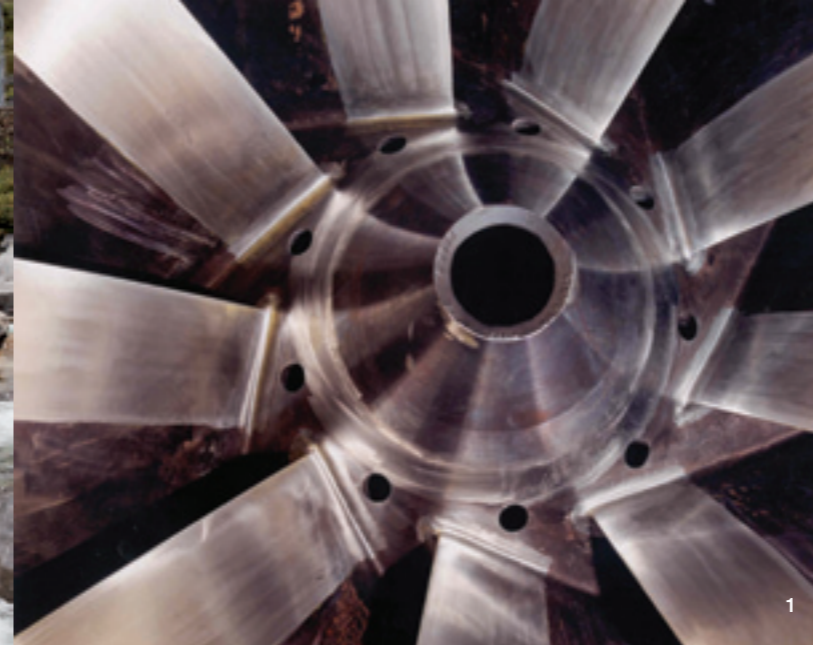
Europe

- Heidenheim Germany
- St. Pölten Austria
- St. Georgen Austria
- Tolosa (Ibarra) Spain
- Milano Italy
- Oslo Norway
- Trondheim Norway
- Sarpsborg Norway
- Västerås Sweden
- Pilsen Czech
- Ankara Turkey
- Moscow Russia
- Podgorica Montenegro
- Bucharest Romania
- Trebisov Slovakia

Asia

- Shanghai China
- Noida India
- Vadodara India
- Kawasaki Japan
- Seoul Korea
- Kuala Lumpur Malaysia

- Production
- Sales/Engineering/Service-Shop



1 Voith Hydro, Noida office
 2 A view of the picturesque Iqu SH Project in the state of Himachal Pradesh, India

1-2 State of the art Generator and Turbine components

Voith Hydro in India: Important milestones

Voith Hydro started in India more than a hundred years ago with its foot prints and continues to build a strong presence in the country.

In 1911, Voith supplied three power units for the Khopoli hydropower plant in Maharashtra. Voith equipped the Machkund and Bhira plants in 1949 and a year later, delivered the Hirakud project with four turbines in total. Many other projects followed over the years. In 2002, Voith Hydro established its working unit in India to be closer to its customers. It is presently located in Noida near New Delhi and this was followed up by establishment of a state art manufacturing facility at Vadodara, Gujarat.

Voith Hydro's major Milestones in India:

1911 Khopoli: 4 Units of 13 MW/ Tata Power Company
 1949 Machkund: 3 x 24 MW + 3 x 21.5 MW / APGENCO
 1949 Bhira: 1 unit of 25.7 MW / Tata Company
 1950 Pathri: 3 units of 7 MW / Tata Company
 1950 Hirakud II: 2 units of 25.5 MW
 1950 Hirakud I: 2 units of 27 MW
 1955 Panchet Hill: 1 unit of 40 MW Damodar Valley Corporation
 1956 Periyar: 3 units of 37 MW

1956 Gandhi Sagar: 3 units of 25 MW Chambal Valley Developments
 1956 Koyna I: 4 units of 76.8 MW / SEB, Govt. of Maharashtra
 1962 Koyna II: 4 units of 77.2 MW / SEB, Govt. of Maharashtra
 1981 Lower Mettur: 8 units of 17.2 MW / SEB, Govt. of Tamil nadu
 1985 Upper Indravati: 4 units of 172 MW / Government of Orissa
 1992 Bhira: 1 unit of 176.5 MVA Pump Storage Project for TATA Power
 1994 Nathpa Jhkri: 6 units of 250 MW Generator / NJPC
 1995 Bhivpuri: 3 units of 24 MW / TATA Electric Companies
 1998 Ghatghar: 2 units of 125 MW / GOMID
 1999 Baspa II: 3 units of 100 MW / Jaiprakash
 1999 Khopoli: 3 units of 24 MW
 2000 Baglihar I: 3 units of 150 MW / JKPDC
 2002 Renovation, modernization and uprating of 2 units of 33 MW for Burla Hirakud project / OHPC
 2003 Omkareshwar: 8 units of 65 MW / NHDC
 2007 Bhilangana: 3 units of 8 MW / BHPCL
 2008 Karcham Wangtoo: 4 units of 250 MW / JP

Voith Hydro in India: Portfolio Power Unit

Voith Hydro, Noida (VHN) is a full range supplier of electromechanical equipment for hydropower projects of capacities ranging from 1 MW to 250 MW & above. We provide design solutions for all variants of hydro-power projects from water to wire solutions. We offer hydropower automation from a single source to ensure complete service and seamless availability of your hydropower plant and all its components and systems.

Our portfolio covers:

- Pelton Machines
- Francis Machines
- Kaplan Machines
- Generators
- Plant Automation
- Electrical and Mechanical Auxiliaries

Noida also provides single window solutions for:

- Renovation and plant up-gradation
- Spares and after sales Service
- New plant Automation systems & up-grades
- On site Customer support for plant operation



1



2



1



3



2

1 Omkareshwar Project
2 A massive 220 kV, 15 bay out door switch yard

1-2 Omkareshwar Project
3 Gold Shield award by President of India

Voith Hydro in India: Portfolio Balance of plant auxiliaries and Automation

Voith offers tailor-made solutions to meet individual system demands. We offer comprehensive solutions including Balance of plant electrical and mechanical auxiliaries and Automation systems. Our systems are designed to provide stability in the seamless operation of hydropower plants and ensure high availability.

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.

Voith Hydro, India has a highly competent team of experts who are able to provide value added services to customers in India and abroad.

The company has a fully equipped Automation Workbench in place at its Noida facility to carry out software and hardware engineering for hydropower project including carrying out of FAT as well as remote assistance to project sites.

Voith Hydro in India: Project Execution

Omkareshwar 520MW HEP: A remarkable success story of project execution.

The Omkareshwar Project is situated on the river Narmada, near the famous Omkareshwar Temple in Khandwa district of Madhya Pradesh. The Project derives its name from this famous temple, which is one of the 12 most revered shrines of the Hindu God Shiva. The temple is located on an island downstream of the project. The river Narmada is very sacred and is associated with many legends and folklore.

Voith Hydro was responsible for Supply of Electro mechanical equipment consisting mainly of eight vertical Francis Turbines, eight Synchronous Generators, Balance of Plant equipment including eight 80 MVA Generator Transformers, a massive 15 bay 220 kV outdoor switchyard and all associated auxiliaries and plant Control systems. Voith Hydro's scope also included the entire on-shore services for the complete erection and commissioning of the eight units and auxiliaries.

More than 300 man-months of Voith experts were utilized for training and providing advisory services to local engineers and technicians during the entire process of erection, testing and commissioning of this project.

At the peak of works at site, Voith Hydro employed hundreds of local engineers, supervisors and technicians who worked round the clock to meet the tight targets.

The Omkareshwar Project was commissioned in a record time of 48 months. The board of management of the Owners, NHDC placed on record their appreciation for the early completion of the Project. The Consortium received early completion bonus of 309 unit days and went on to earn the Gold Shield from the Ministry of Power for early commissioning.

The success of the Project is largely an outcome of concurrent engineering carried out from various Voith Hydro locations world-wide which were on-line coordinated with civil engineering carried out by civil partners M/s Jai Prakesh Associates Limited.

The strict schedule was met by setting up of a Voith Hydro cross border and cross business unit Project Organization fully empowered to meet the expectations of the client. The members regularly met for Progress Review Meetings to monitor and implement expediting measures. The Omkareshwar Project has set a benchmark for hydropower execution in India.



1



2

1 Stator assembly at Omkareshwar project, India
2 A proud worker at the Omkareshwar site

Erection and Commissioning Services

Flawless erection and commissioning services are vital contributors towards successful project execution. Voith's highly competent and dedicated manpower ensures this by being available 24 x 7 during construction. Voith's field services personnel across the globe share experiences and best practices for continuous improvement of onsite services.

Voith keeps safety on the highest priority. Innovative techniques and time schedules are continuously developed to achieve high productivity of resources at site. Voith implements standardized processes and documentation which ensure best quality of execution at all its installations worldwide.

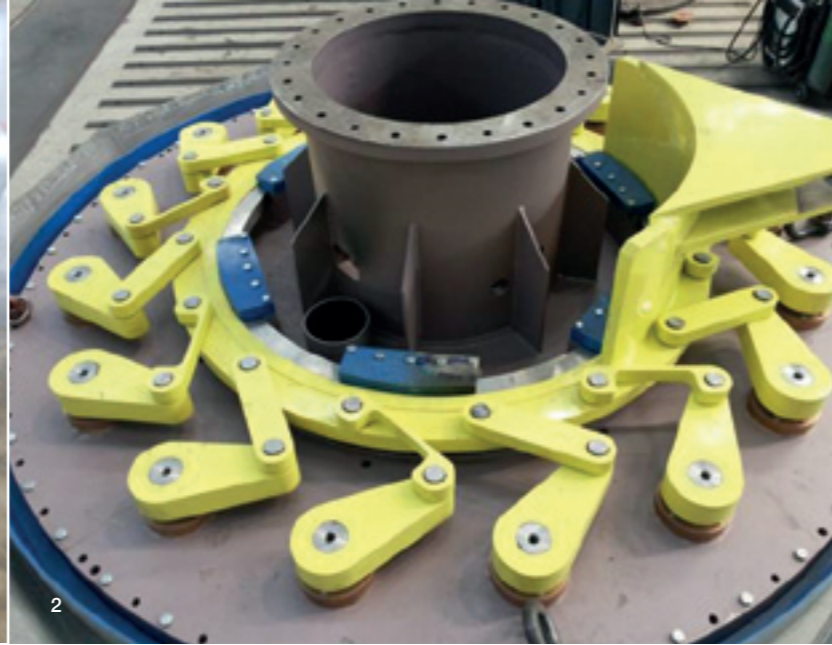
Voith site personnel provide inputs during the design phase for trouble free installation at site.

Post completion of services, Voith site engineers and technicians provide their valuable feedback to the design engineers for improvement of site assembly.

Voith's site personnel take immense pride to be the first interface point with customers at the Project site.



Project under construction: Sainj, 2 units of 50 MW
(Customer HPPCL)



Manufacturing facility at Vadodara

Voith Hydro's state of the art manufacturing facility in India is situated in the industrial city of Vadodara in the State of Gujarat. The factory has the best in class machinery and has delivered turbines and critical turbine components to customers in India, Japan, Europe and the Americas.

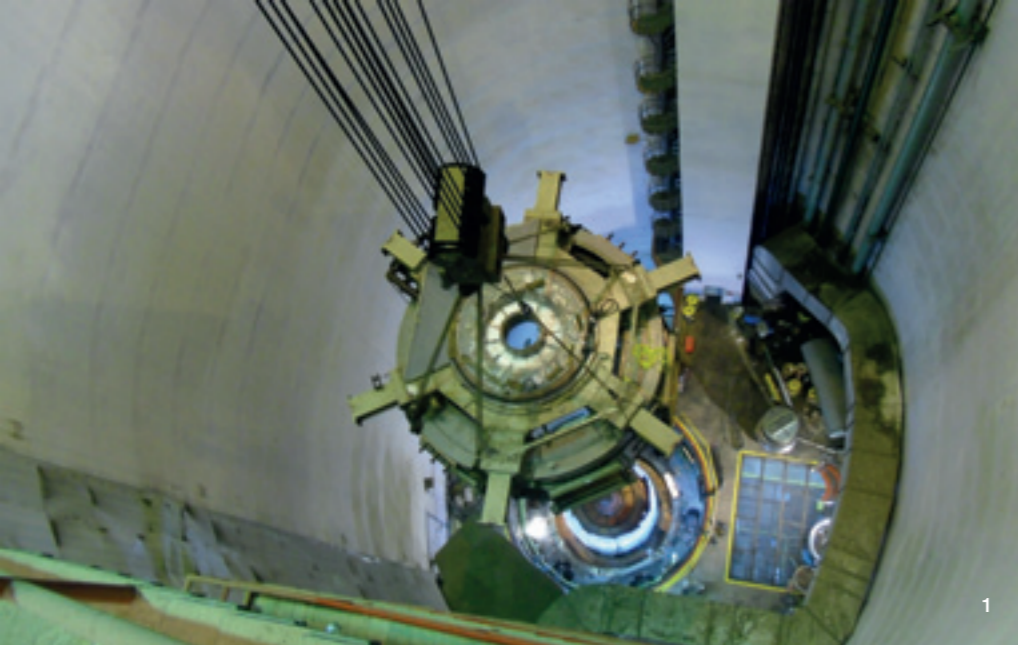
Voith's manufacturing facility at Vadodara is fully equipped with modern machinery and is fully capable to cater to all requirements of the local and export markets. Latest manufacturing technologies are implemented to produce high precision parts and components within tight schedules to match Customer's needs.

Voith employs highly competent engineers and technicians who work with great dedication to support the production process and strive to bring continuous improvements.



- 1 Runner - Umamichi, Japan
- 2 Turbine - Lake Mainit, Philippines
- 3 Runner - Chugu, Japan
- 4 Runner - Lake Mainit, Philippines

- 5 Runner - DakTer-1, Indonesia
- 6 Nozzle - Kokish, Canada
- 7 Labyrinth Seals. Nathpa Jhakri, India
- 8 Men behind the machines



1-2 Stator and Rotor installation during repair of Generator at site

1 Collaboration on construction site
2 Baglihar dam view

Hydro Services in India

Voith is a full line service provider for turbines, generators and automation systems. Whether it is parts replacement, repair, inspection, upgrades or full rehabilitation, Voith has customized solutions to meet your needs. Voith has installed over 40,000 turbines and generators worldwide. We have experience in dealing with a range of challenges that may arise at your facility or with your equipment. We provide innovative solutions to enhance equipment / plant performance as well as to optimize down time.

Service with a difference:

Nathpa Jhakri - Supply of Upper Labyrinth Seals

Voith Hydro has supplied 16 nos. (10 sets of Stationary Rings and 6 sets of Rotating Rings) Upper Labyrinth Seal Rings for 250 MW Francis Turbine for SJVN Limited. This was the first time SJVN Limited procured this labyrinth from India and Voith has successfully manufactured these high precision turbine parts at its Vadodara facility.

Other Major References include:

- Nathpa Jhakri HEP; Upper Labyrinth Seal (10 Nos.); In-spection of Generator; Upgradation of Excitation System
- Baglihar I HEP; Operation & Maintenance Support; Repair of Generator Earth Fault; repair of 400kV XLPE cable
- Baner HEP; Supply of spare Pelton runner
- Western Yamuna Canal HEP; Supply of discharge ring and regulating ring
- NHPC; Baira Siul - Supply of Guide Vanes

Service with a difference:

- Efficient and customized solutions
- Reduced outage time and longer-running machines
- Components restored to meet OEM standards
- Environmentally-safe and compliant procedures
- Safe, on-site work with professional project management
- Customer training

Voith Hydro in India Projects under execution

Voith Hydro started in India as early as 1911 and continues with its strong commitment to build state of the art hydropower plants in India and neighboring countries. We have commissioned projects from unit size of 1.5 MW to 250 MW in India. Voith Hydro is a full line service provider to the hydropower plants in the region.

Orders under execution include:

- Baglihar-II 3 x 150 MW (Customer: J&K State Power Development Corporation Ltd., India)
- Bhasmey 2 x 27 MW (Customer: Gati Infrastructure Bhasmey Power Pvt. Ltd., India)
- Singoli Bhatwari 3 x 33 MW (Customer: L&T Uttaranchal Hydropower Ltd., India)
- Sainj 2 x 50 MW (Customer: Himachal Pradesh Power Corporation Ltd., India)
- Rongnichu 2 x 48 MW (Customer: Madhya Bharat Power Corporation Ltd., India)
- Kakobola 3 x 3.5 MW (Customer: Angelique International Ltd., India)
- Bhyunder Ganga 2 x 12.15 MW (Customer: Super Hydro Electric Pvt. Ltd., India)
- Dakter 12 x 1.8 MW (Customer: Phu Thinh Kon Tum Joint Stock Company, Vietnam)
- Pusaka I 2 x 4,4 MW and Pusaka III 2 x 1.5 MW (Customer: PT. Pembangunan Pusaka Parahiangan, Indonesia)
- Bungin III 2 x 2.5 MW (Customer: PT. Great Colour Energy, Malaysia)
- Kurhed 2 x 2.25 MW and Tulang 2 x 1.5 MW (Customer: Himachal Hydel Projects Pvt. Ltd., India)
- Behna 2 x 2.5 MW (Customer: Himadri Hydropower Project Pvt. Ltd., India)
- Thapakhola 2 x 6.8 MW (Customer: Mount Kailash Energy Company Pvt. Ltd., Nepal)

Voith Hydro Holding GmbH & Co. KG
Alexanderstraße 11
89522 Heidenheim, Germany
Tel. +49 7321 37 0
Fax +49 7321 37 7828

Voith Hydro Pvt. Ltd.
A-20 & 21, Sector-59,
Noida - 201 301 (UP / India)
Tel. +91 12 03 07-4242
Fax +91 12 03 07-4243
hydro.india@voith.com
vhnsales@voith.com
www.voith.com

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