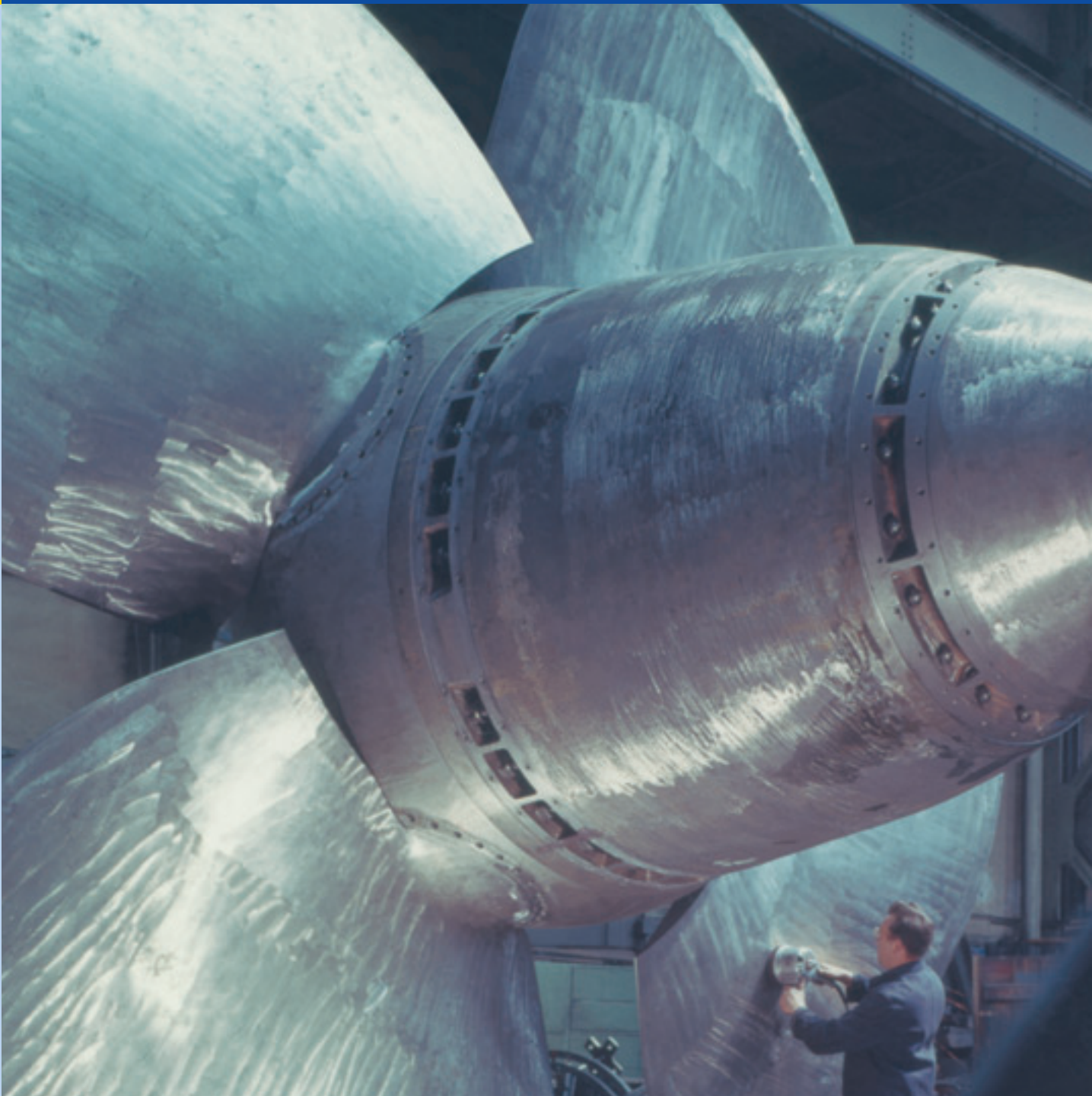


VOITH SIEMENS
HYDRO POWER GENERATION

Kaplan turbines



Expertise in hydro

with engineered reliability

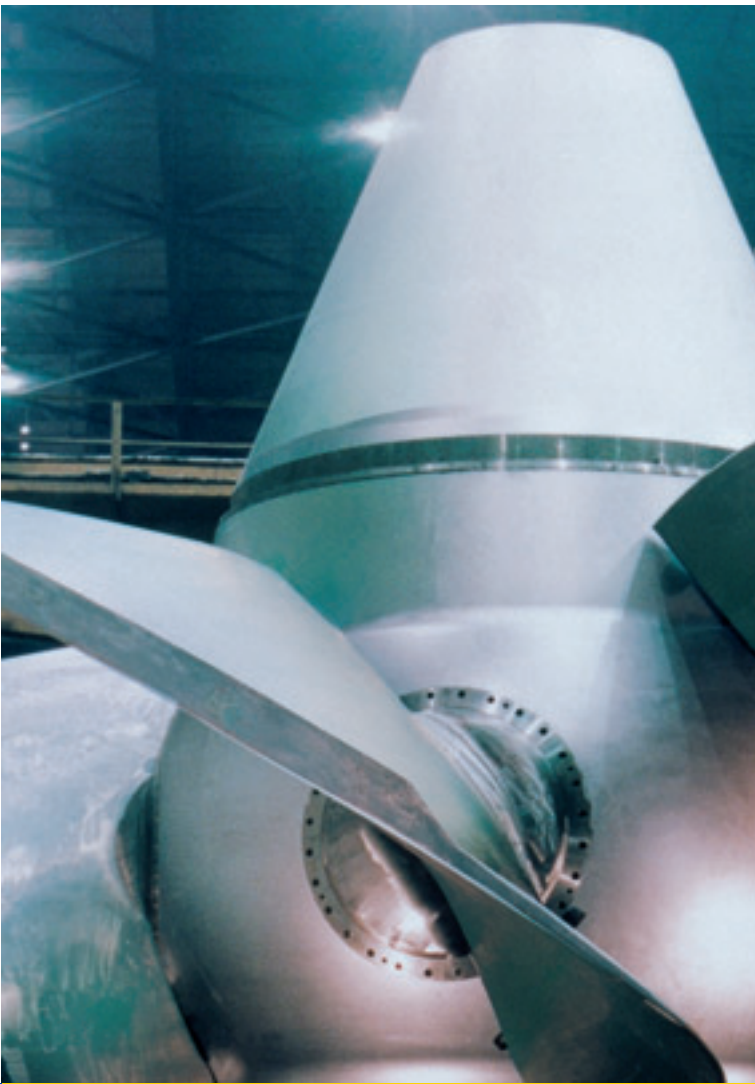
The future belongs to hydropower. It conserves our fossil fuel reserves, is in abundant, self-renewing supply, is non-polluting and produces no waste streams. The world's hydropower potential from rivers and reservoirs amounts to no less than 15 billion MWh per year – and only about 20 percent of this has been developed so far.

Hydropower is not only environmentally friendly, but also cost-effective. Hydropower plants have the highest operating efficiency of all known generation systems. They are largely automated, and their operating costs are relatively low. Hydropower plants also play an important role in water resource management, in preventing flooding, making rivers navigable, solving irrigation problems and creating recreation areas.

Voith Siemens Hydro Power Generation is a leader today in hydropower equipment and services. As an experienced partner to power-plant operators, we provide fast, creative and cost-effective solutions. We offer everything from individual components to complete customized concepts, from turnkey delivery of new plants to the modernization of existing power stations, truly your best choice for one-stop shopping.



Lajeado, Brazil



Competence and capabilities

- Consulting, engineering, erection and commissioning
- System/plant assessments
- Service, modernization and rehabilitation of existing hydropower plants
- Complete equipment, installation and services for hydropower plants
- Francis, Pelton, Kaplan, bulb turbines, pump-turbines, standard and custom
- Storage pumps, radial, semi-axial and axial-flow pumps
- Generators and motor-generators, excitation systems
- Frequency converters, protection systems, switchyards for all voltages, transformers
- Power plant automation, control centers for hydropower plants and cascades, including plant management and diagnostic systems
- Shut-off valves

As your complete hydroelectric partner, Voith Siemens Hydro Power Generation also covers your service needs. In keeping with our comprehensive hydropower expertise, we have a worldwide customer service network on which you can always depend for enhanced operating results.

With our Integrated Services (IS) concept, we provide you with customized support right down the line – from project planning through implementation to plant commissioning and service.

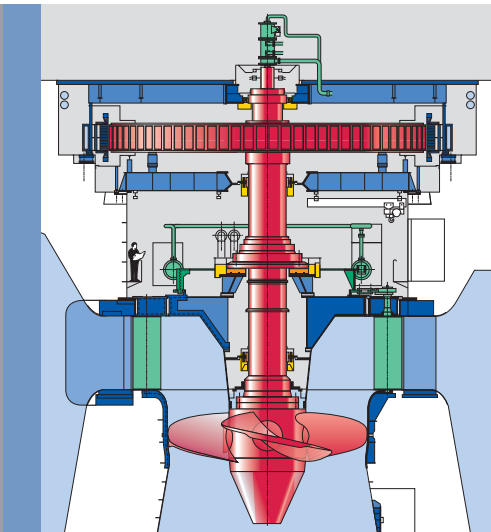
Why take chances? Profit from

Engineered reliability.



Characteristics

Right from the beginning, Kaplan turbine development has always been synonymous with Voith.



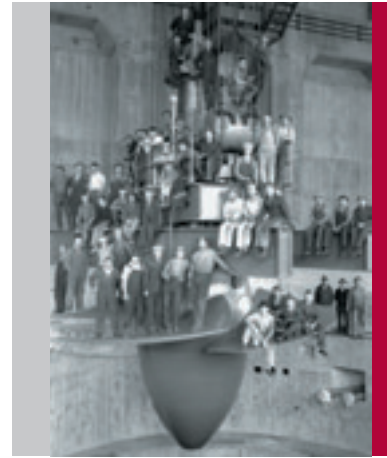
Cross section of a 9.5 m diameter Kaplan runner for the Yaciretá hydropower plant in Argentina



Modernization project in Nera Montoro, Italy

In 1913, the company was the first to recognize the importance of Victor Kaplan's invention and, in partnership with him, developmental tests were carried out in the Voith research laboratory. Since then, thousands of Kaplan turbines have left our workshops, among them the most powerful and largest in the world.

Our program offers an economical solution for any requirement. Large custom-built Kaplan turbines for high output ranges are Voith Siemens Hydro's speciality.

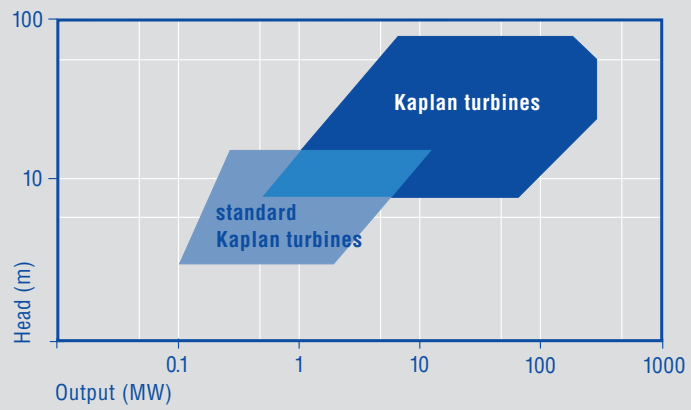


Conowingo, USA



Milling of a Kaplan blade on the 5-axis-CNC-machining center

Application range



Characteristics

Custom Kaplan turbines are used primarily for lower heads and larger flows.

Voith Siemens Hydro Power Generation also supplies cost effective Kaplan units in standardized designs for smaller hydro power plants.

References and milestones



Villach, Austria



Yacyretà, Argentina

- 1870** Beginning of hydro turbine manufacture.
- 1916** Development of Voith-Kaplan model turbine.
- 1922** First prototype Kaplan turbine, Austria.
- 1928** Ryburg-Schwörstadt, Germany: Most powerful ($P = 35$ MW) and largest ($D = 7$ m) Kaplan turbines of their time.
- 1952** Jochenstein, Germany/Austria: Runner diameter 7.4 m.
- 1958** Três Marias, Brazil: Kaplan turbines at a head of $H = 50$ m with 8 runner blades.
- 1960** Aschach, Austria: Runner diameter 8.4 m.
- 1964** St. Martin, Austria: Kaplan turbines at a head of $H = 75$ m with 7 runner blades.
- 1979** Nova Avanhandava, Brazil: Kaplan turbines with output $P = 112$ MW.



Machicura, Chile



Kompienga, Burkina Faso

- 1988** Yacyretá, Argentina:
The largest and most powerful Kaplan turbines in the western world rated at 154 MW and featuring a runner diameter of 9.5 m.
- 1995** Rocky Reach, USA:
Most advanced fish-friendly designed Kaplan turbine in the industry.

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