

HyPower

Voith Siemens Hydro Power Generation customer magazine

Gilgel Gibe to drive Ethiopia's development | Waldeck pumped storage scheme | Important generator projects





10



27



30

Report

Focus on Ethiopia

- 4 Hydro to drive development: Ethiopia discovers its most valuable resource

Technological leadership

- 14 Pelton turbine design of Gilgel Gibe II

Projects

Germany

- 22 Germany's Waldeck pumped storage scheme – successful longtime partnership

Turkey

- 24 Two new hydro power plants for Turkey

China and USA

- 26 Two important generator projects

News

- 28 Caojie, China
- 28 El Platanal, Peru
- 29 Fuchunjiang, China
- 29 Dychów, Poland

News from the Voith Group

- 34 Voith Paper – host to "Location of Ideas"

Essay

Ethiopia and Germany

- 30 A longing for the distance

Staff news

- 36 Shanghai, China
New Chief Financial Officer
- 36 York, PA, USA
New Member of Management Board
- 37 Montreal, Canada
New President and Chief Executive Officer
- 37 New Delhi, India
New Managing Director

Events

- 35 Business Summit on Sustainable Hydropower drives political effort in the industry
- 38 Conferences, seminars and symposia

*Dr. Hubert Lienhard,
Chairman of the Board
of Voith Siemens Hydro
Power Generation*



Dear readers, dear friends,

Our magazine, well-read, as we can see from various responses, has always tried to make a difference to purely technical reporting, both in design and wording. And with the newly designed format, as presented from this issue on, we want to deepen our intent to not only spread our technical expertise and engineered reliability approach in projects and technical solutions.

We also clearly strive to provide our views and opinions on the importance of hydro power for regions, countries and people, and the political framework within which hydro has fought quite a battle to be further recognized as part of the renewable energy generation family.

Our story line will be even more focused on the advantages of hydro power and its direct effects, meaning what hydro does for this world, and how our business activities are simply part of this.

In this issue, we start out with showing how hydro power helps the development of Ethiopia: This country, in early times considered to be a culturally sophisticated and rich nation, has had very little development over the years. It therefore, today heavily depends on a domestic and possibly renewable resource for energy generation. This it has in abundance: water for hydro power.

Our reportage journey takes you from Addis Ababa, meaning “new flower”, to the mountain areas where the Gilgel Gibe I and II hydro power stations bring this development in many respects, to show how hydro development helps this “flower” bloom again. And, we not only help develop hydro production, but we also help esteem the cultural relationships spanning over 100 years between Ethiopia and Germany, through our co-sponsorship in an exhibition this year.

With this widened approach to clearly state the benefits of hydro, we will in parallel build up our focus on the political front for hydro. This time, we urge you to participate in an event that will be held in conjunction with Hydrovision 2006 in Portland Oregon, – the IHA sustainability summit.

It is of major importance that our industry joins forces through platform events like this to discuss the challenges hydro experiences in the fuel mix and in political decisions. I hope to see you at this event and that you will take part in the dialogue among all stakeholders, including NGOs.

I am looking forward to seeing you in Portland on August 1, 2006!

Whatever your comments and opinions are, please send them to my personal e-mail: Hubert.Lienhard@vs-hydro.com

Yours sincerely

Hydro to drive development: Ethiopia discovers its most valuable resource





Omo River.



Addis Ababa seen from the Entoto hills.

Currently almost three million people live in Addis Ababa, the capital of Ethiopia. As late as the 1970s, its population was still well under a million. Addis Ababa means “new flower”. And this “new flower” is blooming, as is the entire country.

This growth needs energy. Hydro power is the solution. Ethiopia’s new hydroelectric powered heart is arising some 270 kms south-west of the capital in the inhospitable region between the Gilgel Gibe and Omo Rivers at Gilgel Gibe II.

Ethiopia’s documented history goes back to the fifth century B.C. The oldest remains of prehistoric man were found here and Ethiopia is acclaimed to be the cradle of mankind.

First time visitors soon realize just how young this ancient country steeped in history actually is.

More than 40% of the population is under 15.

Children are everywhere. They run around shouting in the streets of Addis Ababa, they play tabletop soccer outside, they beg and sell fruit and vegetables at make-shift stands. There is movement everywhere.

Also, there is a lot of activity along the broad highway leading out of the lively metropolitan city into the dissected hills and mountains of the southwest. Women in colorful garments carry baskets, cloths and clay jugs filled with water; men and children lead lean cows and goats along the road.

Mini-buses filled to over-capacity are on the move; carts loaded with firewood and market produce are pulled from village to village by donkeys.

Heavy trucks are loaded with construction material and machinery. They are on their way to the Gilgel Gibe II construction site.

The new power plant is scheduled to be in operation in 2008. The four new Pelton turbines for Gilgel Gibe II will more than double power production. It will be located not far from the country's largest hydro power project to date – Gilgel Gibe I, a 185 MW underground hydroelectric power station that began service in 2004.

This second plant at Gilgel Gibe alone, will raise Ethiopia's hydro capacity by over 50%.

It is being built by Salini Costruttori of Italy; Voith Siemens Hydro is supplying the turbines, generators and the entire electrical and mechanical equipment. Financing of the 490 million Euro hydroelectric project comes from Italian funding and the European Investment Bank (EIB).

Addis Ababa, street scene.

Children's delight: tabletop soccer in the street.





*Mountain road toward
Gilgel Gibe II.*

The further you get away from the capital on the Addis Ababa-Jimma highway, the quieter it becomes, but not as quiet as one would perhaps think. Even where the new asphalt road stops and is replaced by gravel and then by an older route full of potholes, you will still come across small settlements on both sides of the path – traditional straw-covered huts made of clay and eucalyptus branches, single-story clay tiled structures with corrugated roofs and sheds. The road built with the financial support of the European Union is making it far easier for the people who live here to move about from village to village.

This is the case, in particular, where the road meanders through the Ethiopian hills and mountains. In the rainy season, this dusty route is often transformed into mud. Travelers sink up to their knees with every step taken in February and

March and also from June to September. Traveling is almost impossible – whether with the donkey cart or off-road vehicles.

Gilgel Gibe II: A promise of better times ahead.

It is quite easy to imagine here how gravel and asphalt can literally bring about progress to people's daily lives. To develop the area around Gilgel Gibe II, the Italian general contractor has constructed more than 70 kms of road through the dissected uplands.

The complete project is a promise – a promise of better times ahead. It brings optimism and the hope of electricity – hope of light at night and of warmth during the rainy season, which is particularly cool in the mountains. Currently, only 15% of villages are connected to the power grid.

The Ethiopian Electric Power (EPCO) wants to change this with an ambitious plan. Over the next few years, the 6,000 kms of the country's high-voltage lines are to be doubled and the roughly 22,000 kms of distribution lines will be increased six-fold. The first 400 kV high-voltage line is being specially built to connect Gilgel Gibe II and ensure that the losses over the considerable distances to the capital are kept to a minimum.

It is expected that when the 428 MW power plant is linked to the grid, the number of villages supplied with electricity will rise from today's 900 to around 6,000. This would mean that half of the rural settlements of this African country will be supplied with power.

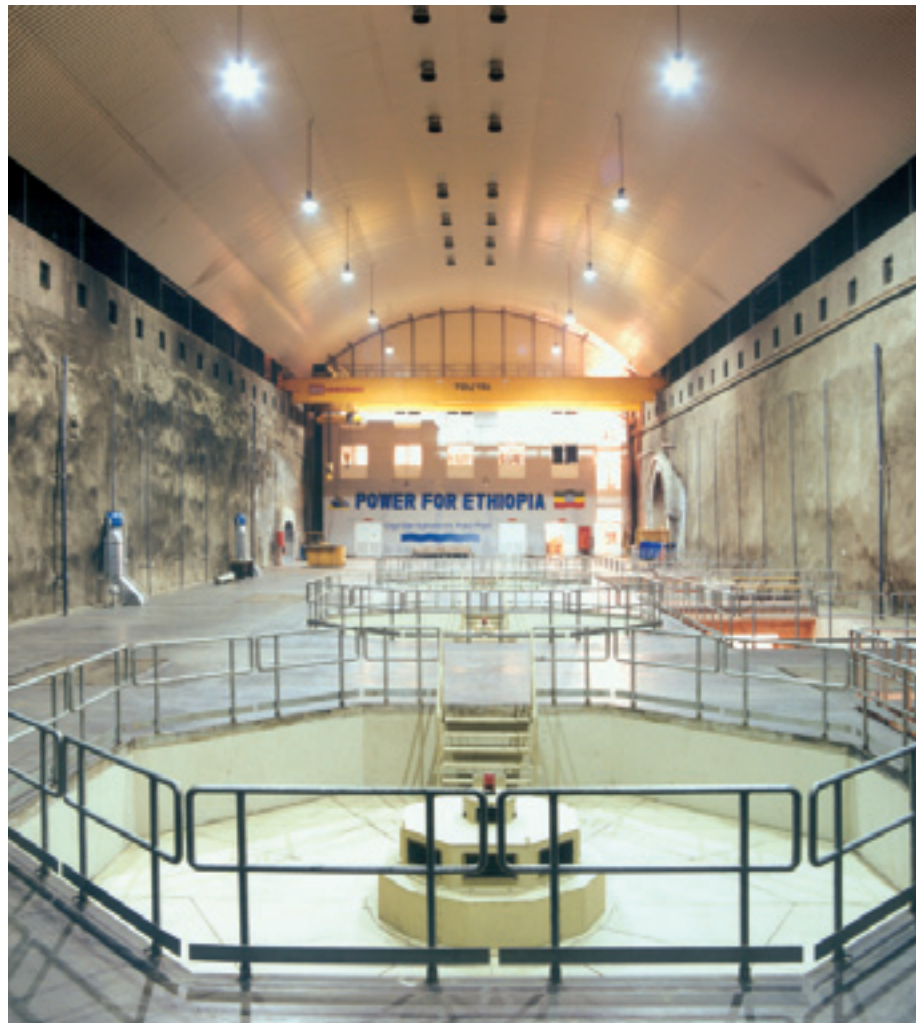


Control room in Gilgel Gibe I.

Inside view Gilgel Gibe I.

Currently only 15% of villages are connected to the power grid.

Gilgel Gibe II will use the water of the older Gilgel Gibe I plant, upstream on the Gibe river, also referred to as “gilgel” meaning “little” in Amharic, the dominant and official language of Ethiopia – a semitic language, coming from Amhara, a former kingdom of northwestern Ethiopia. The reservoir extends like a light blue carpet across the barren landscape with only a few bushes and stunted trees here and there. Further downstream, the small Gilgel Gibe II reservoir will be fed from its spillway and the water coming from the discharge of the first power plant. Soon, water will be flowing into the power tunnel to the new power-house.







Outside the tunnel of Gilgel Gibe II.



Parts of tunnel before mounting.

At the moment there is still a gaping open pit. At its end, a seven meter diameter opening leads to a tunnel. The view follows a railroad track on the tube bottom into the tunnel – so far it simply disappears at some point in the distance. The walls are lined with precast concrete elements, a large supply and exhaust air tube runs along the ceiling. It supplies the workers with air who – kilometers further on – are pushing ahead with the tunnel meter by meter using a huge tunnel boring machine, over 200 meters long. A small electric rail system with barred wagons transports man and material to the work area. The excavated earth exits the tube the same way.

The powerhouse will be built on the banks of the Omo River – as the Gibe River is called further downstream after a complete turn south-east of the entrance. It is longer than a soccer stadium and almost 30 m wide. From the powerhouse side another tunnel boring machine carves out a second tunnel through the hard rock. Somewhere at a center point between Gilgel Gibe and Omo the tunnels will unite into a single 26 km long power channel.

It forms a kind of subterranean shortcut between the upper and lower courses of the Gibe-Omo River.

About 500 meters above the powerhouse, the water is directed from the concrete-lined tunnel into two steel penstocks which then run along the surface. After a short horizontal section, the gradient drops vertically and the water rapidly picks up speed. After a few hundred meters, the penstocks will bifurcate into four, feeding the huge runners of the Pelton turbines. The water will be directed to the buckets of the runners through six jets, which turn the almost three and a half meter diameter turbine runners to 333 revolutions per minute.

Both, the generators and Pelton runners, are being manufactured by Voith Siemens Hydro in São Paulo, Brazil. Their hydraulic profile was optimized at the company's facilities in Heidenheim, Germany. State-of-the-art design technology allows minimal energy loss when the water impacts the runners at a velocity of over 350 kilometers an hour.

Ethiopia is dependent on reliable production of energy to sustain its development.

These turbine-generator units will be transforming the energy of the water into electricity for many decades to come with no fuel cost. Ethiopia, like any other developing nation, is dependent on the reliable and low-cost production of energy to sustain its development. Without it, it will be difficult to create industries and develop efficient communication systems. A dependable supply of power is important to kick-start trade and basic services and to provide the basis for a well-functioning health system. Medical equipment is often electrically driven. Other than low-cost electricity, there is no way of improving the living conditions and daily routine of so many people so quickly and dramatically.

Even though it will be a few more years before Gilgel Gibe II starts producing power, the progress from the construction of this power plant is already being felt in the small mountain village of Fofa. Until quite recently, Fofa could only be reached on the most exhausting of paths.



The newly constructed road linking the Gibe and Omo sites which Salini pushed through with endless twists and turns across the 2,500 meter high mountain, go through Fofa. Salini set up its camp nearby and now ensures that medical treatment is available for the surrounding villages. Fofa is now connected to the power grid.

The poor, in particular in the countryside, still depend on traditional energy sources such as wood and dung burning.

But what has become reality for the people of Fofa is a long way off for many Ethiopians. According to UN sources, life expectancy today is still 48 – just a year more than it was fifteen years ago and only five years above the 1970’s figure. The poor, in particular in the countryside, still depend on traditional energy sources such as wood and dung. For millions this means spending a lot of time every day looking for material to burn for cooking and heating – time which is then not available for education or employment.

It is no wonder that only one third of Ethiopian women can read or write whereas the male literacy rate is just under 50%. Electricity can surely help to escape the vicious circle of poverty and lack of education.

Currently, the national grid has a total installed capacity of 785 MW, more than 95% coming from hydroelectric sources. With its twelve extensive river systems and favorable topography, this country at the Horn of Africa has an enormous potential in hydro power. It is estimated that currently under two percent of the potential that can be economically developed is being used. Thus the scope for hydroelectric power generation by far exceeds Ethiopia’s domestic demand in the foreseeable future. As a result, the development of hydro power opens up the medium-term prospect of exporting energy into neighboring states, such as Djibouti and – with the Southern Africa Power Pool grid coming a step closer – even to more distant countries as well.

It doesn’t come as a surprise that the Ethiopian government grants top priority to the development of water and energy in order to create those opportunities for a sustained social and economic growth. EEPKO’s expansion plans aim to increase generation capacities to 3,000 MW in 2009/2010 and double the number of customers, making this country ready to bloom.

Hydro summary

- Ethiopia is building three hydro power stations and which could bring additional revenues in foreign currency by the export of excess electricity to neighboring countries. The new will have an installed capacity of 1,155 MW. By 2010 the construction of Tekeze hydro power station with 300 MW, Gilgel Gibe II hydro power project with 420 MW and Belesse with 435 MW will be completed. Ethiopia currently has installed an overall hydro capacity of almost 800 MW.
- When Gilgel Gibe II starts generating electricity in 2008, it will be Ethiopia’s most powerful hydroelectric plant, at that point of time. Voith Siemens Hydro is supplying all the mechanical and electrical equipment for the project. Furthermore, the company is responsible for the installation, testing and commissioning and will also train EEPKO’s staff.

Omo River.



Ethiopian woman carries dung fuel.



Pelton turbine design of Gilgel Gibe II

The Gilgel Gibe II project contains four Pelton turbines, each delivering 107 MW to the Ethiopian grid. Their impressive physical dimensions place these turbines among the world's largest. The design of the turbines is a product of the longstanding correlation of computerized tools by the hydraulic and mechanical experts of Voith Siemens Hydro, making the equipment in Gilgel Gibe II one of the most advanced power units in the world.

A look at history and technology

Pelton turbines belong to the family of free jet turbines. Originally invented in 1880 by the gold miner Lester Pelton, design was refined and optimized over the time.

The basic principle, however, is still the same. A nozzle is placed at the end of the pressure line, converting the potential energy of the water into kinetic energy by forming a water jet. The jet is directed to the runner buckets, the hydraulically active parts of the turbine. At the entrance into the symmetrically shaped buckets the water jet is split into two parts, each developing a sheet of water on the bucket's curved surface. At the end of the working cycle, the water leaves the bucket in the opposite direction of the free jet. The rotational energy is then transferred through the shaft to the generator.

At a runner circumferential velocity of around half the jet velocity, the maximum efficiency in the energy conversion is reached because the energy of the discharging water is at its minimum.

A common classification of modern Pelton turbine designs is related to the orientation of the shaft. Pelton turbines with a horizontal shaft are designed with up to three nozzles; turbines with a vertical oriented shaft have three to six nozzles. The typical application of Pelton turbines is in low specific speed conditions, which means the available water flow rate is small compared to the available head. Among the different types of hydraulic machinery, the Pelton turbine shows an impressive part load performance.

The author, Reiner Mack, is Voith Siemens Hydro's Product Responsible for Pelton turbines. Reiner.Mack@vs-hydro.com





The graph bottom left shows a comparison of the efficiencies of a six jet Pelton turbine with a typical Francis turbine. At up to 60 % load the multi-jet Pelton turbine has a clear advantage, which explains why Pelton turbines are very often used for rapid grid regulation.

Pelton turbines have been designed and built at Voith Siemens Hydro for more than 100 years. A large number of turbines have been delivered to our customers ranging from small hydro size up to a unit capacity of almost 300 MW – as reached by the most powerful Pelton turbines in the world. Longstanding experience and continuous development make Voith Siemens Hydro one of the leading suppliers of Pelton technology.

Pelton solution for Gilgel Gibe II

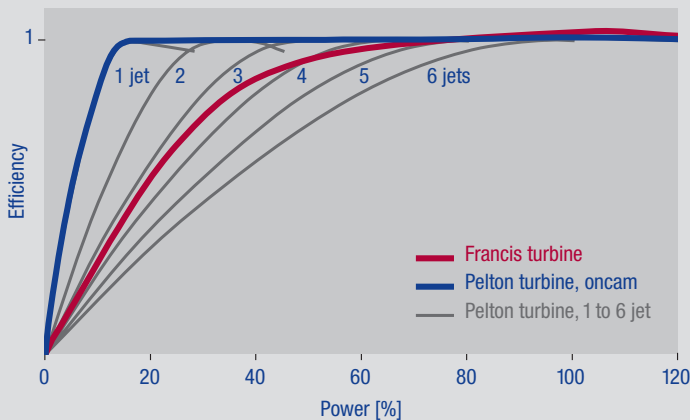
Among past projects, the turbines for Gilgel Gibe II stand out, because the design and layout was strongly supported by computer aided design tools. Some aspects of the hydraulic and structural design of these turbines are presented here.

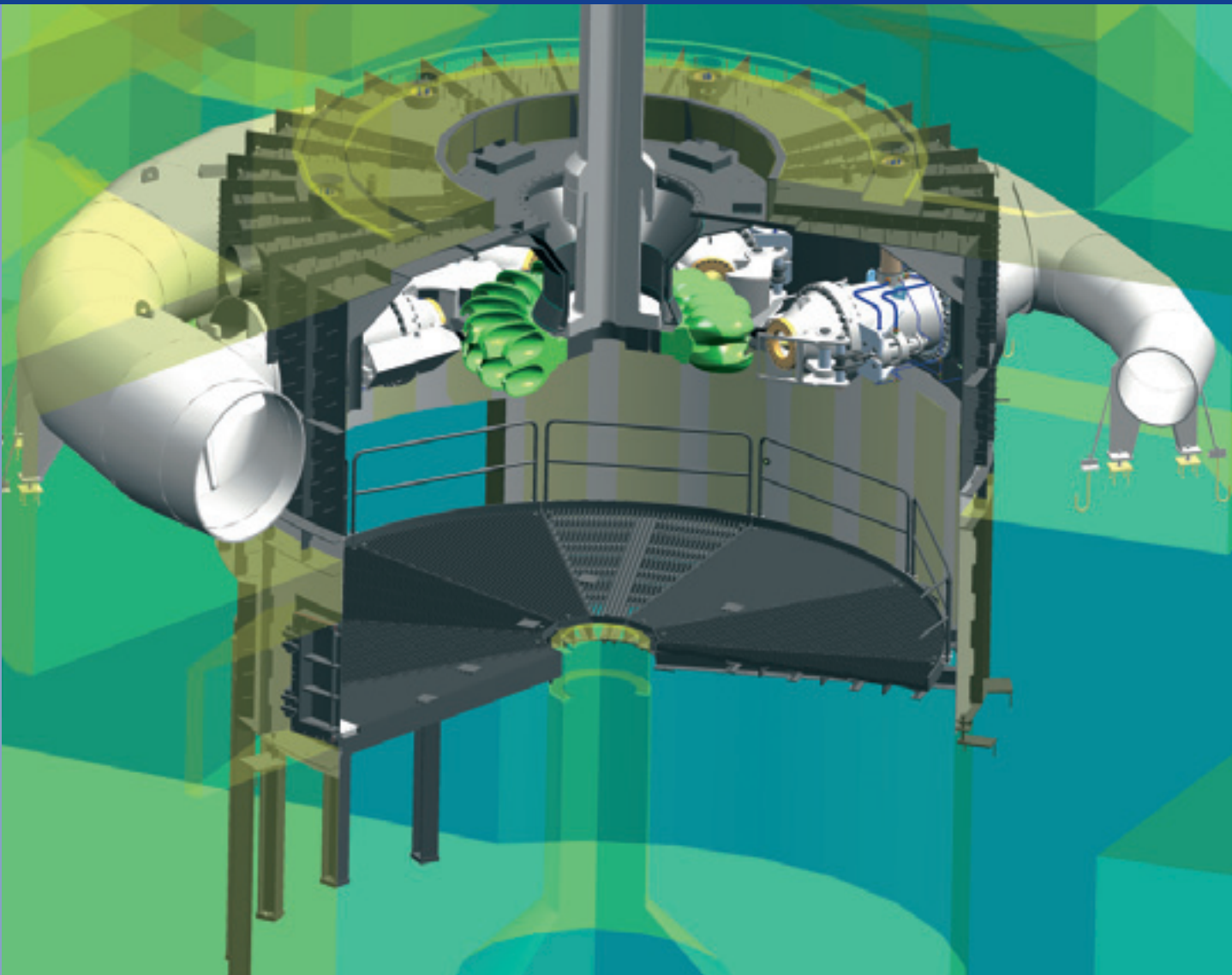
The illustration on the right shows a cutout view onto a 3D CAD model of the turbine. Six nozzles are fed by a distributor line that has a total width of around 14 m.

The Gilgel Gibe II project's four vertical Pelton turbines each deliver 107 MW power at a maximum net head of around 500 m. The photograph below illustrates the large dimension of the distributor line during manufacture. The inlet is nearly two meters in diameter, making it possible to walk through most of the distributor line.

Efficiency comparison of a six jet Pelton turbine with a typical Francis turbine.

Distributor line of Gilgel Gibe II during manufacturing.





Cutout view of the 3D CAD model of the Gilbe Pelton turbine.

Distributor details

Each distributor line is manufactured in three pieces, which are then welded together at the construction site. A particular hydraulic challenge for these turbines was the high specific speed at which the turbines will run with respect to the typical range of Pelton turbines. Because of this, a detailed optimization of all components had to be performed during the development of the turbine.

The optimization of the distributor line was focused on reducing flow separation zones, which are the main cause for energy loss and for insufficient jet quality at the outlet of the nozzles. The computational fluid dynamics tools (CFD), established at Voith Siemens Hydro for many years, were used for the optimization.

The detailed view into all aspects of the flow field allowed the identification of critical areas and a rapid change in the geometry of the machine. Several development loops were done within a short period of time, leading to a significant improvement. The final geometry shows a very even velocity distribution, illustrated by the streak lines as shown below.

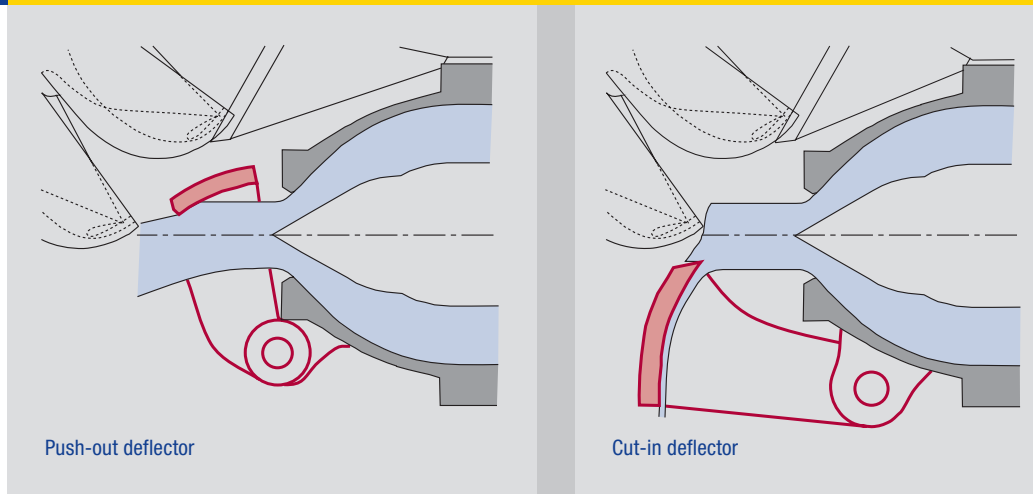


Streak lines of the optimized Gilgel Gibe II distributor line.

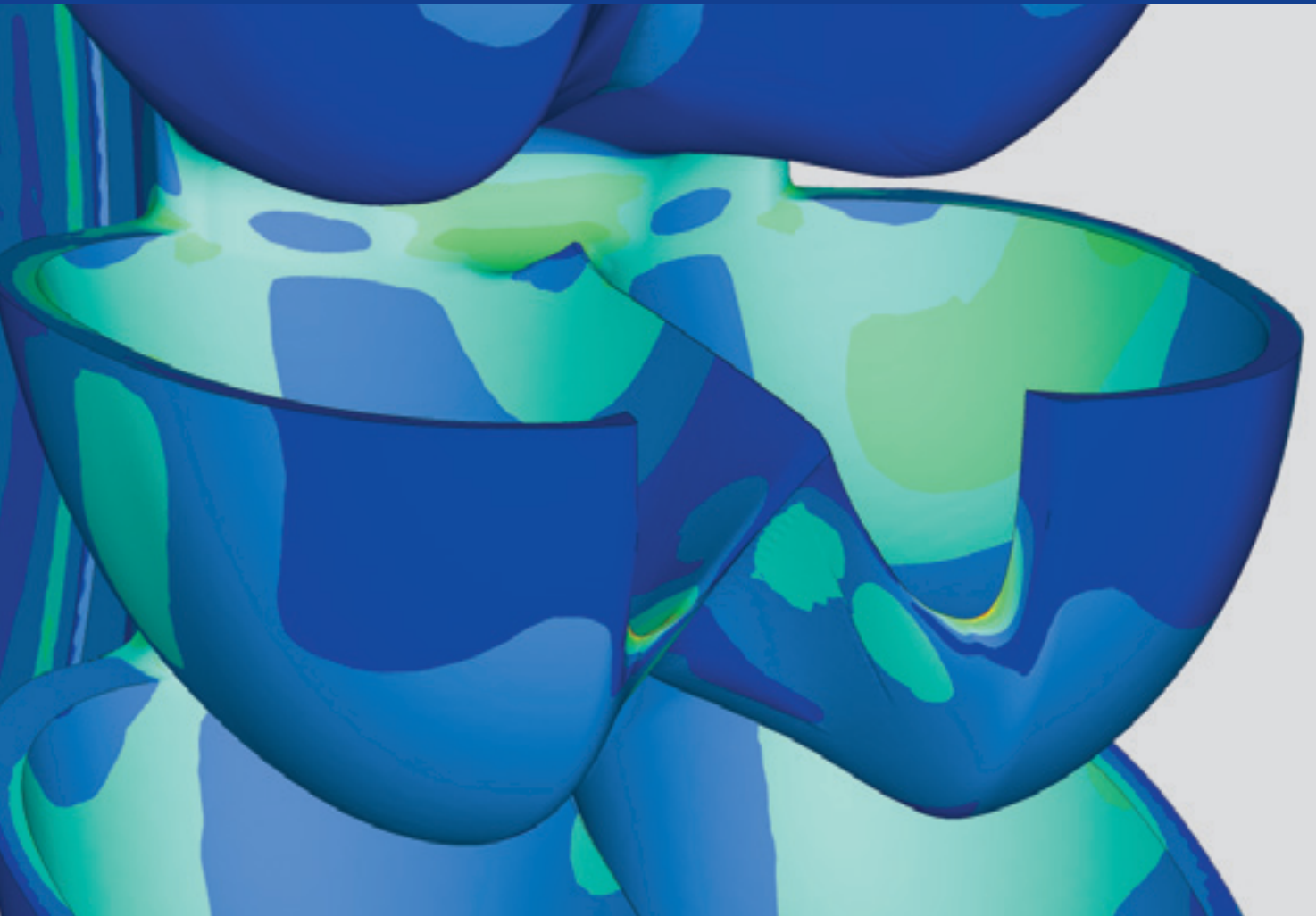
Regulation capabilities

Since the power of the Gilgel Gibe II turbines is large, compared to the electrical grid they are connected to, rapid and very frequent regulating capabilities of the units are necessary. Because of this, the typical Voith Siemens Hydro cut-in deflector was used for the turbines. An illustration of the difference between the cut-in deflector and the commonly used push-out deflector is shown in below. While the push-out deflector presses the complete jet to larger jet circle diameters, the cut-in deflector guides only a part of the jet away from the runner.

The push-out deflector bends and deforms the jet right at the side where the bucket touches the jet first. However, the inlet part of the Pelton bucket is very sensitive to changed inlet conditions and poor jet quality. Drop erosion and cavitation damage to the runner often are the result of the use of push-out deflectors for frequent regulating action. The cut-in deflector has very little impact on the jet, especially on the side where the bucket touches the jet first. There is no negative change in the jet surface or shape.



Comparison of the push-out and the cut-in deflectors.

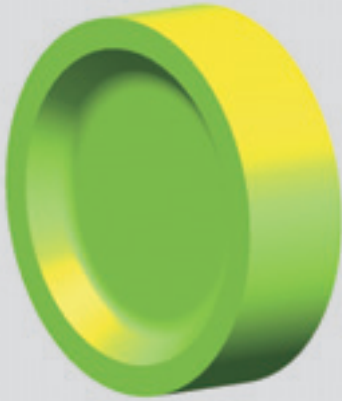


Runner design

The runners for Gilgel Gibe II are almost 3.5 m in diameter and each is manufactured from a forged disc with welded buckets. This technology, patented by Voith Siemens Hydro, ensures the highest possible material quality in between adjacent buckets, the area where the highest stresses typically occur. The first stage of the process is the manufacturing of the forged disc. An intensive check for hidden cracks is performed with ultrasonic testing after the disc is pre-machined. After that, the root area of the buckets is milled out of the disc.

Parallel to the milling of the forged disc, the bucket heads are cast and machined. The buckets are then welded onto the machined disc. In order to ensure the highest quality of the weld seams, ultrasonic, magnetic particle and liquid penetration testing is performed. Balancing and polishing of the hydraulic surfaces finalize the manufacturing. For the reliable and safe operation of the runner, a complete geometrical check of the hydraulic surfaces and the high stressed regions is performed after the manufacturing of the runner is completed.

Stress distribution of the Gilgel Gibe II runner.



Forged disc



Milled root area



Bucket head welded

Runner manufacturing process used in Gilgel Gibe II.

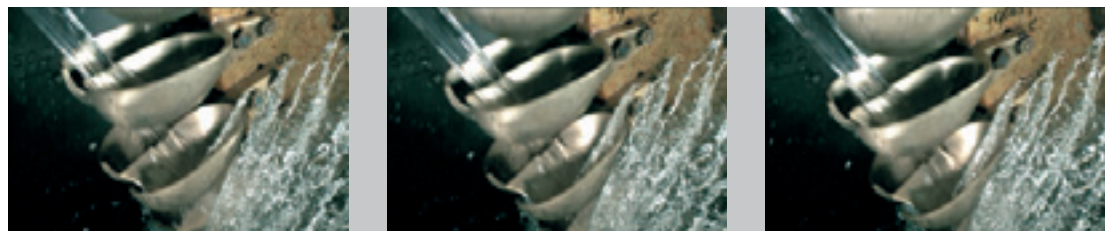
Jet bucket interaction

Similar to the hydraulic design of the distributor line, the optimization of the jet bucket interaction was also developed using CFD tools. A typical bucket flow sequence, taken by high speed camera, is shown below. The time dependent working cycle can be observed very well by looking at the discharging water. As the buckets move, the water starts to discharge in the root area.

Further into the working cycle, the discharging water covers more and more of the bucket rim. Though the high speed camera gives a good impression of the bucket flow, the insight is limited to only certain viewpoints on the moving buckets. In order to have a more detailed view of the flow behavior, instationary simulation of the bucket flow was used. In particular, the multijet configuration was investigated in more detail.

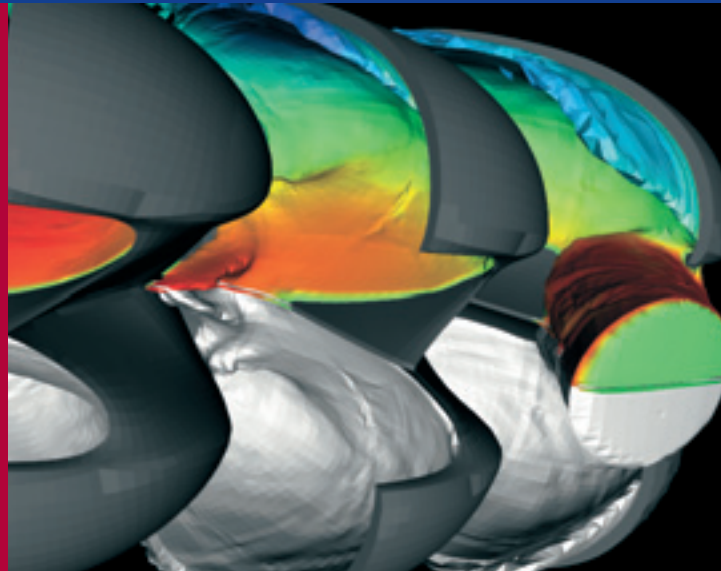
A snapshot of the water sheet development during the cut in sequence of an adjacent jet is shown on page 21 top right. As illustrated, the incoming jet touches the already established water sheet of the previous jet. Because of this, detailed simulations with one and two jets had to be performed in order to optimize the multijet configuration for the Gilgel Gibe II design.

Time dependent flow visualization, taken by a high speed camera in a typical model Pelton turbine.





Finished runner

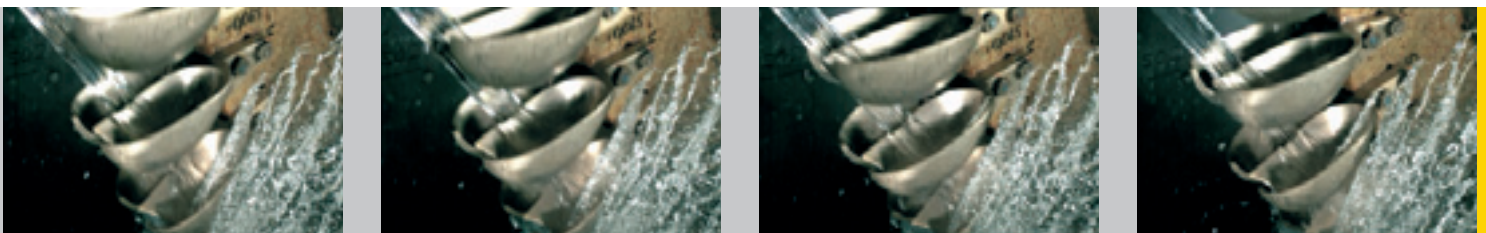


Snapshot of the multijet bucket flow simulation during the entry of the second jet.

The addition of the Pelton turbines at Gilgel Gibe II will improve the Ethiopian electrical grid. Not only will the available power increase, but also the fast regulating capabilities and the high efficiency over the whole power range will substantially improve the stability of the grid and consequently will increase the reliability of the energy supply. Optimized with modern computer aided tools that were correlated with the longstanding experience of the Voith Siemens Hydro experts, the Gilgel Gibe II turbines will be one of the most advanced power units operated worldwide.

Technical summary

- Scope of supply includes:
 - Four 107 MW vertical Pelton-turbines, frequency governor and inlet valves
 - Four 125 MVA generators and excitation equipment
 - Protection, control and monitoring system
 - Main step-up transformers
 - Switchyard 400 kV including overhead lines
 - Powerhouse cranes
 - Ventilation and air conditioning
 - Cooling water system
 - Auxiliary electrical equipment
 - Telecommunication and control systems
 - Fire protection
 - Lighting and small power systems
 - Cabling systems
 - Earthing and lightning protection system
 - Emergency power supply





Panoramic view of Lake Edersee and Waldeck (Courtesy of Eon Wasserkraft).

Germany's Waldeck pumped storage scheme – successful longtime partnership

For over 75 years the name of Waldeck stands for a reliable partnership for both customer and supplier. Voith Siemens Hydro's German unit has been awarded a contract by Germany's Eon Wasserkraft for supplying equipment for the modernization of the Waldeck pumped storage stations.

Eon Wasserkraft is going to invest 50 million Euro in the modernization of Waldeck I hydro power station, located in Germany's federal state of Hesse on Lake Edersee. The project comprises the modernization of an old unit, as well as building a new pumped storage plant. The contract value for Voith Siemens Hydro's share of the project is 24 million Euro.

The overall technical concept – from structural to electromechanical design – was developed by Voith Siemens Hydro in close cooperation with civil construction partner Bilfinger Berger. This led to finding the most efficient solution during the pre-bid phase, when both partners considered all aspects of interdependency of hydraulic design, electromechanical concept and civil construction aspects.

Bilfinger Berger will execute the civil works for the new complex which will be built additionally to the existing station of Waldeck I, and Voith Siemens Hydro will be responsible for the supply of the complete electromechanical package, containing a new reversible 74 MW pump-turbine, motor-generator, shut-off valves, start-up converter, transformer and process control system.

As early as in 1929, Voith Siemens Hydro supplied the turbines, governors, and shut-off valves for the first Waldeck I project. After decades of operation, this equipment will be overhauled, simultaneously to the construction of this new pit-type pumped storage station.

Again, in 1975, when the second power station was built – Waldeck II pumped storage station – Voith Siemens Hydro was awarded the contract for supplying turbines and spherical valves.

These components are currently also under rehabilitation in the Heidenheim facilities.

In 2009, when the new pumped storage station will be connected to the grid, Voith Siemens Hydro will be able to look back at 80 years of successful partnership.

Technical summary

Voith Siemens Hydro scope of supply

- **Waldeck I:**
Overall concept, reversible pump-turbine, motor-generator, process control system and electromechanical components.
- **Waldeck II:**
Modernization of turbines and spherical valves, motor-generators.

Author



Dr. Leopold Heninger
Member of the Board
of Management,
Voith Siemens Hydro
Kraftwerkstechnik,
Heidenheim, Germany

- Leopold.Heninger@vs-hydro.com

Lake Edersee.



Waldeck II spherical valves.



Waldeck hydro power station.



Two new hydro power plants for Turkey

Turkey's General Directorate of State Hydraulic Works DSI (Devlet Su İşleri Genel Müdürlüğü) and Kolin Construction, each awarded a contract to Voith Siemens Hydro in St. Pölten, Austria, for the supply of the equipment for the Akköprü and Akköy hydro power stations.



*Prof. Dr. Veysel Eroğlu,
Director General of the DSI and
Chairman of Turkish National
Committees, ICID (TUCID),
ICOLD (TCOLD) and WWC.*

Two 59.3 MW vertical Francis turbines, butterfly valves, turbine governors, 65 MVA generators, transformers, medium and high voltage switchyard as well as the automation system for the turnkey project of Akköprü will be supplied by Voith Siemens Hydro.

The Dalaman Akköprü Dam and hydroelectric power plant, located in southwest Turkey, is the country's seventh largest project among those under construction. It will enhance development for Muğla and its surrounding areas once it is completed. The dam will also provide flood protection for the Seka Dalaman paper factory, the Dalaman airport, and several tourist resorts, while supplying reliable electricity for the entire region.

Electricity shortages have become a major issue in Turkey for some time. In order to address this problem, the Turkish government has started building dams in various parts of the country. Prof. Dr. Veysel Eroğlu, the DSI's Director General, emphasizes the importance of reliable solutions for energy supply:

“With a sufficient supply of energy and electricity vital to social and economic development, electricity consumption in Turkey is increasing by six to eight percent per year on average. Similar growth is expected for the coming years. With electricity supply and demand studies showing a clear imbalance in Turkey, a shortage is anticipated for 2009.



Akköprü construction site.

In order to maintain and extend economic progress, Turkey needs to rely on natural energy sources that are both crisis proof and independent of fluctuating crude oil prices. Taking these factors into account, hydro power generation offers a viable alternative to conventional methods of power generation in Turkey.”

Akköprü hydroelectric project, to be connected to the national grid in 2008 with an annual generation of 343 GWh, will make a significant contribution to the share of hydro power in Turkey.

In Turkey’s northeast, another new hydro power plant will contribute to assuring the electricity supply: Akköy hydro power project, fed by the Harşit River in Anatolia. Equipping this project will also be handled by Voith Siemens Hydro St. Pölten. The customer is Kolin Construction Tourism Industry and Trading Company. Voith Siemens Hydro will supply two vertical Francis turbines with an output of 35 MW each, governors, two 40 MVA-generators and two butterfly valves.

Technical summary

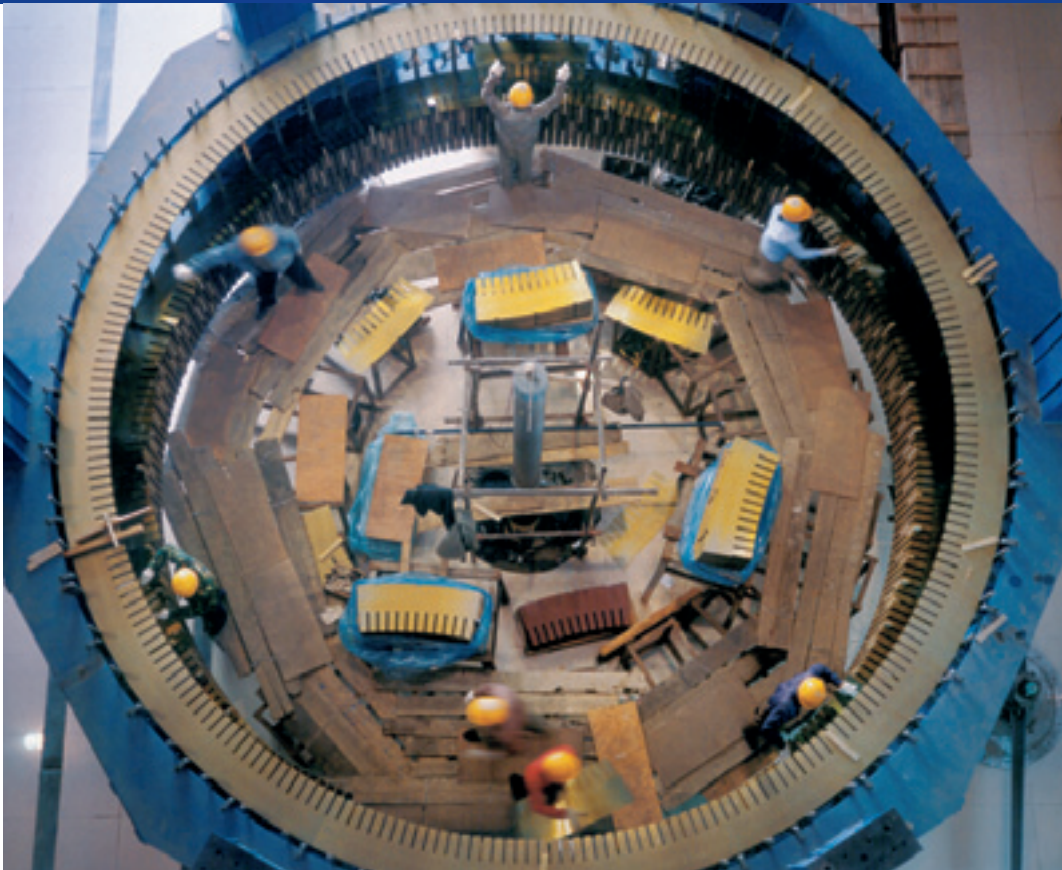
- Akköprü:
 - Two 59.3 MW vertical Francis turbines
 - Two 65 MVA generators
 - Automation system
 - Two butterfly valves
 - Turbine governors
 - Medium voltage switchyard
 - High voltage switchyard
- Akköy:
 - Two 35 MW vertical Francis turbines
 - Two 40 MVA generators
 - Governors
 - Two butterfly valves

Author



Anton Schmidt
Project Manager,
Voith Siemens Hydro,
St. Pölten, Austria

- Anton.Schmidt@vs-hydro.com



Stator frame, Jilintai, China.



Outside view, Jilintai, China.

Two important generator projects

Voith Siemens Hydro, Shanghai, China, and Voith Siemens Hydro, York, USA, are involved in major hydro generator projects and the results point at a most gratifying development in this sector.

Jilintai Project is located in the western region of Xinjiang province in China. This power plant will generate peak power for the northern Xinjiang power grid, which is one of the key projects in the development of China's western areas. The whole project will be complete in 2006 with a total installed capacity of 460 MW.

The first generator contract for the project came in 2001, followed by contracts for two more units. The generators' capacity is 128 MVA each at 214.3 rpm and a rated voltage of 15.75 kV.

A special feature of this project is the insulation: due to VPI (Vacuum Pressure Impregnation) technology, complete removal of all air and solvents from the insulation is assured. Both generators have a single shaft structure.

On the other side of the world, Voith Siemens Hydro, York, PA, USA, was awarded a contract to replace the entire generator stator for unit five of Avista Utilities' Noxon Rapids project.

Noxon Rapids is located on the Clark Fork River about 20 miles upstream of Avista's Cabinet Gorge project in the state of Montana. It has the largest generating capacity of any of Avista's eight hydro-electric developments.

The replacement stator will resolve long standing distortion problems with the original generator.

Voith Siemens Hydro's patented anti-buckling design features will be implemented to ensure long term reliability of the unit. An international team of engineers participated in the proposal phase and significant engineering was performed before submitting the offer to Avista Utilities.



*Noxon Rapids view,
Montana, USA.*

Authors



Clare Chen
Marketing Service
Administrator,
Voith Siemens Hydro,
Shanghai, China

• Clare.Chen@vs-hydro.com



Stanley Kocon
Director of Sales
and Marketing,
Voith Siemens Hydro,
York, PA, USA

• Stanley.Kocon@vs-hydro.com

Caojie China

New hydro power plant
on Jialing Jiang River



Contract signing for Caojie hydro power project.

Voith Siemens Hydro in Shanghai was awarded a contract for equipping the Chinese hydro power project Caojie in Chongqing province. For the contract, worth approximately 51 million Euro, Voith Siemens Hydro will supply four 128 MW Kaplan turbines. Chongqing Shipping Construction Development Company, whose main business covers water way projects and electric generation in major rivers, key ports and wharfs, is the operator of the plant. In order to optimize transportation conditions for the 9.5 m diameter turbine runners, a harbor will be set up near the construction site.

Caojie integrates power generation and navigation development at Jialing Jiang River.

Clare.Chen@vs-hydro.com

El Platanal Peru

High-head machinery
for Andean plant



Voith Siemens Hydro in São Paulo, Brazil, recently was awarded a 25 million Euro contract for the El Platanal project in Peru. The São Paulo facility will supply two 110 MW vertical Pelton turbines, each rated for a net head of over 600 m. In addition, generators (120 MVA output), automation systems, governors and excitation will be supplied to the operator of El Platanal – Compania Eléctrica El Platanal S.A. – owned by the Peruvian Cementos Lima. The El Platanal hydro power project is located in the Andean foothills and is fed by the Cañete River. Besides generating clean renewable energy, the plant will be used for the irrigation of 27,000 hectares of uncultivated land of the pampas of Concón-Topará between Cañete and Chincha Alta on the south coast. Commissioning is scheduled for May 2008.

Luiz.Souza@vs-hydro.com

Fuchunjiang China

Third unit again fit for summer's peak



Kaplan runner for the Fuchunjiang hydro power station.

After a month of smooth operation, Fuchunjiang has obtained the full affirmation by East China Power Grid Company last year. Strict timing was necessary, because this unit plays an important role in responding to energy demands during China's summer peak power demand.

The unit passed all specified tests with flying colors due to the smooth cooperation with the owner.

With state-of-the-art technology, the eight meter diameter unit will play an integral role in the future of the Fuyang region, which is a new economic growth region in modern China.

Clare.Chen@vs-hydro.com

Dychów Poland

Complex modernization



Dychów hydro power station.

Dychów hydro power project is one of the largest plants of the Lubuskie Voivodship in Poland. In 1997, after 50 years of operation, Elektrownie Sczytowo-Pompe S.A. realized that the hydro power plant required comprehensive reconstruction. As a result of modernization, installed power has risen up to 90 MW and the average annual production for the entire plant grew from 98 GWh to 120 GWh. Voith Siemens Hydro's units in St. Pölten, Austria, and in Heidenheim, Germany, including Voith Turbo's Polish subsidiary, overhauled the three Kaplan turbines and generators, four storage pumps, and one motor, including ancillary equipment. Turbine output increased from 26.1 MW to 30.5 MW and discharge from 110 m³/s to 119.3 m³/s. The overall efficiency of the pump storage cycle has been increased from 77 % to 88 %.

Josef.Gaschl@vs-hydro.com



Ethiopia and Germany

A longing for the distance



Double diptych pendant 17th/18th c., wood, 11.5 x 8.5 cm, State Museum for ethnography, Munich, photograph by Marianne Franke.



Advertisement poster for Volkswagen, 1960, designed at the School of Fine Arts in Addis Ababa, photograph by Peter Roenpage.

Even though official diplomatic relations only began some 100 years ago, exchanges between Ethiopia and Germany have spanned five centuries.

For many years this was bolstered by a longing for the distance one could never achieve, – a romantic fascination for something not completely known, something mysterious. This has been particularly true for the poetic, often purely fictitious images of Ethiopia as portrayed many times in European literature, visual arts and music since the 16th century. This realm of images was confronted by the attempts to get near to things distant by means of expeditions and scientific explorations.

A special kind of exchange: delicate jewelry and steam rollers

Diplomat Friedrich Rosen, as head of the first German delegation, came to Ethiopia on an official mission in 1904.

This initial contact, the following scientific expeditions and interest shown by the trade delegations provided a huge impetus to German-Ethiopian relations.

The German delegation took along some truly wonderful gifts: silver and golden embroidered velvet cloaks, silver-mounted shields, delicate jewelry, valuable signatures, mediaeval icons, prayer scrolls and everyday items. Kept in the museum they document this important encounter. The gifts for Emperor Menelik II included an electric dynamo to provide his palace with light as well as a truck. Germany presented itself as an advanced technological country and later sent industrial age acquisitions to Ethiopia as gifts-in-return: steam rollers, alternators and the first automobiles.

Although other countries had representatives in Ethiopia, Germany was the first to construct its own embassy in Addis Ababa. Building began in 1906 on land donated by the Ethiopian emperor.

Diplomatic relations developed very favorably under Menelik II. He seized every opportunity to use German expertise for improving a number of development projects – projects that even included the supervision of tree plantings. However, not all plans could be realized in view of a lack of financial support at times.

One of the success stories is the Kebena Bridge in Addis Ababa. It is still locally referred to as “Germen”, thus hinting at its German origin. Menelik very much appreciated the German specialists. And even today the demand for German expertise and engineering skills continues.

Voith Siemens Hydro, for instance, equips numerous hydroelectric power projects in the Horn of Africa – including the country’s largest hydro power plant – with state-of-the-art equipment and, as such, is playing a major role in Ethiopia’s development today.

Lake Tana, in the northwest-highlands is the source of the Blue Nile and Ethiopia’s largest lake. Some of its islands shelter orthodox monasteries and remains of Ethiopian emperors.

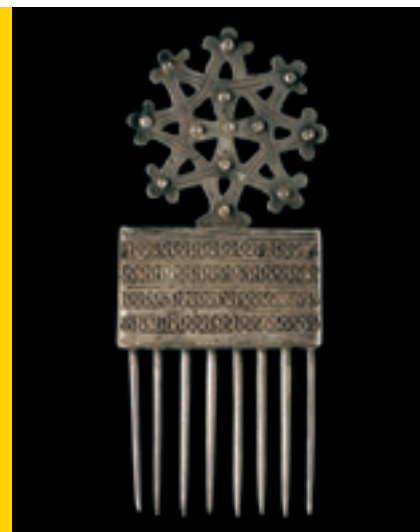




Cross used in processions, Lalibela, 15th c., brass, height: 40.2 cm, State Museum for ethnography, Munich, photograph by Marianne Franke.



Cane, knob in shape of a lion, Ethiopia, ivory and iron, length: 98 cm, State Museum for ethnography, Munich, photograph by Marianne Franke.



Comb, Ethiopian Highlands, Amhara, silver, 10.5 x 4 cm, State Museum for ethnography, Munich, photograph by Marianne Franke.

Exhibition in Germany and Ethiopia looks at the relations of both countries

On the basis of historical and contemporary exhibits from the cultural, artistic and political worlds, the fascinating history of the relations of both countries can now be told in the “Äthiopien und Deutschland. Sehnsucht nach der Ferne” (Ethiopia and Germany. A longing for the distance) exhibition.

The project of the Dresden State Art Collections (“Staatliche Kunstsammlungen Dresden”) – which is being sponsored, among others, by Voith Siemens Hydro – can be viewed in Leipzig from the end of May to the end of August 2006 and in its sister city of Addis Ababa from November 2006 onward.

Light will be shed not only on the great number of expeditions and scientific explorations but also on German-Ethiopian political and artistic relations. Present-day artists from the two countries along with their exhibits will be attending.

Summary

- Äthiopien und Deutschland. Sehnsucht nach der Ferne Ethiopia and Germany. A longing for the distance
- An exhibition of the Dresden State Art Collections in cooperation with the Saxonian State Ethnographic Collections and the Association City Partnership Leipzig-Addis Abeba e.V. in the newly opened GRASSI MUSEUM für Völkerkunde zu Leipzig, Johannisplatz 5-11, 04103 Leipzig, Germany
- Opening hours: 21 May- 27 August 2006 Tue-Sun 10am-6pm

Author

Dr. Kerstin Volker-Saad
Project Coordination
Dresden State Art Collections



Anja Lehmann (Voith Paper Marketing) and Ulrich Begemann (Managing Director Voith Paper Technology Center GmbH).



Presenting the partnership plaque (from left to right) Friedrich-Karl Finck (Senior Vice President Corporate Communications of Voith AG), Dr. Hermut Kormann (President and CEO of Voith AG), Dr. Michael Rogowski (Chairman of Shareholders' Committee and Supervisory Board of Voith AG), Mike de Vries (CEO of FC Deutschland).

Voith Paper – host to “Location of Ideas”

Germany – “Land of Ideas”

Voith Paper was recently awarded a spot in a new exciting campaign. The Group Division had applied as a “Location of Ideas” with its new Paper Technology Center in Heidenheim.

The new center is the largest single investment in the Research and Development sector Voith has ever made in its history. Together with the preliminary investments, it amounts to over 75 million Euro.

The objective of the campaign “Germany – Land of Ideas,” is to improve the image of Germany at home and abroad. It is established to serve this idea during the 2006 Soccer World Cup.

The “Land of Ideas” consists of “Locations of Ideas.” These locations are not cities in a geographical sense but places where ideas are born, developed and promoted.

Each of the selected 365 locations will present itself to the public on a separate day – the Paper Technology Center will have its big moment on May 11, 2006, the day of its official inauguration.

The German weekly “Die Zeit” is covering the project from an editorial standpoint. The 365 winners in the “Land of Ideas” are entitled to use the slogan “Selected Locations 2006” in their advertising and public relations activities. Voith Paper Technology Center was among 365 winners, chosen from 1,200 contestants.

Already in November 2005 Dr. Michael Rogowski in his co-function as Member of the Board of Directors of FC Deutschland GmbH and Mike de Vries as its CEO handed over the official partner board to Dr. Hermut Kormann. The campaign “Germany – Land of Ideas” is managed by FC Deutschland GmbH.




Business Summit on Sustainable Hydropower drives political effort in the industry

In conjunction with the HydroVision 2006 conference and exhibition this summer, the Business Summit on Sustainable Hydropower organized by the International Hydropower Association will hold a pre-conference program.

The International Hydropower Association is at the vanguard in representing hydro power's interests. The industry faces challenges as to what constitutes "sustainable" energy, and what constraints may be applied for new development. These are vital issues – issues that can affect the ability to garner political support and investment.

Recent developments have created important opportunities for hydro; fuel prices and climate change are among the key drivers. An overview of the issues and how recent actions affect hydro will be provided. Specific information and guidance will focus on new opportunities for retrofitting and modernization, taking advantage of renewable energy incentives and benefiting from carbon credits.

Under the title of "Critical issues of international policy on hydro power", Tuesday, August 1, 2006 will see a program that reviews recent policy challenges and actions and results to hydro in a cleaner energy future.

Business leaders will describe the history, substance and current status of leading policy initiatives. Summit participants will learn about critical issues, and how to make informed decisions. Participants will also learn the outcomes of recent meetings that have special significance for hydro, including the Beijing International Renewables Energy Conference, United Nations Framework Convention on Climate Change, African Ministerial Conference on Hydropower and Sustainable Development, and the Fourth World Water Forum.

Finally, the summit will address, through a roundtable, the future direction for shaping and improving hydro to better serve worldwide water and energy needs.

Among other high-ranking industry professionals, Dr. Hubert Lienhard, Chairman of the Board of Voith Siemens Hydro, will be a panelist in this event.

For further information

- <http://www.hydropower.org>
- <http://www.hcipub.com/hydrovision>
- <http://www.hydropowerconference2006.co.za>
- <http://www.worldwaterforum4.org.mx>
- Critical issues of international policy on hydro-power, Tuesday, August 1, 2006

Shanghai, China

New Chief Financial Officer



Jianxian Dai, CFO in Shanghai, China.

The Board of Voith Siemens Hydro Shanghai, China, has appointed Jianxian Dai Chief Financial Officer and Member of the Board of Management of Voith Siemens Hydro, Shanghai.

Jianxian Dai has a degree from Zhejiang University in Metallurgy and Economics, and graduated at Shanghai University in Finance and Economics with an additional commercial degree. Beyond, he pursued studies in Germany.

After his graduation in Germany he went through several senior management positions in German industry, and joined Voith Siemens Hydro Power Generation in Shanghai in July 2003 as Finance Director.

York, PA, USA

New Member of Management Board



Mark E. Self, Executive Vice President, York, PA, USA.

Effective 1st of January 2006, Mark E. Self has been appointed Executive Vice President and Member of the Board of Management of Voith Siemens Hydro Power Generation in York, PA, USA. In his function as Member of the Board of Management, he is responsible for US Marketing and Sales.

Mark E. Self received his B.S.C.E. from Tennessee Technological University and followed a career in various large enterprises in the power industry.

Montreal, Canada

**New President and Chief
Executive Officer**



*Denys Turcotte, President and CEO,
Montréal, Canada.*

Effective 1st of January 2006, Denys Turcotte has been nominated President and CEO of Voith Siemens Hydro's Operating Unit in Montréal and of Voith Siemens Hydro's Operating Unit in Mississauga, Canada.

He has a Master of Industrial Engineering from the Ecole Polytechnique de Montréal and has been following a career in various assignments in the petroleum and power sector.

Parallel to this, the Canadian unit in Montréal will be coordinating marketing, project and customer relationships in Canada directly. The Mississauga generator rehabilitation facility will report directly to the Montréal office. This will further strengthen Voith Siemens Hydro's presence in serving customers in Canada.

New Delhi, India

New Managing Director



*Amresh Dhawan, Managing Director,
New Delhi, India.*

Amresh Dhawan has been appointed Managing Director of Voith Siemens Hydro's operating unit in New Delhi, India. He joins Voith Siemens Hydro, from a position of President Power Technology Products and Member of ABB India's Corporate Management Group.

Amresh Dhawan has acquired a Bachelor of Science in Electrical Engineering from the Regional Institute of Technology in Tatnagar, India, and has accumulated wide experience in the fields of manufacturing, project management, sales and marketing and operations of power plants and electrical equipment over many years.

Conferences, seminars and symposia

Date/Event	Further information
<p>31.07. - 04.08.06</p> <p>HydroVision 2006 Portland, Oregon, USA</p> <p>See us at our booth!</p>	<p>Voith Siemens Hydro paper presentations:</p> <p>Overhaul of the Bath County pump-turbines and motor-generators Authors: Robert D. Steele, Voith Siemens Hydro, York and David Johnston, Dominion Virginia Power</p> <p>The operation of multiple units on aerating performance of Francis turbines Authors: Richard K. Fisher, Jr. and Gregory Snyder, Voith Siemens Hydro, York and Daniel Parrott, U.S. Army Corps of Engineers</p> <p>Wanapum dam advanced hydro turbine upgrade project: Part 2 – Fish passage test results using computational fluid dynamics Authors: Richard K. Fisher, Jr., and Michael Graf, Voith Siemens Hydro, York Thomas Dresser and Curtis Dotson, Grant County Public Utility District and Marshall Richmond of Pacific Northwest National Laboratory</p> <p>Hydro modernization in Brazil: A fast track hydro modernization case study Authors: Stanley F. Kocon and Antonio F. Canina, Voith Siemens Hydro, York and São Paulo and Cesar Teodoro of Duke Energy Brazil</p> <p>Keowee hydroelectric plant governor replacement Authors: Michael Byrne and Gregory Yohe, Voith Siemens Hydro, York and Howard T. Grant, Duke Power</p> <p>http://www.hcipub.com/hydrovision</p>
<p>12.09. - 14.09.06</p> <p>Service and Maintenance Seminar York, PA, USA</p>	<p>Voith Siemens Hydro Power Generation, Inc., York, PA, USA, presents its 24th Service and Maintenance Seminar, September 12 - 14, 2006.</p> <p>Experience has taught us that there is more to the hydroelectric industry than hardware and plant operation. Stewardship of the rivers also plays an important role in the delicate balance of power working with nature. This seminar provides an opportunity to learn first-hand the latest in technology and proven methods available in our industry for the operation, maintenance and extended use of hydroelectric equipment.</p> <p>For information and registration: Debra.Myers@vs-hydro.com</p>

Date/Event	Further information
<p>17.10. - 21.10.2006</p> <p>IAHR Symposium on Hydraulic Machinery Yokohama, Japan</p>	<p>Voith Siemens Hydro paper presentations:</p> <p>Using the potential of CFD for Pelton development Authors: Reiner Mack, Dr. Wolfgang Rohne, both of Voith Siemens Hydro, Heidenheim</p> <p>Experiences with remote diagnosis support during commissioning of pumped storage power plants Authors: Ulrich Seidel, Alexander Schechner, Martin Giese, all of Voith Siemens Hydro, Heidenheim</p> <p>Simulation of full load surge pressure and power oscillations at a hydraulic system with pump-turbine Author: Dr. Jiri Koutnik, Voith Siemens Hydro, Heidenheim</p> <p>Classification of vortex and cavitation phenomena and assessment of CFD prediction capabilities Authors: Dr. Thomas Aschenbrenner, Armin Otto, Dr. Winfried Moser, all of Voith Siemens Hydro, Heidenheim</p> <p>Research of the jet interference of Pelton turbine Tsuneaki Fujii, Voith Siemens Hydro, Kawasaki Dr. Tadashi Tsukamoto, Voith Siemens Hydro, Kawasaki</p> <p>Development of reversible bulb pump-turbine for refurbishment of Lower Olt Project Suzuki Ryoji, Manfred Göhringer, both Voith Siemens Hydro, Heidenheim http://iahrice.hyd.eng.hokudai.ac.jp/</p>
<p>22.11. - 24.11.2006</p> <p>14th International Seminar on Hydropower Plants University of Technology Vienna, Austria</p>	<p>Paper presentations and booth by Voith Siemens Hydro http://info.tuwien.ac.at/doujak/tagung2006/hp2/index2.htm</p>

Published by:

Voith Siemens Hydro
Power Generation GmbH & Co. KG

A Voith and Siemens Company

Editor:

Barbara Fischer-Aupperle
Voith Siemens Hydro
Power Generation GmbH & Co. KG
Alexanderstr. 11
89522 Heidenheim, Germany
Fon +49 7321 37-68 48
Fax +49 7321 37-78 28
barbara.fischer-aupperle@vs-hydro.com
www.voithsiemens.com