HyPower

Customers magazine for Voith Siemens Hydro

9

November 2004

Summary

Editorial

Voith Siemens Hydro Power Generation

Successess and historical landmarks

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

Dear readers,

With the end of the year approaching, Voith Siemens Hydro can look back on a fascinating period, filled with activity.

I am satisfied with the fact that the industry increased its focus on political awareness inside-out and outside-in, which was evident from activities in this year's major international hydro events, HydroVision 2004 in Montréal and Hydro 2004 in Porto. We are also proud to have contributed to the wonderful progress various hydro organizations and associations made this past year. But in order to have hydro power of all sizes again a "fuel" that is recognized for all its benefits in a sensible ratio with some of its – undisputable – side effects, a lot still needs to be done. Our goal is to achieve better reconciliation in processes involving all stakeholders, despite the limitations that the equipment suppliers' role usually has.

Voith Siemens Hydro has had a satisfying year in terms of order intake and business development; as can be clearly seen from the reports in this issue. Our success in China, North America and Europe, confirms our strategy of compensating changing business cycles in one region by other emerging markets throughout the world.

Our focus this time, however, clearly is on Latin America's largest market: Brazil. Our operating unit in São Paulo has recently celebrated its 40th anniversary. We have enjoyed a long and rich period of local presence in a certainly interchanging market.

The celebration of this anniversary deserves the reflection on Voith's past activities in this country – including Voith Paper and Voith Turbo products as well – and acknowledges once more our corporate culture of being global and acting local.

Even though the business in Brazil started almost 100 years ago with the delivery of our first turbine, local engineering and local manufacture was the right option in 1964 to be able to participate in market opportunities, which emerged from the country's economic boost at the time.

Voith's endurance to stay there, even with decreasing business during the later economic slow-down has paid over and over again: Today, Voith Siemens Hydro in São Paulo is simply the Latin American hydroelectric equipment company with the deepest expertise for the largest hydro plants in the world.

The "Paulistas" can be proud of their history and proud of their business!

We are interested in your opinions and comments, please feel free to direct them to me personally at Hubert.Lienhard@vs-hydro.com.

Yours sincerely

Dr. Hubert Lienhard

Brazil: Hydro power to remain strong

With an installed capacity totalling almost 90 gigawatts, Brazil is one of the world's largest electricity markets. It is by far the largest in South America, with a total primary energy consumption twice as large as Argentina, Bolivia, Chile, Paraguay and Uruguay combined. Hydroelectric power is the most important primary source for generating electricity, occupying an overwhelming share in the energy mix. There are approximately 50 million consumers in this country, and total consumption has more than quadrupled in the last 20 years. Currently, some 95% of Brazilian households have access to electricity.

The prevalence of hydroelectric energy makes the Brazilian generating system differ from that of any other country in the world. Hydroelectric power makes up almost 80% of the Brazilian electricity market. Due to a severe drought, the hydro powered Brazilian energy sector experienced a major supply crisis in 2001 when power stations were left with shrinking or dry reservoirs.

São Paulo

However, the government successfully minimized the impact of the crisis by implementing a rationing program.

Since the end of the rationing period, an unprecedented decline in demand, some minor capacity growth and abundant rain have resulted in an estimated excess of up to seven gigawatts. It is important to note, however, that this surplus is only temporary. Unless new generating capacity is added to the system, any growth in demand could result in a new crisis. The new government, inaugurated in January 2003, has acted quickly to evaluate the power sector policies and initiate programs to solve bureaucratic red tape and overcome investment problems in the sector.

The Ministry of Mines and Energy (Ministério de Minas e Energia) is about to issue licenses through an auction process for 2,800 MW of new hydroelectric projects expected to be operated by 2009. The hydroelectric site auction will award projects to bidders who offer the lowest electricity prices rather than 20 year-contracts.

With average growth rates for Brazil expected to be about 3% per year for the next ten years, industrialization and development of the energy sector will continually increase. Provided that there are no significant changes, this means an additional 37.6 gigawatt of hydroelectric power is required to be installed by 2014.

Iguaçu Falls

Voith Siemens Hydro, São Paulo: 40 years high-tech in

There is still an estimated 226 gigawatts of untapped hydroelectric potential in Brazil. Due to this huge potential and to its economic attractiveness, hydroelectric power is the country's most important primary source for generating electric energy. Moreover, it is a renewable source, not dependent on price increases or supply interruptions. Today, the technology for its development is domestically available, with a very low import ratio.

Today's main entrance of Voith Siemens Hydro São Paulo, Brazil

Location opening in 1966

This can be traced back to 1964 and the foundation of Voith S.A. Máquinas e Equipamentos in the Jaraguá district. This plant was Voith's first production unit on the American continent and was established on September 22, 1966.

Even before the creation of a facility in Brazil, the name Voith was already known in the country, due to the German company's supply of turbines for Brazilian plants. In 1905, Voith supplied the turbines for the first hydropower plant in Brazil, at Itatinga Santos. Since then, the name Voith has been inseparably connected with hydroelectric power in the largest country in the southern hemisphere.

Among them were three Francis turbines, supplied in 1912 for São Paulo Light Co., with a capacity of 17,500 HP each. In 1936, the company supplied a turbine for the Rio Light Co., the biggest in the world at the time. Kaplan turbines were also brought to Brazil by Voith and installed in the Três Marias hydropower plant in Minas Gerais, where they achieved the record for the world's highest head for a Kaplan unit.

hydro technology

In 1964, Voith São Paulo started with 295 employees and was able to supply turbines to 62 projects over the next four years. Then, in the 1970s, the contract for twelve units for Itaipu, the largest hydropower plant in the world was awarded to Voith. When the first turbine runner for Itaipu was delivered in 1982, it was the biggest in the world, weighing 300 tons with a height of 4.5 meters and a diameter of 8.6 meters. It was manufactured of carbon-steel and built entirely at Voith's São Paulo facilities, during a three-year period.

Many important orders followed in the subsequent decades. In the 1990s, the Brazilian factory started to manufacture components for Chinese hydro projects, including the world's largest Francis rotors for Wu Qiang Xi.

Xingó, Brazil

Competence center in generator manufacturing

With the merger of the hydroelectric business of Siemens and Voith Hydro in 2000, the plant in São Paulo began to supply not only systems and equipment but also generators for complete plants.

By the turn of the millenium, the São Paulo facility had supplied a total of 260 hydropower projects in this tropical country. Additionally, São Paulo delivered generator stator frames – the largest ever – and turbine buckets for the enormous Three Gorges project on the Yangtze River.

Lapa, Brazil

São Paulo plays an important role in the group's overall development. This is the location of Voith Siemens Hydro's largest generator manufacturing plant worldwide. Know-how is regularly exchanged between Brazil and Germany. International collaboration is a matter of course: employees from Brazil work for a few months at the headquarters in Heidenheim and employees from Germany spend part of their project time in Brazil. Cross-training is essential to our commitment to excellence.

In the meantime, Voith employs over 1,800 people at its plant in the city of 20 million. The Voith Siemens' plant is the largest metal-processing company in the city. In 2002, Voith Siemens Hydro Power Generation received an award from the Brazilian trade journal Exame as the most respected machinery manufacturing company in the country, an honor of which we are very proud.

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40 years of Voith in São Paulo – a reason to celebrate

40 years ago, Mr. Hugo Rupf inaugurates Voith facility in São Paulo and in September, 2004 Mrs. Martina Mann inaugurates the Voith Siemens Hydro's newest electric component plant

There was much to celebrate in mid-September 2004: Voith's facilities in São Paulo just received a prestigious award for being the largest metal-processing company in the city and it was designated as the largest generator manufacture location within Voith Siemens Hydro Power Generation worldwide.

And the Paulistas provided everything worthy of such a success story. More than 700 people accepted the invitation, and the festivities began with a splendid gala evening. Among the guests were many members of the Hanns Voith family, friends of the company, political and business representatives, as well as many customers from all around the world.

Geraldo Alckmin, Governor of the State of São Paulo, emphasized the importance of Voith for the State of São Paulo in his address: "With its successful history in Brazil, Voith is contributing to the development of the country. Not least in our own interest, we would like to wish Voith another 40 successful years in Brazil!"

Mrs. Martina Mann and her great-grand-daughter visit the school Friedrich von Voith

The commemoration starts with a press conference on September 16

Mrs. Martina Mann talks to customers and employees in a very emotional speech

Other highlights of the gala evening were speeches by Dr. Michael Rogowski, Chairman of the Supervisory Board and the Shareholders' Committee, and by Martina Mann, the eldest daughter of Hanns Voith.

The following day, the factory doors were opened to customers, suppliers and employees and their families. During this day, Martina Mann inaugurated the new Voith Siemens Hydro generator plant, which had been moved from the city's Lapa district to the Voith location in Jaraguá. From now on, mechanical and electrical components of the project will be built in these new workshops.

The visiting program also included some social and environmental projects sponsored by Voith and an exhibition with photographs showing the development of Jaraguá, the district where the Voith plant has been located over all its 40 years.

The last day of the anniversary saw a celebration with employees, friends and relatives, with more than 10,000 people taking part.

Johannes Hammacher, representing the Hanns Voith family, said: "Always remember that Voith cannot exist without you. Brazil will always have a special place in the hearts of the Voith family." Under the tropical sun of São Paulo, a barbecue with music and rhythms of the "Rosas de Ouro" (golden roses) samba school was held.

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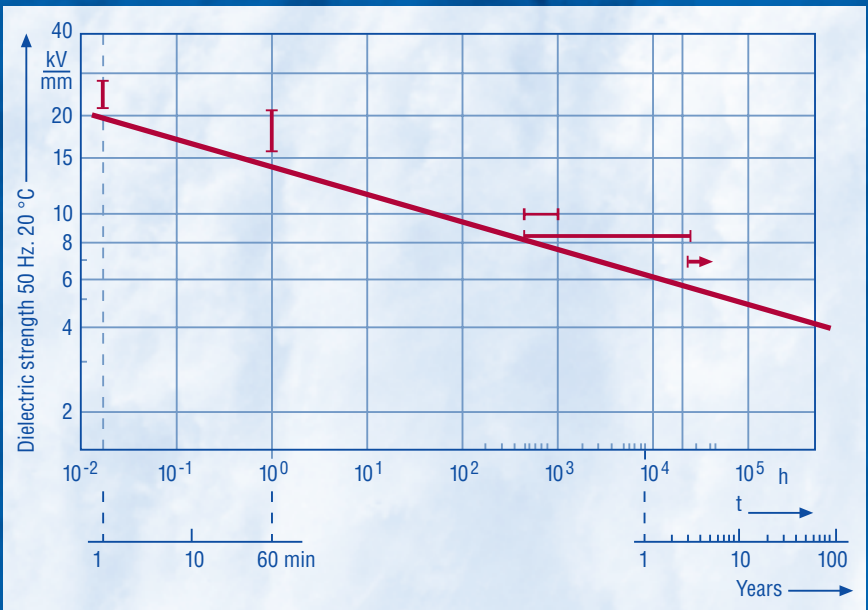
Micalastic: outstanding performance facts and figures

Micalastic is the brand name of Voith Siemens Hydro's successful insulation system for all kinds of hydro generators. It was introduced almost half a century ago in 1957. Owing to an outstanding performance, the history of Micalastic has become a success story that still continues today.

Transposed conductor of a Roebel bar

The main function of an insulation system is to separate the electrical circuits of stator winding components at different voltages (high voltage) from each other and from metallic components at earth potential in order to assure high reliability and long service life for the electric machine.

Micalastic insulation is based on the use of inorganic fine mica tape as a base and curing synthetic resins as a bonding material, in conjunction with a sophisticated manufacturing technique, including the VPI (Vacuum Pressure Impregnation) process to guarantee the complete removal of any air or solvents in the insulation.



Endurance curve of the Micalastic insulation

Micalastic effectively insulates the bars and coils of high voltage machines. Based on VPI technology, it fulfills minimum Thermal Class F requirements according to international standards (IEC 34). The main components of this insulation system are impregnated glass yarn for the strand insulation, fine mica tape with accelerator (Zinc-Naphthenat) for the main insulation, and an epoxy resin as impregnation resin.

The high reliability of the Micalastic insulation system is shown by impressive figures that underscore its flawless performance.
Since 1957 it has been applied to over 400 hydro units worldwide (rated output higher than 5MVA). That equates to more than 275,000 bars and coils adding up to over 5,000 service years or an accumulated service hours rate per unit of more than 45,000,000. In all this time, not a single failure has been reported due to the aging of the insulation.

Furthermore, since the early 1970s, the properties of the main insulation have been proven by short- and long-term endurance tests. The short-term test is the one-minute breakdown test, in which the dielectric strength is measured applying a voltage with a continuous increase rate until the insulation fails. Typically, the breakdown happens at a dielectric strength higher than 25 kV/mm.

The long-term endurance test is the VET (Voltage Endurance test). Typically, these tests are carried out at 3 x Un and 2 x Un. For these voltage tests, respectively, the minimum life time of a bar or coil is higher than the values specified by the KEMA standard which is the international reference for this kind of test. Micalastic also fulfills the VET according to IEEE 1043 and IEEE 1553.

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Micalastic Insulation – Characteristics and Test Voltages

Electrical characteristics

Relative dielectric constant, ε_r, 20 °C, 50 Hz	≈ 4	
Tang δ at 0.2 U_N, 20 °C, 50 Hz	≤ 2,0%	
1/2 (Tang δ/0.6 U_N - Tang δ/0.2 U_N), 20 °C, 50 Hz	≤ 0.5%	
Max. Δ Tang δ/step 0.2 U_N (from 0.2 U_N to U_N)	≤ 0,5%	
1 min. breakdown strength, 50 Hz, slot side	≥ 25	kV/mm
– Single stator bars (half coil)	Up ≥ 4.5 U_N at slot side	kV
	Up ≥ 3 U_N at front side	kV
– Single stator coil (diamond coil)	Up ≥ 2 . (2 U_N + 1 kV) at slot side	kV
	Up ≥ (2 U_N + 1 kV) at front side	kV
Surge voltage endurance along slot	≥ 50 (1.2/50 μs wave)	kV/mm
	Us ≥ (4 U_N + 5 kV) at slot side	kV

Test voltages and permissible surge in operation

Test voltage, 50 Hz, Up_{RMS}, 1 min		
– Single stator bars (half coil)	Up ≤ 3 U_N	kV
– Single stator coil (diamond coil)	Up ≤ (2 U_N + 5 kV)	kV
– finished winding assembly	Up = (2 U_N + 1 kV)	kV
Ratio between test DC an AC voltage Up_{DC}/Up_{AC}	1.7	
Test voltage, conductor strands, 50 Hz	220	V
Permissible surge voltage on windings in operation	≤ 3.5 U_N at Uphase-core	kV
	≤ 5 U_N at Uphase-phase	kV

Great expectations for small hydro

Boosting Brazil's renewables

The Brazilian Alternative Energy Sources Incentive Program (PROINFA), originally launched in 2002 and revised in November 2003, aims at substantially increasing the role of alternative energy generation, including wind, biomass and small hydro power to 10% of the annual electricity consumption, within 20 years.

To achieve this goal, the Brazilian Government has designated a federal state-owned power utility, Eletrobrás, to act as the purchaser of electric energy generated by alternative energy facilities in Brazil. Eletrobrás will buy energy at pre-set preferential prices and then market the electricity generated from renewable sources. This guarantees a price of at least 70% of the average energy supply tariff, charged to end consumers in Brazil. Contracts between Electrobrás and the renewable energy generators will be valid for a period of 15 years from the date of operation and applicable to plants that begin production before 2007.

Under PROINFA, 1,100 MW have been distributed for each alternative source, totalling 3,300 MW.

The Brazilian National Development Bank can finance up to 70% of capital costs, excluding site acquisition and imported goods and services. Interest is not charged during construction, and amortization is set at ten years. Payments are due six months after the start of commercial operation. Furthermore, the Brazilian Electricity Regulatory Agency (ANEEL) will discount as much as 50% of the transmission and distribution rates charged for power produced from renewable energy sources, including small hydro electric plants.

Power Future 2004

One of Brazil's most important events of the year with regard to alternative energy, took place in April at the Ceará Convention Center in Fortaleza and focused on renewable energy sources and more specifically on PROINFA.

Voith Siemens Hydro São Paulo presented its small hydro technology to a highly interested public, among them the state governor of Ceará and energy secretary of São Paulo.

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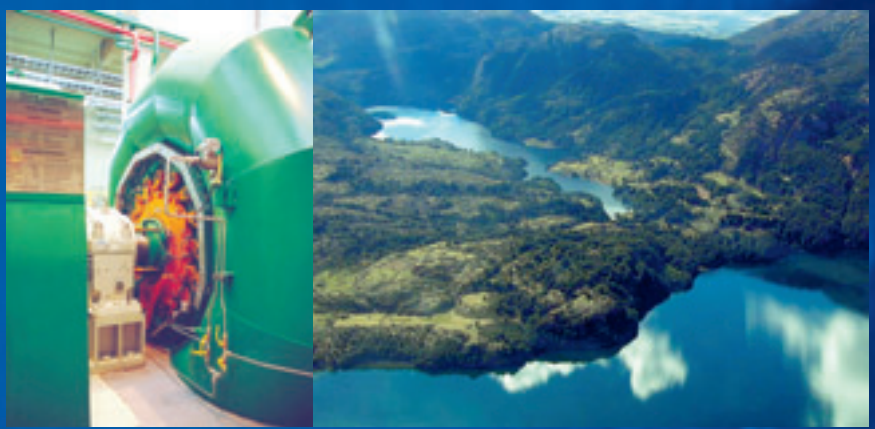

CIGRE:
Expertise sought after in energy conferences

Voith Siemens Hydro São Paulo, as the worldwide center of competence for generator technology gathers prolific manufacturing know-how and technical expertise. Brazilian experts also take an active role in the development and exchange of engineering knowledge and information at international events on energy generation.

Voith Siemens Hydro's São Paulo group participates in the technical committee on rotating machines of CIGRE (Conseil International des Grands Réseaux Électriques), the International Council on Large Electric Systems, a non-governmental and non-profit organization, based in France.

At CIGRE's biennial conference, various committees and work groups come together to discuss reports on predefined topics, submit papers, and define and publish new technical recommendations. This year, the conference took place from August 29 to September 4 in Paris. Henrique Alvarez and Thomas Hildinger of Voith Siemens Hydro, took part in the committee debates and plenary sessions.

Voith Siemens Hydro's technical competence is in great demand at CIGRE's national committee events in Brazil, too. With 28 participants and presentations on more than ten different technical topics, it was the most active private company in last year's national seminar on electric energy production and transmission (Seminário Nacional de Produção e Transmissão de Energia Elétrica). "For the next year, we have already submitted around 20 abstracts, which will be analyzed and evaluated for presentation," stated Thomas Hildinger.

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Thomas Hildinger

Modernization of Furnas, a Brazilian milestone

Built in the late 1950s, the Furnas Dam was one of the first major modern dams in Brazil. Its power stations marked the starting point of an accelerated increase in installed capacity that went from around 5 gigawatts before these plants began operating, to almost 90 gigawatts today. The Furnas hydro plant, with an installed capacity of 1,216 MW, was a milestone in the hydroelectric development of its time, noteworthy also for its ability to regulate flow to important downstream installations. After more than 40 years of operation, it is now being modernized by a consortium of companies led by Voith Siemens Hydro.

120 meters high, the Furnas Dam impounds the waters of the Rio Grande and Sapucaí Rivers, forming a huge reservoir spreading over 1,400 square kilometers. Located in the south-eastern state of Minas Gerais, the dam with its hydro power facilities lies right in the center of an extensive regional electrical grid serving the industrial centers of São Paulo, Rio de Janeiro, and Belo Horizonte.

The original design of the Furnas plant included six machines – Nohab Bardella Francis turbines and Siemens generators – the first of which was installed in July 1958. Five years later, in 1964, Furnas power station began operation. In 1974 and 1975 another two generating units were added, with the same technical characteristics.

Control room and substation

Voith Siemens Hydro is responsible for the modernization of the older units 1 to 6 that have now reached the limits of their life-span, after more than four decades of excellent performance. The company will also deliver supplementary items for units 7 and 8, plus the plant substation.

Project duration is scheduled to be 62 months. The planning phase is already completed, and construction of the new relay house has already begun.

The total modernization is expected to be finished by March 2010.

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Peruvian Callahuanca to be modernized

Voith Siemens Hydro São Paulo is pleased to announce that it will modernize the Peruvian hydropower plant Callahuanca. The contract with plant owner Edegel S.A.A., a company of the Spanish Endesa group, has already been signed. It is the first time that the Brazilian unit will carry out a modernization of this importance in Peru.

Callahuanca is located 60 km east of the capital Lima and is situated in the Andes. With its four horizontal Pelton unit, it is capable of generating a total output of 73 MW. The first three machines, equipped with Voith runners, were installed in 1938: a fourth unit followed 20 years later. Now, the hydro specialists from São Paulo will supply new runners with an optimized hydraulic profile, thus increasing the turbine output of the three older units by 25%.

New stator cores, speed and voltage regulators, transformers and improved turbine shut-off valves are part of the modernization work, too.
New auxiliary equipment will be provided for the newer unit and the entire station will be automated and receive a new control room.

An innovative runner production method will result in superior quality and allow for reduced manufacturing time. Under a tight project schedule, limiting unit outage to a challenging maximum of 90 days per unit, this gain of manufacturing time is much appreciated.

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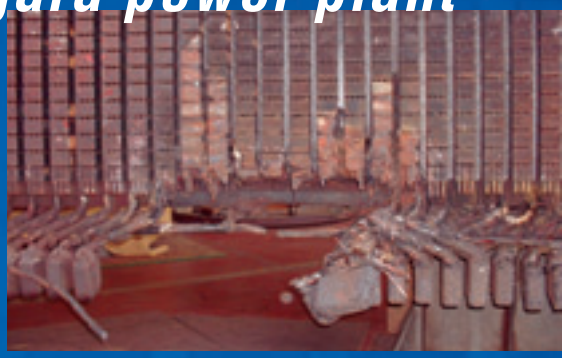
Continued support – 13 units rehabilitation of NYPA's Robert Moses Niagara power plant



The Robert Moses power plant was constructed between 1958 and 1962 with thirteen Francis units rated at 175 MW. In the late 1980's, the New York Power Authority made the decision to rehabilitate the existing units rather than expand the power plant.

Voith Siemens Hydro's involvement in the rehabilitation of the power plant started in 1992 after a successful competitive model test resulted in a contract award for 14 uprated 213" (5.4 m) Francis runners rated at 200 MW.

The contract included the hydraulic design, model manufacture, test and shafting analysis for uprate as well as the additional scope for various parts and services that result from the evaluation of each unit and disassembly.

Before and after repair

Installation, transportation, field machining and a spare runner are also included in Voith Siemens Hydro's workscope. The project rehabilitation schedule of one unit per year accommodates having the maximum availability of units for power generation.

In 2002, Voith Siemens Hydro was given the additional opportunity to continue the relationship with the New York Power Authority and in the improvements of the Robert Moses plant. The contract to perform the stator repair and rewind of the 13 generator units and one spare was awarded to the Voith Siemens Hydro facility in Mississauga, Canada.

To date, eleven units have been completed with runner uprates and turbine rehabilitations with scheduled completion of all units for 2006. Two units have been completed with stator repairs and rewinds with scheduled completion of all units slated for 2010.

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Voith Siemens Hydro's work in progress on the stator repair and rewind at the Robert Moses Plant

Voith Siemens Shanghai to equip Laxiwa on the Yellow River

Laxiwa project site

The Yellow River is one of the earth's ten longest rivers. It starts in the Bayankale Mountains which divide it from the Yangtze in the south. From these mountains, whose highest peaks reach over 5,000 meters, the river flows eastward, passing through a number of narrow gorges. It is here, at the upper stream of the Yellow River in the province of Qinghai, where the river falls 140 m every 100 km, that a new generating facility with a capacity of well over 3 gigawatts will be built: the Laxiwa hydro power plant.

Laxiwa dam

In August 2004, Voith Siemens Hydro Power Generation Shanghai Ltd. was officially awarded the contract for supplying five 711 MW Francis turbines by Yellow River Upper Stream Hydropower Development Co., which belongs to China Power Investment Corporation. It is the largest contract Voith Siemens Hydro Shanghai has ever received since it has been established.

Laxiwa is the biggest hydro project along the Yellow River, and is part of the Chinese National Hydro Power Development Program to utilize the hydropower resources in the western region. It transmits the energy to the eastern areas. The first unit is scheduled to be put into operation in 2008. The plant will help meet the continuously increasing Chinese power demand.

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Successful model acceptance for China's Shui Bu Ya

A successful model acceptance test for the Chinese hydropower station Shui Bu Ya took place at the "Brunnenmühle", Voith Siemens Hydro's Corporate Technology facilities in Heidenheim, in September 2004. The model turbine, designed and optimized for the requirements and boundary conditions of the Chinese hydro project, was tested in the presence of representatives of the customer, Hubei Qingjiang Hydroelectric Development Co., Ltd. Much to the customer's satisfaction, the operating performances fulfilled, and in some cases even exceeded the contractual guarantees. Thus, the final step of the hydraulic development phase has been taken.

The 1,840 MW Shui Bu Ya project will be the third hydropower station constructed on the Qingjiang River, one of the major affluents to the Yangtze. The annual energy output of the power plant is 3.92 billion kWh, with a head range of 145 to 203 m.

Voith Siemens Hydro will supply four Francis turbines with a capacity of 466.3 MW plus auxiliary equipment. The first unit is planned to be commissioned in July 2007. The project is scheduled for completion in 2009.

The power station will play an important role in the regulation of flow on the Yangtze during summer flood season and will help balance peaking power demand in Central China's power grid, thereby enhancing safe and reliable operation of local power grids.

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Miyashiro, Japan: 100 years of successful operation

It was a good 100 years ago when a caravan of heavily loaded horse-drawn carts made its arduous way through the central mountains of Japan. In big wooden boxes they carried a turbine and a generator destined for one of the early hydro power stations there, Miyashiro No. 1 Power Station, not far away from the famous city of Matsumoto located in the Northern Japanese Alps.

The equipment had made a long journey, all the way from Germany, since the turbine was designed and manufactured by J.M.Voith in Heidenheim and the generator by Siemens Schuckert Werke in Berlin.

For 100 years, to the delight of the owner, Chubu Electric Power Co., Inc., the machines have run smoothly and without major failure or breakdown.

On September 11, 2004, Chubu Electric Power Co. Inc. commemorated 100 years of flawless operation at the power station. After a religious Shinto ceremony held at the site, a cheerful party was given, attended by many former employees, engineers and city officials. Representatives of the owner, the operators and Voith Siemens Hydro expressed their great satisfaction and pride in making and successfully maintaining a power station over such a long period of time.

To mark the opportunity, the responsible Chubu Electric General Manager of the Power Station, Mr. Norio Yamanoi, received from Dr. Martin Kuechle, President of Voith Fuji Hydro K.K., the entity of Voith Siemens Hydro in Japan, a large acrylic panel displaying the etched copy of the Voith original order sheet for the turbine. The document reads, among other things, “Turbine No. 1433… Spiralturbine Gr. 5 B 3%”, order received on July 13, 1903, to be delivered on October 1, 1903 (!) and, remarkably, among other technical data, the machine output was given as “Nutzeffekt PS 371” (output 371 horse power).

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Early finishing of site rehab in Coo pumped storage plant

From left to right:
Found condition of valve inside
Liftout of seal ring
Examination of the bolts

Neither narrow working areas nor unexpected difficulties are obstacles to completing a successful refurbishment. Voith Siemens Hydro completed overhauling three 2,650 mm diameter spherical valves at the Coo 2 pumped storage plant in Belgium, operated by Electrabel, two days earlier than scheduled.

The plant is equipped with six Voith Siemens Hydro Francis pump-turbines, three in the Coo 1 and three in the Coo 2 power houses. The overall installed capacity of Coo exceeds 1,100 MW. The partial on-site overhauling of Coo 2 was tightly scheduled for six weeks and three days.

The main scope of work comprised the disassembly and overhaul of the upstream and downstream movable and fixed seal rings in addition to the disassembly of the downstream half-body and the non-destructive testing (in this case an ultrasonic test) of all bolts.

Besides a rather limited working area Voith Siemens Hydro had to deal with some unexpected damages on single parts of the valves during the refurbishment. Nevertheless, the team finished its task ahead of schedule. Before Coo 2, Voith Siemens Hydro had already successfully completed the overhauling of three spherical valves in Coo 1 within a comparably challenging timeframe.

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Generator rehabilitation of the Schwarzach power plant in Austria

An award to renovate a generator of the Schwarzach power plant was granted to Voith Siemens Hydro Power St. Pölten by Verbund-AHP (Austrian Hydro Power). In November 2005, a completely new stator will be delivered, resulting in an increase of rated output from 35 MVA to 37.5 MVA.

The Schwarzach power plant, situated on the Salzach River, is not a typical run-of-river power station. The water for generating power is drawn from the Högmoos weir facility, 17 kilometers away, led to the Brandstatt storage reservoir and from there through the penstock into the power house.

This enables the power station to generate peak power. Voith Siemens Hydro has already rehabilited – from 1987 to 1991 – the Francis turbines of the four units in existence since 1959, when the output was raised to 34.41 MW. The present generators, however, are not capable of fully reaching this capacity.

View of the hydro power plant

Moreover, the existing stator windings, including stator cores, have arrived at the end of their service life and have to be renewed.
Through modernization, losses can be reduced by around 20%, even with a 7% increase in output. Furthermore, the present auxiliary equipment for the oil bearings will be renewed.

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Generator hall

New turbines for Hauterive in Switzerland

Hauterive, located in the Canton of Fribourg in Switzerland on the Gruyère Lake and fed by the Sarine river houses, is one of the oldest swiss hydro-electric plants. The people know it especially for the Hauterive-Rossens power plant which was put into operation in 1902 with six turbines.
This historical plant is still running, and, when modernized by Voith Siemens Hydro Power Generation, will soon have a substantially increased output.

The small hydro operating unit of Voith Siemens Hydro at St. Loup in France has signed the contract with the Swiss plant owner, Entreprises Eléctriques Fribourgeoises near Fribourg. Scheduled to be renovated by means of a new, vertical Francis turbine are two old units, each with an output of 7.5 MW.

In the spring of 2006 the new machine will relieve the older models from 1919 and 1925. At a head of 94 meters, 24.7 MW will be generated from the new unit in addition to three existing units with Francis turbines at 15 MW each.

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HydroVision 2004 and Hydro 2004
Hydro technology with a political orientation

In mid August, more than 1900 delegates from 56 countries met for one of the most important conferences in the hydropower sector: HydroVision 2004 in Montréal, Canada. In this year's program – besides technical lectures on subjects such as state-of-the-art technologies and equipment, distribution strategies, etc. – a clear emphasis was additionally put on social, environmental and political aspects.

As a keynote speaker, Gregg Easterbrook, editor-in-chief of the "The New Republic", attracted particular attention. Easterbrook explained his most important argument for hydro power: "As long as the world produces more people, they will need more dams to bring water, irrigation and clean power to displace polluting power sources." Not only the Western world, but developing countries in particular could be substantially benefiting from hydro power, according to Easterbrook. On one hand, energy generation through hydro power is economically profitable, emissions-free, and renewable. On the other hand, alternatives like wind, solar, geothermic power and biomasses can never cover the increasing need for primary energy production.

He backed his speech with a call to national governments: "There are failings of governments, not of hydro power… The root problem is the need for all governments to treat the impoverished better."

The hydro industry – convinced that it is providing power in the best way, but while the public image of hydro power is often tarnished – has found a platform for action: joining forces for the second time at HydroVision, the Joint Organizations Meeting, called for by International Hydro Association (IHA) and National Hydro Association of USA (NHA) saw an increasing move towards activating the dissemination of IHA guidelines.

Another increase in focus on environmental and social issues of hydro and a turn-around in the public image could also be felt in Hydro 2004 in Porto, Portugal.

Not only was the keynote speech of Dr. Hans P. Schiffer, Chairman of Hydro Equipment Association, looking at the history of development in mankind's history from a very different angle. The attendance of representatives of NGOs, such as IRN (International Rivers Networks) showed, that dialogue among the sometimes most critical stakeholders has started to evolve.

As a sponsor and member of the IHA and NHA, Voith Siemens Hydro fully supports this. Additionally, through Hydro Equipment Association, the suppliers' association of Voith Siemens Hydro, Alstom Power Hydro and VA Tech Hydro, it will continue to work in this field.

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Essay

The Madeira River

In the interests of three countries

Most people, if asked about the great rivers in the world, think immediately of the Amazon.

When its water levels are at their peak, this river can flood an area up to 100 kilometers wide in the forests along its banks. The delta on the South Atlantic coast is also several hundred kilometres wide and encompasses the huge river island Marajó, and, with approximately 4,900 square kilometres, is the largest delta island in the world.

The incredibly large Amazon River system – if source rivers are included – is the longest river in the world. One of its tributaries is the Rio Madeira, and with 1,450 km, is a mighty river in its own right so therefore, worth a closer look.

The river owes its name to the fact that on the journey to the Amazon delta from its source, at the confluence of the Guapore and the Mamoreo Rivers, it carries a great deal of timber – countless trees that it has torn down. Since the Portuguese word for wood is “madeira”, it is today known as the “river of wood”.

With a navigable section of 1,100 km between Porto Velho and Itacoatiara, the Rio Madeira is one of the most important waterways in South America. It is the main transport route for most of the soy, produced in the state of Mato Grosso, and also for exported goods transferred to large ocean-going freightships at the trading centre of Itacoatiara.

The Rio Madeira has an important part to play in the development of the transport infrastructure in three major South American countries – Brazil, Bolivia and Peru.

Together with the other rivers, it forms a navigable waterway of 4,225 km, giving access to the Atlantic Ocean and thus to international markets for agricultural products and industrial goods.

The cultural history of the Rio Madeira is closely linked with the creation of the federal state today known as Rondônia and its capital Porto Velho, which is also the most important port on the river.

The Amazon delta was discovered in 1499 or 1500. The sailing ships of the Italian Amerigo Vespucci and the seafarer Vicente Yanez Pinzon reached it at almost the same time, but Vespucci is often credited as the first to arrive. His voyage was commissioned by the Portuguese, who then began to colonize the Amazon region and made the land fit for agriculture.

Marshal Cândido Mariano Da Silva Rondon, who was born on May 5th 1865 in Mimoso, Mato Grosso, is considered to be a trailblazer of the modern era in terms of national development policy. A great humanist, he served in the new republican government of Brazil and was responsible for opening up the vast region around Rondônia. Rondon and his team built roads, erected hundreds of telegraph poles and with many kilometers of wire, recorded the topography of the areas, discovered unknown rivers, studied the flora and fauna and were the first to build up a relationship of respect with the native inhabitants.

Any description of the flora and fauna of the vast riverscape around the Rio Madeira calls for the use of many superlatives. The rainforest is extremely rich in species.

Exotic plants, ancient trees that grow to unimaginable heights, and countless wild creatures, all enjoy virtually perfect living conditions here.
A particular feature is that the Madeira River is home to the largest freshwater species of dolphin. These friendly mammals – known as boto – are the subject of many legends still told by the region's inhabitants.

The area around the Rio Madeira is, of course, still developing. High levels of investment are improving the living conditions of many people in Brazil, Bolivia and Peru. The carefully controlled use of hydroelectric power plays a large part in this. The states of Rondônia, Acre and Mato Grosso, for instance, are to be connected to the Brazilian electricity grid and the amount of hydroelectric power produced is to be increased by some 18,000 megawatts.

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