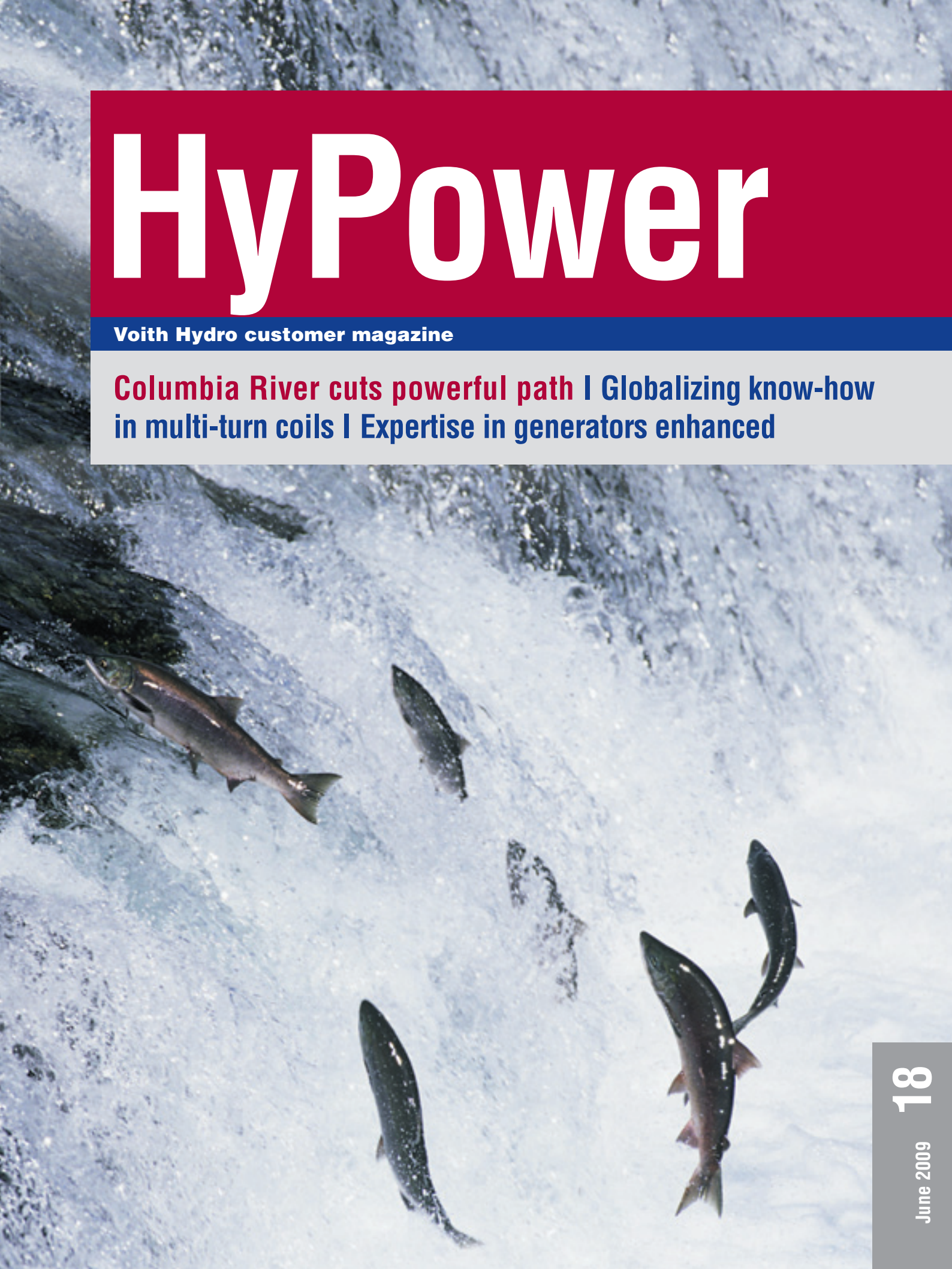
HyPower

Voith Hydro customer magazine

Columbia River cuts powerful path I Globalizing know-how in multi-turn coils I Expertise in generators enhanced



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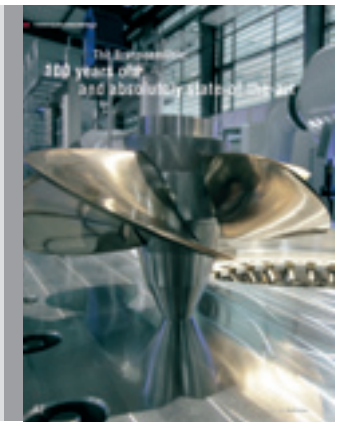


See backflap for the 100th Brunnenmühle anniversary.

Dr. Roland Münch
President and CEO of Voith Hydro
Member of the Board of Voith AG

Dear readers,

In my first year as CEO of Voith Hydro I have had many opportunities to observe this business and I was able to meet many of our customers.

The first excellent meeting with a U.S.-based group of owners and operators for me happened intensely during Hydrovision 2008 in Sacramento, California. My impression of the U.S. hydro business is the impression of a market in full upswing. And this trend seems to continue despite the financial crisis.

The U.S. – as many countries – have the tremendous challenge to meet their increasing energy needs and cost with a fuel mix that will have to be clearly oriented towards CO_2 reduction. The new administration of President Obama is – as we can observe it – certainly setting very new accents here.

There is no silver bullet, but a new mind set for international models and a strong drive with new orientation certainly make things happen unthought of for many years.

Efficiency gains in existing systems and the increase of the renewables' share in the global energy mix are our best bet.

Of course, the hydro industry's aspiration is to see more hydro development. From the large number of dams in the U.S., only 2,400 are generating electricity. The potential by "only" adding hydro power plants to these existing constructions is considerable. Built for navigation, water supply or irrigation purposes, this infrastructure is already in place; adding a hydro power plant will not create a great impact on the environment or local area. And it can tap a significant potential and create the opportunity of powering millions of U.S. homes. With our recent contract for the Ohio River projects, our largest ever for our U.S. location in York, Pennsylvania, we are proud to contribute to this effort.

In addition we are committed to the sustainable development of new hydro power stations for the future.

The Hydropower Sustainability Assessment Forum (HSAF), has set a first strong mark at the beginning of this year and proves evidence of a new and extremely professional process to develop guidelines and criteria for sustainable hydro power stations worldwide. Voith Hydro fully supports and commits to this process, and I hope we can inspire others to further join forces here!

Last but not least, we have changed our name: from Voith Siemens Hydro Power Generation to Voith Hydro. Nothing changes – but the name. Siemens will remain our 35% shareholder and we will continue to be the same joint venture as started in 2000: a leading and successfully growing full-line provider of hydro power plant equipment and services.

To give me your thoughts and ideas on any subject in the industry, please do not hesitate to mail me under Roland.Muench@voith.com.

Voith Hydro:
new name for successful joint venture

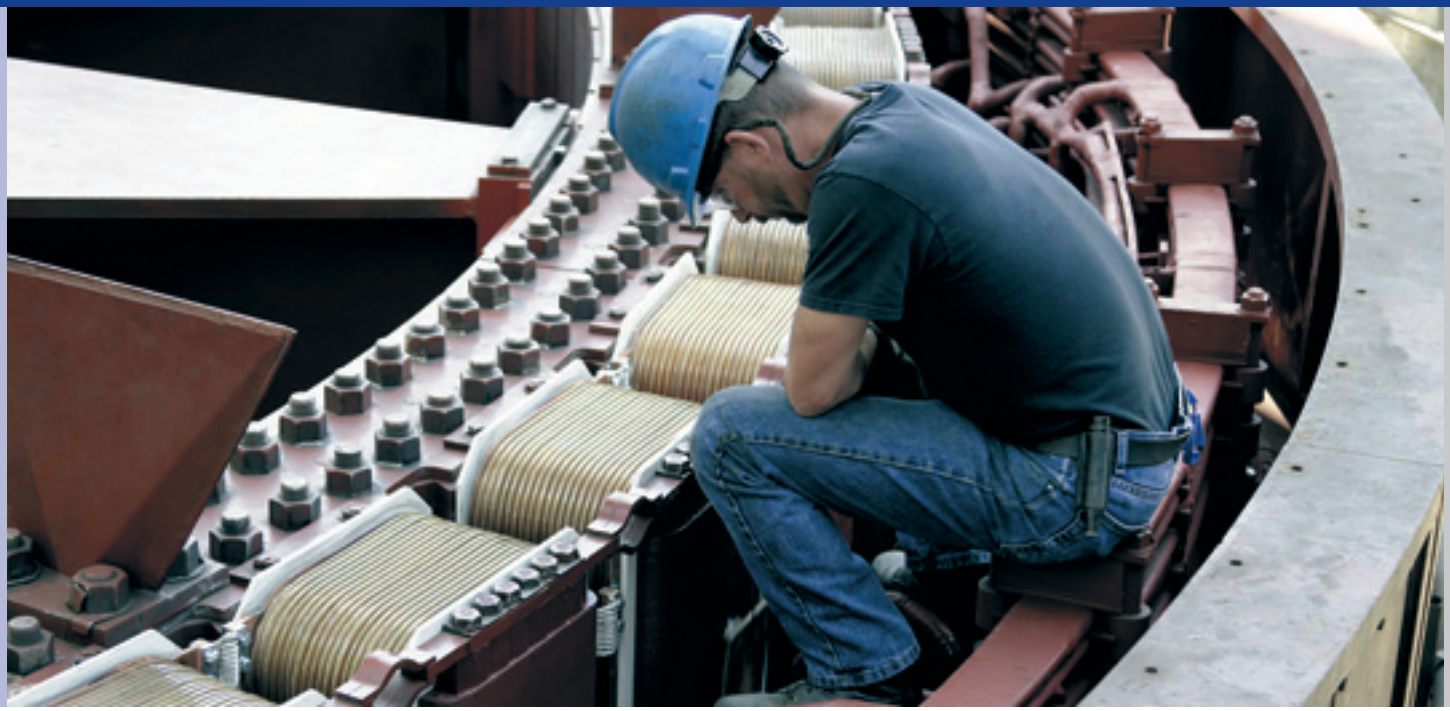
The company name is changing, but the successful course will continue in mutual agreement: Since 1st April 2009, Voith Siemens Hydro Power Generation is Voith Hydro. The shares remain the same.

In the year 2000, Voith and Siemens had joined forces to create a joint venture of the two leading manufacturers of hydro turbine and generator technology in the field of hydroelectric power. Since then, the joint venture has been driven forward with great success. Now, the success stays, with the company name changing due to a name agreement that limits the use of the Siemens brand. The shares of the two joint venture partners remain unchanged, though: Voith holds 65 percent and Siemens 35 percent of the company shares in Voith Hydro.

The joint venture has been able to substantially develop its competencies during the last nine years. Today, Voith Hydro is a full-service provider offering everything from the complete solution to individual electrical and hydraulic components from own engineering and production facilities.

Dr. Roland Münch, Chairman of the Board of Voith Hydro, feels confident, that also under the new name the company continues to stand for proven expertise, excellent research and development, technical reliability and innovations that gained worldwide recognition.

A look on the figures confirm this assessment: Over the last years, the joint venture successfully expanded its leading position in the global market for hydroelectric power. The order volume has grown above one billion order intake per business year for two years in a row to nearly 1.4 billion Euro today (see page 5), not least due to the high worldwide demand for emission-free energy. ■



Voith Group: Growth pattern sustained but preparing for harder times ahead

In Voith's fiscal year ending September 30, 2008, the company once again successfully maintained the pattern of growth witnessed in the preceding years.

Order intake rose 18.7 % to 6.1 billion Euro from a previous year's 5.1 billion Euro. Sales were up 17.8 % to 4.9 billion Euro from 4.2 billion Euro – the highest level in the history of the Voith Group.

Double-digit sales growth had contributed to robust business performance. At the same time, Voith further expanded its strong position in the world's key growth regions with around 30 % of product and system sales in the forward-looking markets of Asia.

Around 400 million Euro were spent on investments and acquisitions, while a further 250 million Euro were channelled into research and development, thus laying a firm foundation for the future.

President and CEO Dr. Hubert Lienhard sees Voith's products provide answers to the pivotal questions of the 21st century, addressing issues such as the efficient use of energy and resources and the need for clean, renewable sources of energy. With a healthy balance sheet and adequate capital resources in place, he sees room to maneuver in difficult times ahead.

In the first months of the current fiscal year, the impact of the economic crisis varied throughout the Group. Both new orders and sales remained stable in the Group Divisions that service the markets for oil, gas, energy and public transport. Voith is nevertheless confident that the future holds strong business potential in its markets.

Voith Hydro's order intake for fiscal year 2007/2008 was another year to grow, from almost 1.1 billion Euro to nearly 1.4 billion Euro. This good trend continued in the first six months of the current fiscal year.

Columbia River cuts powerful path

The Columbia River is power. It's also tradition. History. Recreation. Transportation. Controversy. Arguably one of the most significant forces in the United State's Pacific Northwest, the Columbia River cuts an impressive 1,250-mile path, starting in Canada, winding through the states of Washington and Oregon, and ending in the Pacific Ocean.

Through lush green surroundings, steep rocky landscapes and passed high Evergreen-spotted cliffs, the Columbia River is a provider – of power, food, transportation and recreation. The historic river is not without controversy, as farmers, utilities, native tribes and recreational enthusiasts compete for its use across state and national borders.

Almost everyone in the Pacific Northwest is touched by the Columbia River, whether it's because of the low electricity rates, eating apples or cherries grown in rich soil irrigated by the river or enjoying a direct product of the river – fresh salmon.

"The river is a unifying force, and plays an integral role in the everyday lives of the region's citizens", says Donna Sinclair, program manager at the Center for Columbia River History. "From salmon to windsurfing, the Columbia is at the center of the economy, society, policy and spirit of the Northwest."

A long history of tradition

Human life along the Columbia River basin dates back more than 15,000 years. Those early groups fished the river, hunted and gathered plants, and they built their dwellings along the river. Many Native American tribes continue to have a strong presence on the Columbia River.

According to oral history passed down from Native American elders, tribal culture, pattern of movement and many traditions were based on the Columbia River and its salmon season. Like the buffalo's importance to tribes in the United States' Great Plains, the salmon from the Columbia River provided a valuable resource that is still celebrated today.

Europeans first became aware of the Columbia River in the 17th century, charting its course on maps in the late 18th century. Then came the industrial revolution. The Columbia River played a key role in transportation in those early years.

Discovering the Northwest: The Lewis and Clark expedition

It was not before 1793 that a Scottish fur trader reached the Pacific as the first European via an overland route on Native American trails crossing through the Canadian Rockies and making the path for fur trade.

Through a book on this trader's adventures, President Thomas Jefferson's interest was awakened and the idea of a journey for the exploration of this area was born: In 1801, Jefferson made his personal secretary, Meriwether Lewis to lead an expedition and chart the region. The goal was to find a waterway to the Pacific and explore the newly acquired land of the Northwest.

Lewis, then 27, had no training in this sort of action, but could not reject the opportunity. He managed to convince his friend, William Clark, age 33, to come along. Clark was an experienced frontiersman and army veteran. In 1804, a party of 40 left St. Louis, Missouri, to go West. The party travelled relatively well, in part because one of the French-Canadian trappers in the group was married to a young Shoshone woman who, together with Clark's African American servant, was key to guiding, translating and smoothening tension among the group and Native Americans on their way.

The party travelled some 8,000 miles (12,900 km) in one and a half years, documenting everything that came their way. It is reported though that the spelling in their journals was so bad that it took historians a few extra years to sort out all the information. Notes on 122 animals and 178 plants, including some new discoveries were recorded.

The party reached the mouth of the Columbia River in 1805, establishing Fort Clatsop, where they stayed for the winter. They headed back home in 1806. Lewis was later appointed governor of the Louisiana Territory but died a year later under unclear circumstances. Even until today, his death seems to be more related to suicide than to murder. Clark obviously was much better able to deal with this fate and fame and was appointed governor of the Missouri Territory, living to the age of 68.

Their expedition laid important groundwork that considerably helped the future U.S. expansion toward the West.

As canneries, fur-trading and other commerce grew, so did transportation on the river – first sail power, and later, steam. Commercial vessels populated the Columbia, moving goods and freight in the region. Now, roughly 50 million tons of cargo each year is transported on the Columbia River system. Barges can operate on 475 miles of the river system, playing a significant role in moving cargo around the region. Recreation on the Columbia also began in those early settlement times with steamboat tours up the river from Portland. In the 1920s, sport fishing for salmon and steelhead became popular, as well as post-World War II activities such as sailing, water skiing, canoeing and other water sports. Around the Columbia River's Gorge area – about 60 miles east of Portland – strong winds helped create an internationally known destination for windsurfing today.

The real business on the Columbia started in 1932, when private power companies completed the Rock Island Dam in the middle of the river to start harnessing its power.

Turning darkness to dawn

With its heavy flow and large elevation drop, the river lends itself to hydro power. In fact, the Columbia River Basin is the most hydroelectrically developed river system in the world, possessing nearly one-third of the country's hydroelectric potential. With more than 400 dams in the whole basin system – and about 150 hydroelectric projects – the Columbia River's generating capacity is more than 21,000 megawatts – that's enough power to generate electricity for roughly 6 million typical U.S. homes.

The two largest projects are the Bonneville Dam, completed in 1938, and the Grand Coulee Dam, completed in 1941.

The last dams on the Columbia were finished in the 1970s.

The early structures were built as a result of the New Deal program, providing jobs during the Great Depression in the U.S. after World War I. The dams were built to provide irrigation, flood control and electricity. Grand Coulee helps irrigate more than 500,000 acres of fertile – but arid – land in the area. Where before few crops could grow, the central Washington state now is a major agricultural resource, known for producing apples, potatoes, alfalfa, corn, barley and beets. In fact, due to Columbia River irrigation system, Washington State produces more than half of all U.S. production of apples, sweet cherries, pears and hops.

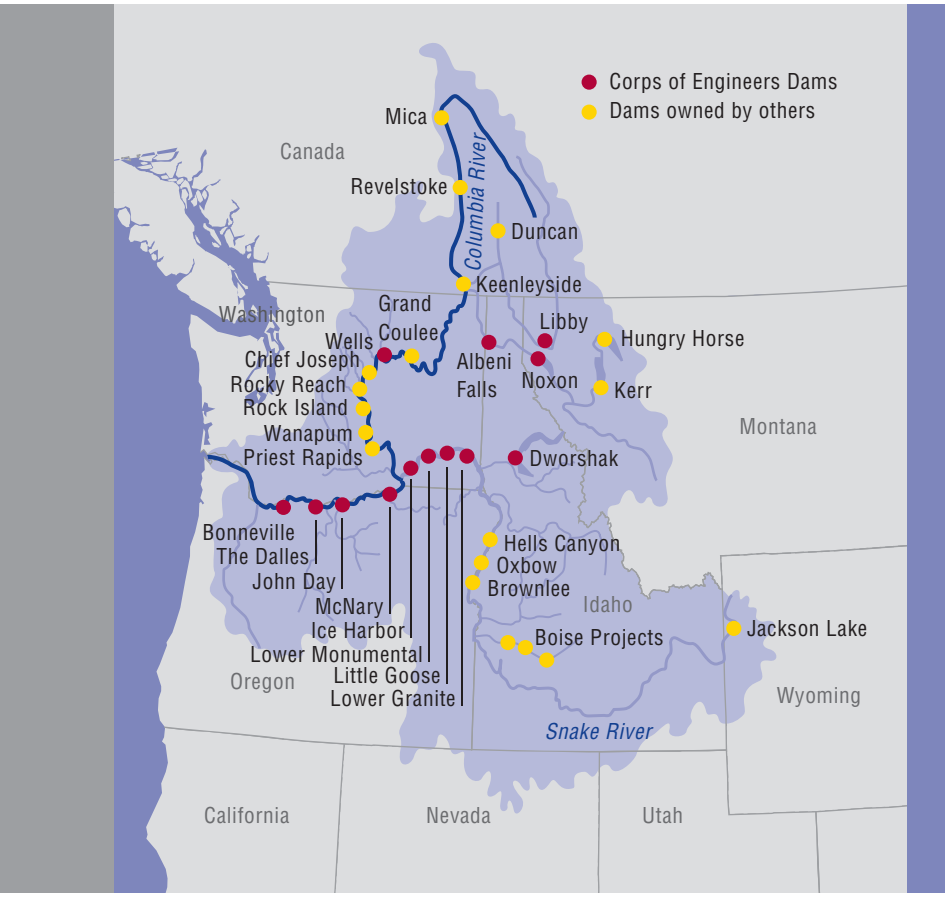
For most residents in the Pacific Northwest, hydro power brings a tremendous opportunity – one not found in other parts of the U.S.

In the state of Washington, almost 70 percent of electricity is produced from hydro power, compared to only three percent in the rest of the U.S. Because of hydro power, the Pacific Northwest has some of the lowest energy rates in the United States. And since it's a clean, renewable energy source, residents will continue to enjoy low electricity rates far into the future.

There's no doubt hydro power has become a part of the culture along the Columbia River. The Bonneville Power Administration, the federal agency that markets the electricity generated at federal hydro power projects on the Columbia River, hired folk singer Woody Guthrie in 1941 to write songs about the river, its history, its culture and the new era of hydro power. Songs include the popular "Roll on Columbia", with the lyrics: "Roll on, Columbia, roll on; Your power is turning our darkness to dawn."

"It's a contested river", says Sinclair, whose Center for Columbia River History has well documented the river's key players. But, over the years, the stake holders learned how to better communicate with each other.

Donna Sinclair,
Center for Columbia River History



The folk songs are just as much a part of the legacy along the river now as the Columbia's colorful "pre-hydro" history.

Hydro power fuels the Pacific Northwest's technology boom

The Pacific Northwest is known for its innovative businesses and corporations, especially in technology. Puget Sound is home to Microsoft, Amazon.com, Starbucks and Costco. And those companies require a tremendous amount of safe and reliable energy to operate. Without hydro power and the low-cost energy it provides, it's unlikely this region would have the jobs and economic boom it's experiencing today.

An abundance of low-cost power – a capacity of 2,000 megawatts – from two hydroelectric projects at Grant County Public Utility District (PUD) in central Washington means large companies like Microsoft and Yahoo are building huge server farms and data centers – which use eight to ten times more electricity per square foot than typical office buildings – in the county because of the inexpensive power.

"There is also more room for growth. I think hydro has a bright future."

Tim Culbertson,
General Manager
Grant County PUD

Demand in the area is booming, bringing international customers like REC (Renewable Energy Corporation), a Norwegian silicon manufacturer, to Grant County.

"The Columbia River means a great deal to the entire Northwest", said Tim Culbertson, General Manager of Grant County PUD. "The river gives us a flexible, renewable energy source. Without it, we would be much more reliant on coal and other resources."

Lots of eggs, one basket: the Columbia River's stakeholders

With so many stakeholders in the Columbia River, there's bound to be competing interests, and plenty of controversy. In the U.S., hydro power operations are overseen by federal agencies and utilities, but many non-profit commissions and local and regional agencies also have a say in how the river is used.

"It's a contested river", says Sinclair, whose Center for Columbia River History has well-documented the river's key players. But, over the years, the stakeholders learned how to better communicate with each other.

Commissions, pacts and accords have been reached. There are still disagreements, but Sinclair says competing interests have more empathy for the other side. And, they are now willing to sit at a table together to work out their differences.

Crossing so many borders, federal governments, state governments and county lines, the Columbia River is governed by a mix of agreements. The Columbia River Treaty, an agreement between the United States and Canada, covers the development and control of the upper Columbia River basin.

A unique balancing act

Signed in 1961 and finalized in 1964, the treaty dictates flood protection and power generation, and mandated the construction of three water storage facilities in British Columbia, and a fourth in the U.S. Under the treaty, any additional hydro power generated in the U.S. is to be shared by both countries, equally.

The treaty was shrouded by controversy, and still today, there is concern because the treaty does not cover fish protection and other environmental concerns – only hydroelectricity and flood control. That's because those early dams were built before there were major concerns about fish runs. The treaty can be terminated with 10 year's notice any time after 2034.

One commission that plays a strong role protecting salmon in the Columbia River is the Columbia River Inter-Tribal Fish Commission (CRITFC). Created in 1977 by four Native American tribes with treaty fishing rights on the Columbia River, the CRITFC coordinates fish management policies and objectives and works on restoring the salmon runs.

The Commission calls themselves "co-managers of the river" says Jeremy FiveCrows, a member of the participating Nez Perce tribe. The Portland, Oregon-based Commission reached an historic 10-year agreement with federal agencies last year – ending years of contentious legal battles.

Wanapum aerial view.

Priest Rapids power house view.

A network of agencies ensure the Columbia River flows

The day-to-day operations of the Columbia River are overseen by a mix of governmental agencies, utilities and private companies managing 21,000 megawatts in the Columbia River basin.

There are 31 federal U.S. hydro power facilities on the Columbia River and its tributaries. The U.S. Army Corps of Engineers operates 21 of them. The other 10 federal operations are run by the U.S. Bureau of Reclamation, created in 1902 to boost the economic development of the dry western states through irrigation.

Three public utility districts (PUDs) – nonprofit, community-owned and governed utilities providing electricity, water, wholesale telecommunications and sewer services – operate five significant hydroelectric operations on the Columbia.

The Grant County PUD, Chelan County PUD and Douglas County PUD hydro power operations have a combined peak capacity of almost 5,000 megawatts. Chelan PUD owns and operates the nation's second-largest non-federal, publicly-owned hydroelectric generating system. Two of the District's hydro power stations, Rocky Reach and Rock Island, are part of an 11-hydro power system on the main U.S. portion of the Columbia River. The district also has a third hydro project on Lake Chelan, giving the PUD the capacity of more than 2,000 megawatts.

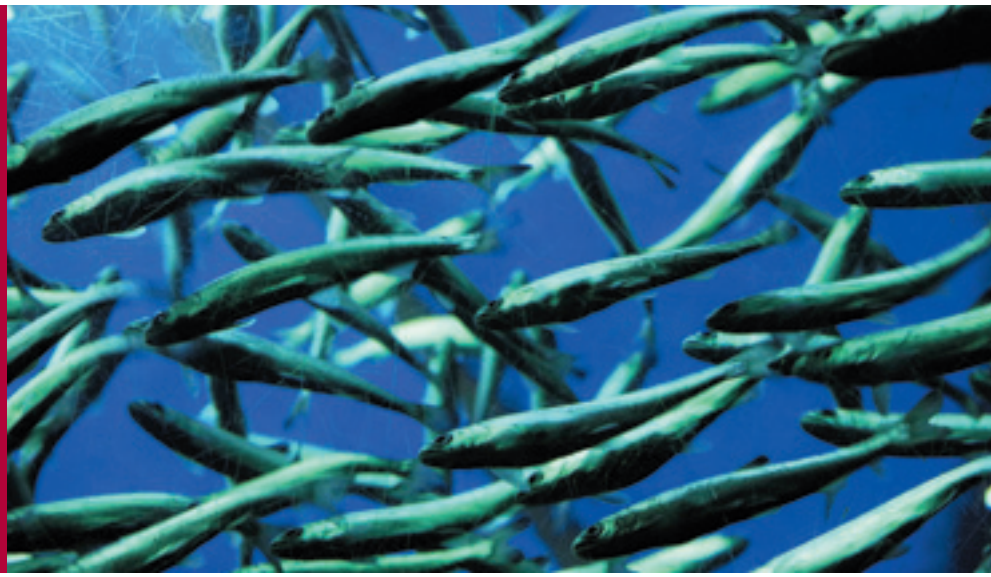
Grant County PUD operates two hydroelectric projects, Priest Rapids Dam and Wanapum Dam. Together, both operations have a combined capacity of about 2,000 megawatts.

Douglas County PUD operates the Wells Dam on the Columbia River, and has a capacity of 840 megawatts.

On the federal side, the Army Corps is comprised of a mix of mostly civilian and some military personnel. It's the world's largest public engineering, design and construction management agency.

"We are part of the Army, but we are engineers", said Diana Fredlund, Corps spokesperson. "In the Pacific Northwest, we are mostly civil workers who manage the navigable waters of the United States."

The Bureau of Reclamation, the other federal agency with oversight on the Columbia River, oversaw development of the Grand Coulee Dam on the Columbia, which is the largest electric power-producing



facility in the U.S., as well as the nation's largest concrete structure.

The Bonneville Power Administration (BPA) is a federal agency created in 1937 to market electric power from the Bonneville Dam and other federal hydroelectric operations, and to create facilities needed to transmit that power. The Portland, Oregon-based BPA sells all power from federally owned hydroelectric projects in the four-state region representing about 35 percent of the electricity in the area.

The BPA also owns and operates 24,445 kilometers of high-voltage transmission lines, one of the largest systems in the U.S. ■

The agreement allows for continuance of hydroelectric projects and commits federal agencies to spend 900 million U.S. dollar on improving Columbia River conditions for salmon runs. The salmon population was in jeopardy even before the dams were built, but FiveCrows said the addition of the dams over the last 70 years meant there was no chance of rebuilding those habitats. Now, the region is hoping to restore those salmon runs as much as possible.

Another governing board with authority on the Columbia River is the Northwest Power and Conservation Council, which was created by Congress in 1980 to give citizens of Washington, Oregon, Idaho and Montana a voice in determining the future of hydro power, and also to protect the fish and wildlife affected by the power resource.

Idaho's Bill Booth, chairman of the BPA-funded Council, said the Columbia River presents a unique balancing act between a need for cost-efficient energy provided by hydro power, and protection of natural resources.

"You've got to take a holistic approach", Booth said. "You've got to keep improving passage through dams, through turbines, for fish." Northwest Power and Conservation Council, CRITFC and the other stakeholders focus on four main factors that affect fish runs. The "Four Hs" include habitat, hatcheries, harvest, along with hydro power.

For example, annual fish harvest rates are tightly controlled based on predictions of the size of fish runs.

In the case of hydro power, the focus is on fish ladders and other fish by-pass facilities, as well as more fish-friendly turbine designs. Other countries that are just now starting to develop hydro power should look to current projects to help guide them. And all entities – from governments to environmental agencies – need to work together and look at the whole picture to make hydro power a true success, Booth says.

Hopes for the Columbia's future

As for the Columbia River, its future will continue to be both a source of clean renewable energy, as well as transportation, irrigation, recreation, food and ongoing tradition.

Governments and coalitions will still debate its uses. In the future, some of the smaller hydro power stations might go offline, unable to sustain the costs of the new fish-friendly requirements.

But the larger facilities will likely continue to evolve and modernize, with more efficient turbines.

"You'll see retro-fitting of certain dams – we're already seeing that", Booth said. "You'll see more efficient turbines." And, Booth says, we should see a boost in the health of the salmon runs. "They are coming back", he says. "It's not too late."

The future of hydro power is expected to continue evolving and progressing along the Columbia River, as all the stakeholders work toward common goals – providing a reliable, renewable and affordable energy source that is environmentally sustainable. There are still four significant facilities on the Columbia River yet to undergo any modernizing upgrade – meaning there's plenty of room for hydro growth and efficiency in the future.

At Grant County PUD, Culbertson says the future of hydro power likely means building pumped storage facilities to gain further electricity flexibility.

He predicts continued growth along the Columbia, especially since relationships between utilities and native tribes are better now than even a few years ago, and equipment is increasing in efficiency and is even more environmentally friendly.

"Not only is there more room for the region to work together to protect our natural resources and provide the best renewable resource for our region, but there is also more room for growth", Culbertson said. "I think hydro has a bright future." ■

Fish-friendly turbines

Fish-friendly turbines are helping Grant County PUD operate at its full maximum capacity – and helped the PUD meet tougher conditions to gain a new 44-year federal license to continue operating the two dams. Before the turbines were installed, the PUD could not operate at full capacity because of concerns about migrating salmon and steelhead. The new turbines, which are supplied by Voith Hydro, are not only more efficient, but have increased the number of fish to successfully pass through the hydro project – while still allowing more water to go through the turbines.

Wanapum aerial view.

Voith Hydro offers fish-friendly solutions for customers

The recent energy concerns worldwide have placed the spotlight on the need for environmentally sustainable energy alternatives. Hydro power is one of the largest renewable energy resources in the world, accounting for 20 percent of all electricity generated and 10 percent of the United States' electrical supply.

Increasing environmental concerns regarding the impact of hydro power on fish and aquatic habitat have sparked the development of fish-friendly solutions for hydro power generation. The two main challenges facing hydro power designers are fish passage and water quality for aquatic habitats. Voith Hydro is committed to developing state-of-the-art hydro equipment designs that are both cost effective and environmentally friendly.

Beginning in the 1990s, Voith Hydro York (VHY), working with several clients including the Grant County Public Utility District, the U.S. Army Corps of Engineers, and the Chelan County Public Utility District, began in-depth efforts to create environmental improvements in turbine designs that improved fish survival. VHY engineers collaborated with scientists to understand the biological effects on fish passing downstream through the turbines. The areas studied included the rate of pressure change, blade strikes, abrasions or cutting due to sharp edges and cavitation. The investigators also examined design changes to mitigate these effects.

Wanapum generator floor.

Wanapum runner ready for installation.

The result was a fish-friendly Kaplan turbine design that is being used for power generation plants along the Columbia River in the northwestern United States. The turbine modifications decreased wicket gate overhang and minimized gaps between the machine blades and hub, as well as between the blade and discharge ring. Thicker blade entrance edges reduced the strike damage to fish. Blade designs also were altered to diminish the rate of pressure change and component shapes were changed to reduce fluid shear.

The goal was to increase fish passage survival rates toward 98 percent. Previous survival rates ranged from 88 to 94 percent. The implemented fish-friendly improvements to the Kaplan turbines have met customer expectations in fish-friendly design.

While the enhancements were aimed at improving the environmental efficiency of hydro power, additional benefits were derived, including improved plant energy generation and reduced operating and maintenance costs. Today, many progressive U.S. utility companies are upgrading or installing new turbines with environmentally friendly designs as part of their endeavors for improving energy generation efficiency, as well as addressing a requirement of relicensing.

The Federal Energy Regulatory Commission (FERC) is the lead permitting agency for private hydroelectric plants. The U.S. Fish and Wildlife Service for the eastern part of the country, and the National Marine Fishery Service for the western part, are other agencies that make recommendations on fish mortality goals. In response to the 1986 Electric Consumers Protection Act these agencies have set their target as “no fish production loss” for all new hydro projects as well as for any projects for which the hydraulic license is expiring.

There are hundreds of plants in the U.S. that must pass through relicensing over the next decade; thus, fish-friendly Kaplan turbine solutions are in demand.

Wanapum Dam

Located downstream from Vantage, Washington, Wanapum Dam is nearing completion with the installation of the fifth unit of the 10-unit Kaplan turbine project. The Grant County Public Utility District project incorporates the Voith Hydro patented fish-friendly turbines.

Beginning in 2003, Voith Hydro York performed hydraulic and basic engineering, followed by detailed engineering, manufacturing and installation. The first unit was commissioned in February 2005, about 80 days ahead of schedule.

Fish survivability tests were conducted through December 2005 and the desired success rates were achieved. The second and third units for Wanapum Dam were commissioned in September 2006 and November 2007, respectively. All 10 units will be completed by mid-year 2013.

Rocky Reach Dam

Rocky Reach Dam spans the Columbia River just a few miles north of the city of Wenatchee, Washington. The primary scope of this completed project was replacing the existing Kaplan units with new units that include modern designed replacement runners. The project was necessary due to a severe runner blade cracking problem.

Rocky Reach aerial view.

Rocky Reach tailrace view.

Operated by the Public Utility District of Chelan County, Washington, Rocky Reach Dam is the first Voith Hydro project where the customer specifically contracted for model testing for fish-friendly solutions. Model testing of the fish passage alternatives were tested at the former Voith Hydro Riva Hydraulic Laboratory in Milan, Italy. These tests included injecting model-size fish into the water passageways to gauge survivability.

In June 1994, after model testing was completed, the contract for refurbishing units 1-7 at Rocky Reach Dam was awarded to Voith Hydro. Fish-friendly modifications, primarily based on the elimination of wedge-shaped gaps between the runner blades and adjacent components, were developed, implemented on the model and tested. This modification was later applied to all 11 Rocky Reach turbines, as well as other Voith Hydro projects along the Columbia River at Wanapum and Bonneville. The entire Rocky Reach Dam rehabilitation project was completed by Voith Hydro in March 2003.

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Salmon – a corner stone of tribal life

Nowhere has any community in the American West sacrificed so much in the face of industrial expansion and development than tribal communities. Their physical and cultural livelihood was placed at risk as the land, waters, and the bounties from them were exploited to meet an aggressive demand for resources. And, today, in a turnaround, no western community has achieved more in the face of adversity to restore and protect the environment than these same tribal communities.

Long before written history, the combined ancestral homelands of the tribes and bands of Yakama, Umatilla, Warm Springs and Nez Perce covered nearly one-third of the Columbia River basin in the United States. Each of the four tribes maintained an autonomy that could be heard in distinct languages and distinguished by individual styles of governance. However, the rivers provided a unifying figure: salmon. They relied on its abundance for physical and cultural sustenance. The salmon connected them by river and through blood forging alliances that exist even to this day.

Today, the four tribes are aligned through the Columbia River Inter-Tribal Fish Commission (CRITFC). CRITFC's mission is to ensure a unified voice in the management of the fishery and to assist in protecting treaty rights through the exercise of tribal sovereign powers.

Though scholars relied on carbon to estimate the tribes' existence at over 10,000 years, their opening chapter begins precisely at "time immemorial." Since time immemorial these tribes gathered at places like Celilo Falls on the Columbia River to share in the salmon harvest where their ancestors practiced restraint and worship so that the salmon would flourish for future generations. Their intent was never to conquer nature because if they did, it would defeat the very purpose of their existence and would place their survival at risk.

In 1855 when these four tribes and the United States negotiated treaties, their forefathers explicitly reserved – and the U.S. agreed to assure – their right to fish in perpetuity across their ancestral homelands and at all usual and accustomed places. They kept their word by ceding vast portions of their homelands and in exchange the U.S. pledged to honor their ancestral rights.

At treaty times, ten to sixteen million salmon returned up the Columbia. As the settlers moved in they took a cue from the tribes recognizing the wealth contained in salmon. Unfortunately, dramatic change occurred: commercial fishing lacked regulation, resource extraction tore into riparian habitat poisoning clean waters, and dams harnessed the natural flows to build a new economy with low-cost electrical power, navigation, and irrigation paving the way for urbanization.

When you make life difficult for the river, you make life difficult for the fish, and when you make life difficult for the fish, you make life difficult for Indian people. The tribes bore the brunt as salmon runs plummeted. In 1957, their ancient fishing grounds at Celilo Falls disappeared behind the Dalles Dam.

Treaties were intended to secure peace, however as salmon populations declined, conflict ensued.

Celilo Falls.

Repeatedly the tribes were in court as their sovereignty and treaty rights were challenged. In an attempt to fence them off the river and monopolize the fishery, the court in U.S. v. Winans upheld their treaty, noting fishing was "not much less necessary to the existence of the Indians than the atmosphere they breathed". In another attempt to deprive the tribes of their share of the harvest, U.S. v. Oregon affirmed fair allocation; and in the approach to enforce state laws over a tribal sovereign, Tulee v. Washington upheld that a treaty takes precedence over state law.

Litigation is one approach yet the tribes never overlook the value of negotiation. Both ways are challenging, but the difference is in the result.

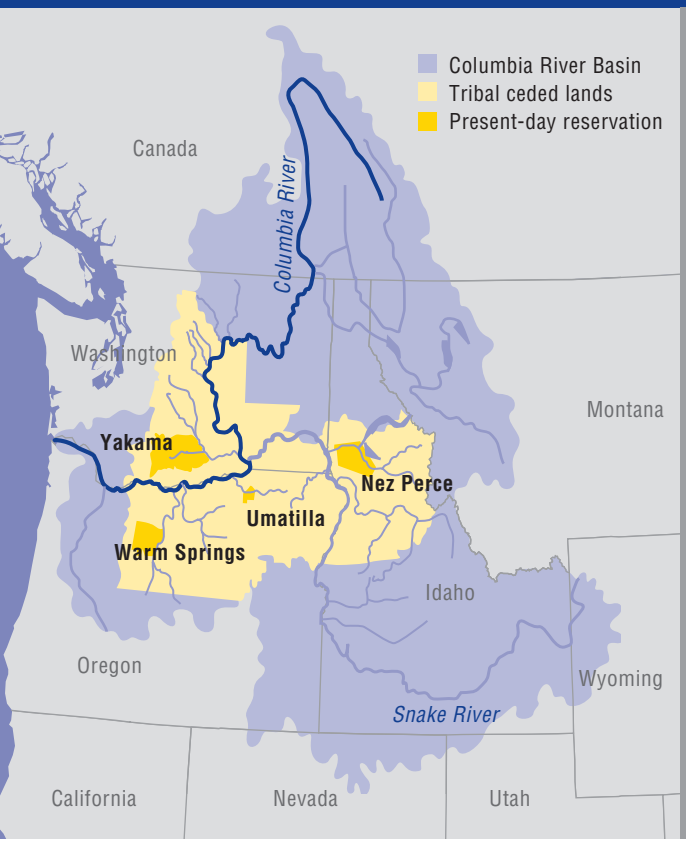
Each individual tribe retains the autonomy to determine their course of action. Yet, it is important to note that the tribes hold the longest track record for collaboration in this country, clearly shown by their sharing of the salmon harvest at Celilo Falls and the treaty negotiations.

The tribes' willingness to harmonize diverse interests was recently represented in a trio of ten-year agreements. First, an agreement was reached with the states under U.S. v. Oregon, which provided a framework for salmon harvest and hatchery production. Harvest is set using an abundance-based approach to protect weak stocks while providing harvest on strong populations.

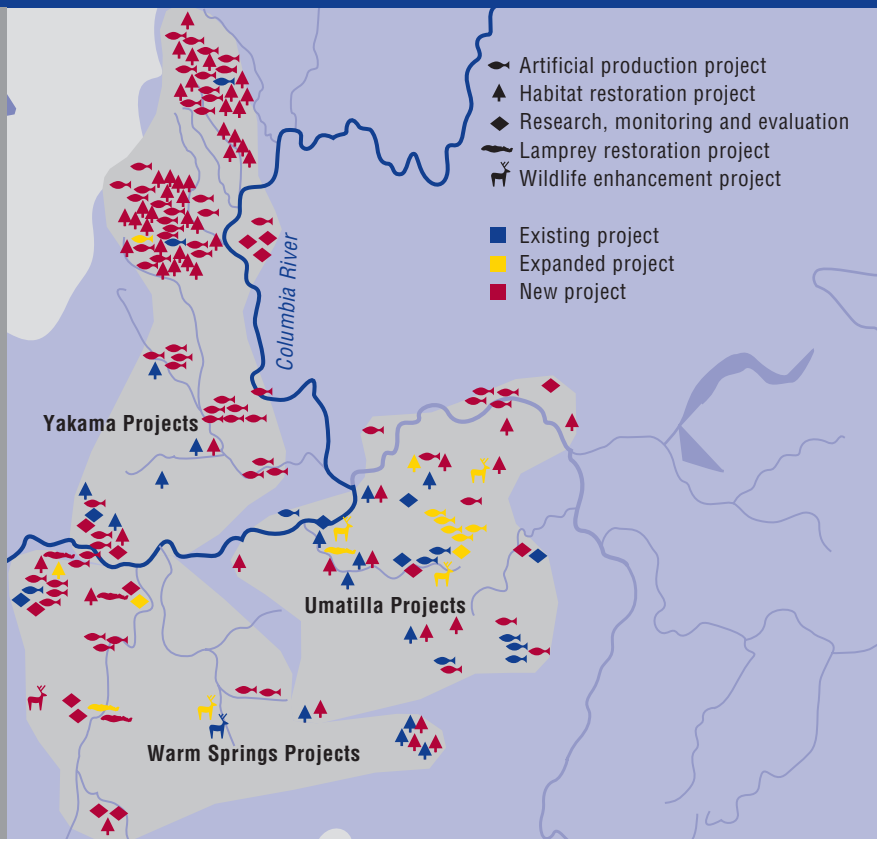
Hatchery production will meet mitigation obligations for destroyed habitat while being consistent with wild fish restoration.

Second, three of the CRITFC tribes along with the federal agencies that operate the river system and sell the hydro power signed the "Columbia Basin Fish Accords". The Accords commit the parties to salmon, sturgeon, and lamprey restoration actions.

Third, under the Pacific Salmon Treaty, U.S. and Canadian negotiators recommended updated fishing arrangements under the Treaty. The updates contain harvest reductions off the north Pacific coast to enable more returning adult fish to spawn in the Columbia basin.



Tribal ceded lands and present-day reservations.



Projects under the Columbia Basin First Accord over ten years.

Having sustainable, harvestable salmon populations requires a mixture of good science, smart politics, collaboration, and when necessary, litigation. Tribes have long been able co-managers and make good allies because they are in this for the long haul and bring to the table tribal fisheries programs that are professional and determined. Their watershed restoration extends beyond tribal land to work with federal, state and private land managers to improve water quality and habitat. Tribal biologists and their regional and international counterparts collaborate to assure the harvest is shared and within limits. They use nature's wisdom to refine hatcheries to rebuild fish populations. Their conservation officers are in the rivers to protect the treaty fishers and their rights.

Tribal experts provide research and consult with hydro operators on how best to manage the system for fish survival. They are now gathering the knowledge to address a changing climate. And, tribal leadership is readily found in framing public policy and outreach.

It has been no small feat and the tribes' work is far from over. The salmon have been the cornerstone of our lives for well over 10,000 years and we both intend to be around for another 10,000 years. And we both intend to still have our say.

About CRITFC

CRITFC, the Columbia River Inter-Tribal Fish Commission ensures that the four tribes have an aligned and unified voice in the management of fishery of salmon on the Columbia River and assist in the protection of the reserved treaty rights, laid down in the 1855 treaty with the U.S. government, by exercising the inherent tribal sovereign power from each tribe.

Author

Jeremy FiveCrows is a member of the Nez Perce Tribe and works for the Columbia River Inter-Tribal Fish Commission in Portland, Oregon, USA

U.S. hydro plans to keep up with expected boom

Interview with Mark Garner

Mark Garner,
President & CEO of Voith Hydro York

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Mr. Garner, how is the York Operating Unit positioned with the current booming demand for clean energy in the United States?

Mark Garner: We're seeing an increasing demand for hydro power, and the York facility is well-positioned to meet this growing need. In the past 15 years, we've seen a market primarily for rehab and refurbishment of equipment. Now, we're seeing growth of new plants, which was hard to imagine a few years ago.

We are ready to take this business – both new and modernization – including the full-range expertise from components to total plant design, from mechanical and electrical equipment to complex automation and control solutions, to meet the needs of the growing market.

How did the York facility prepare, in terms of skills and growth, for this renewed interest in hydro power?

We have always anticipated growth and conducted massive process orientation and qualification drives for our staff in all disciplines.

With strong headquarter facilities in R&D and engineering, our global positioning is strong. We have developed expertise on modernization of current plants, and created integrated solutions and services. When we saw a slowing of new business years ago, we developed new expertise that is now paying off.

What was the biggest challenge in this?

Certainly, the re-building of business segments and the understanding of a completely different growth mindset was a challenge. But that work helped us plan for the future, and come up with the first initiatives on integrated offers and partnering models.

What are your assets and investments today?

We strongly value our employees and our customers. We value our dedicated employees who we honor each year for their service. At the end of financial year 07/08 we celebrated a combined 1,875 years of service for 61 colleagues having reached milestones in their careers.

Promise for new hydro promotion by the new President who visited Voith Hydro York last year during the election campaign.

At the same time we welcomed 133 new employees who look forward to long careers with Voith Hydro. We follow the visions and values set by the entire Voith corporation: "We never let a customer down." We offer what we call "engineered reliability" – not only in terms of highly engineered and reliable and safe products, but also with how we develop customer relationships and keep them.

Our Board of Directors has approved capital investments of over 20 million U.S. dollar to expand our capabilities and capacities in York. We will be adding to our factory two new machine tools with other investments throughout the company.

How much is your operation growing?

It's growing fast. We hired 170 people in the last eighteen months. To recruit experienced and skilled employees and educate them on our special demands is a huge effort. But we were able to build on recognition programs, motivating and enabling our staff to develop with the challenging growth of our business and keep pace with demand and technology.

Why do you think Voith Hydro in York and elsewhere can attract staff in such magnitude?

The corporate values of Voith and Voith Hydro offer a series of specific and unique working conditions. We are a family owned business and we are able to focus on trust rather than deals – with both customers and employees.

"We are ready to take this business."

Our historic roots, combined with a long-established level of trust, have created pioneering approaches throughout our company's history. S. Morgan Smith was a friend of Hanns Voith 80 years ago. Working together, they set up the first cooperation on development of turbines. Also, Voith took a revolutionary stance and grew internationally, at a time when globalization was far beyond people's imagination. The first turbines in Niagara, the largest at their time, were supplied by Voith. And after this, the company's units have constantly contributed to world records, from Niagara to Grand Coulee to Three Gorges.

It's that kind of forward-thinking and teamwork that attracts top-notch people to a company, and allows us to grow in innovative ways.

How would you evaluate the interconnection of U.S. hydro development with global drivers affecting your business?

The global demand for energy has finally reached the U.S., which is seeing soaring prices for resources of all kinds, from oil to gas to daily products. The seemingly once-abundant fossil supply has peaked and will drive prices further up. The public is just now realizing the seriousness of the situation, and that alternatives must be found.

This means renewable energy is gaining favor in the public eye as the one-and-only opportunity to counter soaring gas and energy prices. And this, in turn, creates a renewed interest in hydro power.

There is an incredible amount of growth potential for hydro power. In the past 12 months we were awarded two contracts for the four Ohio River plants, where we are only adding generation plants to existing dams or locks.


NO 1088
200 TON
50 TON
NOTICE

No new dams are needed, so we do not face environmental or social issues. A recent study conducted by the Electric Power Research Institute (EPRI) indicated that an additional 5,000 MW of potential conventional hydro generation is possible at existing dam sites by the year 2025. So the potential here is incredibly high.

We also see the development of new pumped storage in the U.S. because the electricity grid becomes more reliant on intermittent emission-free renewables such as solar and wind. Wind and solar need backup, also called firming. Pumped storage is a proven technology that can store the energy generated by the intermittent renewables and we are well positioned to provide these plants.

What is the future vision of Voith Hydro in the U.S.?

We will continue to be an industry leader in terms of engineering, reliability and customer orientation – and very importantly – in innovative technology, not just traditional hydro. Due to the long gap in new power plant development, many companies no longer have the skills and knowledge on how to design and operate hydro power plants. But we are experts in this area, and will continue to be innovative.

We believe hydro technology development is crucial for the U.S.'s future. But we also go beyond the traditional power-from-water technology as a global organization. The U.S. is lagging behind in all other technologies connected with renewable generation, including the "new hydro" of ocean energies. The U.S. lacks the political framework and regulation. But we have another advantage over any other company here, in the U.S. and worldwide: Voith Hydro is a technology leader in ocean energies, including commercially-operated wave power plants and tidal current technologies.

The future in the U.S. for Voith Hydro is very strong. We will continue to build new plants and modernize existing facilities. As the public continues its desire for clean, renewable energy, we expect our company will be busy keeping up with demand for years to come.

23,000 MW of potential for increases in capacity by 2025. This includes:

- 2,300 MW capacity gains at existing conventional hydro power facilities
- 5,000 MW of new conventional hydro power at existing non-power dams
- 2,700 MW of new small and low head power conventional hydro power (< 30 MW installed capacity)
- 10,000 MW from ocean wave energy technologies
- 3,000 MW from hydrokinetic technologies (river-based)

Location Info

Voith Hydro in York, PA, is a major operating unit of Voith Hydro's global network. The company includes a full range of mechanical production, and also capability for electrical machines, such as generator re-winding, bars and coils. In addition, the York location has a hydraulic laboratory for model testing, which is the only one dedicated to hydro turbine development in North America.

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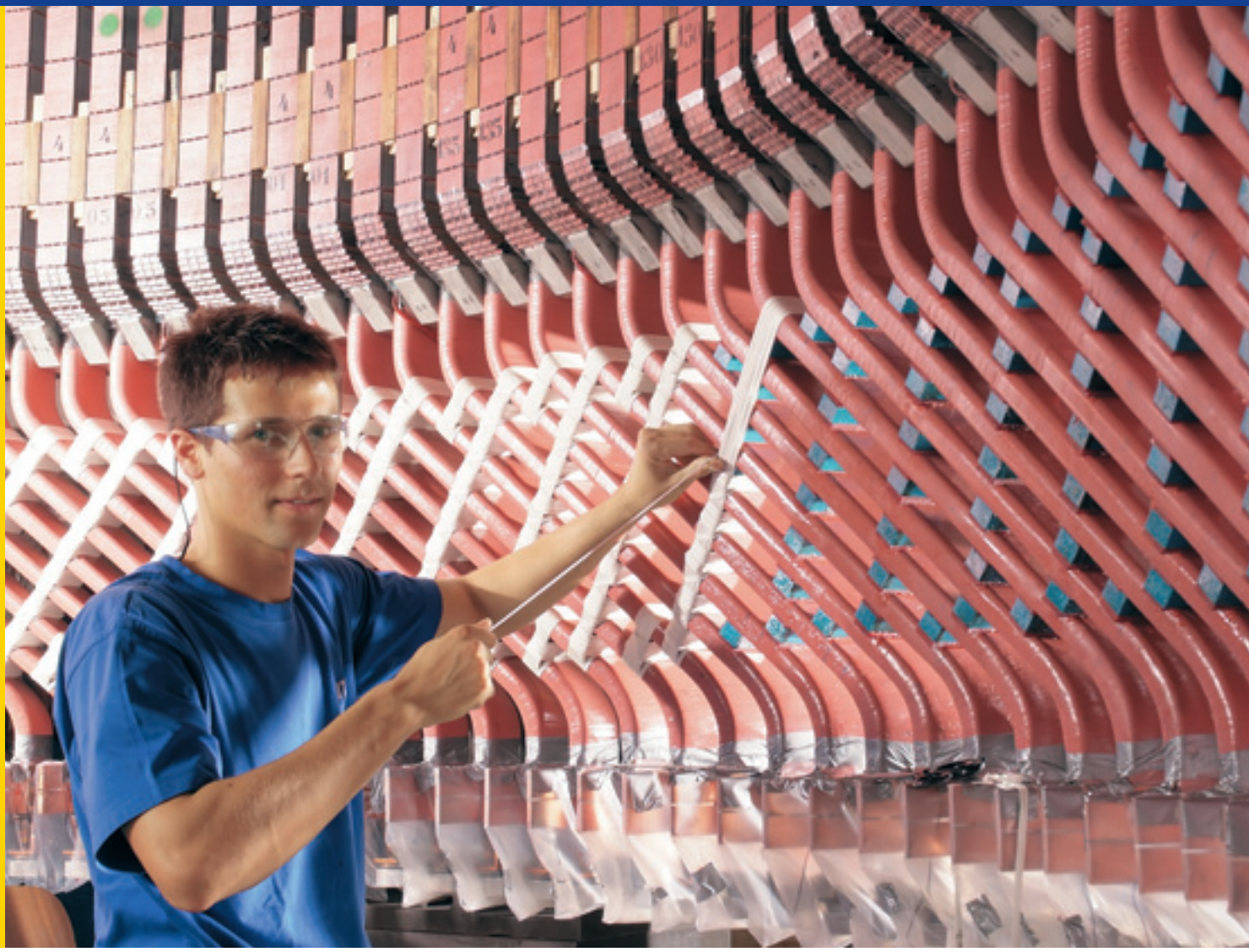


Globalizing know how in multi-turn coils

Exciting developments are underway at Voith Hydro in Mississauga, Canada, as it unveils its global mandate to supply multi-turn coils. This mandate has been enabled by significant investment in leading-edge coil manufacturing equipment along with the introduction of the Micalastic insulation system in North America. The current schedule to supply Micalastic coils commercially is August 2009.

The Micalastic insulation technology has enjoyed a remarkable reputation for quality and reliability for many years already.

The Mississauga location has been a market leader in providing generator modernization services within North America in addition to supplying coils, having supplied coils to over 300 generators across 230 different generating stations over the past thirty-five years. This represents over one gigawatt of machines serviced with coils produced in Mississauga alone.

Leading-edge in coil manufacture

Voith Hydro has always demonstrated a technology leadership approach in the hydro industry in both its design and manufacturing approaches.

This is evidenced once more these days by the significant new investment in leading-edge coil manufacturing equipment now installed in Mississauga.

This new equipment consists of:

- Coil forming machine
- Electric press for coils
- Six-axis auto-taping machine
- Micalastic Vacuum Pressure Impregnation (VPI) System.

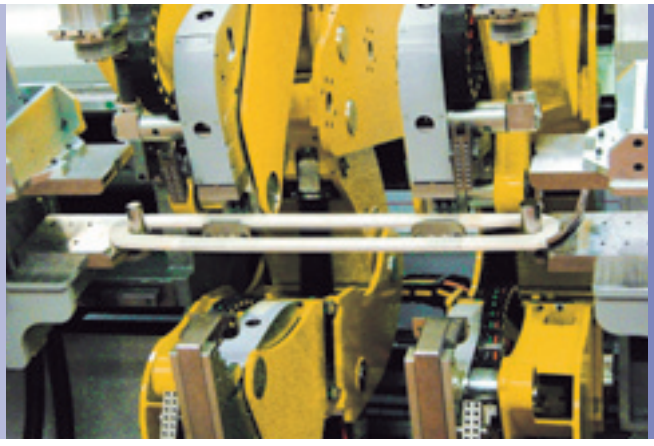
One of the key improvements of the winding manufacturing process is the introduction of six-axis controlled taping for coils. The taping machine wraps the fine mica tape with an adjustable and consistent overlap and tension around the slot and end-winding portions of the coils, thus ensuring uniform thickness over the full length of the coil, including the knuckle of the coil. In combination with a modern and sophisticated VPI technology, this also ensures a void free, high dielectric insulation system.

Benefits of this new coil manufacturing equipment to our customers are

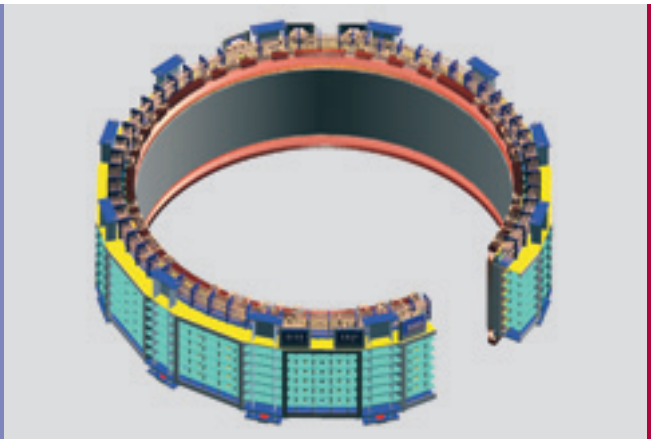
- Best-in-class delivery cycle times with shorter manufacturing cycles
- 50 % less handling of coils in production
- Highest quality product properties
- Unprecedented repeatability and reproducibility of coil dimensions.

Another key advantage of the new equipment is in the design phase for new generators and for generators being modernized. The high precision of the new coil equipment will allow design engineers in Voith Hydro to further maximize the amount of copper in generators which in turn will benefit customers with machines that have higher efficiencies and lower losses. With regard to modernization solutions efforts of Voith Hydro during the design phase, this new equipment will allow to further increase generator up-rate potential to customers.

New coil forming machine.



Advanced computerized design tools.



Six-axis auto-taping machine.

Corona-control finishes.

One global standard in insulation

The current insulation system being used in Mississauga is Thermalastic. As such, coils currently produced for North America from this location were based on the Thermalastic insulation system. Both Micalastic and Thermalastic systems are epoxy resin based and both have a long tradition in the industry recognized worldwide for its technical features and reliability.

Voith Hydro's approach has always been to provide customers with the best engineered solution for their unique applications. Moving to one global standard in insulation systems, Micalastic will offer technological advantages that will benefit customers in many ways:

- Leading-edge technology in insulation will ensure continuation of the best engineered insulation systems for customer applications.
- Insurance of uninterrupted and stable supply of product to customers.
- Technology offer to the marketplace that is technology specific as opposed to site specific. No matter where your Voith Hydro product comes from, the uniqueness of technology and engineering approach around the globe will be based on one global standard and the philosophy of engineered reliability.

Micalastic in high-voltage hydro generators

The common characteristics shared by all types of Micalastic insulation are the use of inorganic fine mica tape as a base material, and heat-curing synthetic resins as a bonding material. This, coupled with state-of-the-art manufacturing techniques geared to the various types and size of machines, makes for its most outstanding features which are high breakdown strength, long-term resistance to electrical stress, and a low power factor (tan δ) as well as excellent resistance to mechanical and thermal stress. The Micalastic insulation system is based on Vacuum Pressure Impregnation technology and meets Thermal Class 155 (IEC)/Class F (IEEE) standards.

Process Control

Six Sigma tools are currently being used to monitor the coil manufacturing process and collect data on an ongoing basis. This will eventually lead to process harmonization across the locations of Voith Hydro that manufacture this product: Shanghai, China, São Paulo, Brazil, and Mississauga, Canada. So, in addition to the global standard in insulation technology as such, the global process and its control will be consistent. Global process control ensures early warning and a fail-safe system within production for the highest quality and engineered reliability to customers.

Going global

Micalastic coils have been the standard outside North America for quite some time. Supply of Micalastic coils outside North America will be seamless. Within North America, the supply of Micalastic coils for the majority of customers will be a non-event since both Micalastic and Thermalastic systems fundamentally share many of the same characteristics.

In fact, there are several customers and machines in Canada and in the U.S. that already have Micalastic coils installed and supplied by the Brazilian location of Voith Hydro in the past. These Micalastic coils have performed absolutely flawlessly since that time.

Design

Computerized design tools allow modeling of the performance of the entire generator. Optimization of the coil design with respect to losses, heating and overall rating is performed. Based on extensive test results on completed projects, the calibrated calculation allows the winding performance to be guaranteed.

The range of applicability for multi-turn coil windings is up to 150 MVA and voltages up to 15.75 kV. Higher voltages are possible by request.

The new coil manufacturing equipment in Mississauga was commissioned in January 2009 and the impregnation system following in April. Micalastic coil qualification trials started in May and coils will be commercially available by August 2009.

This indeed is an exciting chapter for Voith Hydro, as it again demonstrates its technological leadership in the supply of multi-turn coils through its significant investment in equipment and Micalastic technology in Mississauga, Canada.

We look forward to passing on the great benefits of this highly engineered product to our customers all over the world.

Micalastic records in hydro

- Insulation system started and continuously developed since 1957
- More than 55 million accumulated service hours
- More than 300,000 bars and coils supplied
- More than 6,300 accumulated service years
- Applied to approximately 500 hydro units worldwide over 5 MVA

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Micalastic Insulation System, the Voith Hydro VPI Technology

Relative dielectric constant, ϵ_r, 20 °C, 50 Hz / 60 Hz		≈ 4
Tang δ at 0.2 U_N, 20 °C, 50 Hz / 60 Hz		⩽ 1.5 % / ⩽ 1.0 % – w/o resp. w. ICP
$^1/_2$ (Tang δ / 0.6 U_N – Tang δ / 0.2 U_N), 20 °C, 50 Hz / 60 Hz		⩽ 0.15 % / ⩽ 0.10 % – w/o resp. w. ICP
Max. Δ Tang δ / step 0.2 U_N (from 0.2 U_N to 1.0 U_N)		⩽ 0.25 % / ⩽ 0.10 % – w/o resp. w. ICP
Breakdown strength, 50 Hz / 60 Hz, slot side	kV/mm	⩾ 25
Single stator bars (half coil)	kV	Up ⩾ 6.0 U_N at slot side
	kV	Up ⩾ 3.0 U_N at front side
Surge voltage endurance along slot	kV/mm	⩾ 50 (1.2 / 50 μs wave)
	kV	Us ⩾ (4 U_N + 5 kV) at slot side
Test voltage, 50 Hz / 60 Hz, U_{PRMS}, 1 min		
Single stator bars (half coil)	kV	Standard: Up = (2 U_N + 6 kV) (higher values can be applied after request)
Finish winding assembly	kV	Up = (2 U_N + 1 kV)
Ratio between test DC and AC voltage Up_{DC} / Up_{AC}		1.7
Test voltage, conductor strands, 50 Hz / 60 Hz	V	220
Permissible surge voltage on windings in operation	kV	⩽ 3.5 U_N at Uphase-core
	kV	⩽ 5 U_N at Uphase-phase
Maximum permissible temperature IEC 62114 / IEC 60034-18	°C	155, Class F
Flammability: as per model test		Self-extinguishing
Test voltage, 50 Hz / 60 Hz, U_{PRMS}, 1 min – Leads	kV	1.5 x Up

U_N = rated (line-to-line) voltage

America's largest renewable energy resource set to double by 2030

Strong commitment from both public and private partners needed. As the world turns its attention to climate change and U.S. leaders face growing concern over energy policy, the U.S. hydro power industry is charting a course that could see America's largest renewable energy resource double by 2030.

Today, hydro power generates about seven percent of all U.S. electricity – enough for nearly every household in the 10 largest U.S. cities. The Electric Power Research Institute (EPRI) in a 2007 report estimates that the industry could expand its current 96,000-megawatt capacity to add another 23,000 megawatts by 2025, through efficiency improvements at existing facilities, by developing new tidal, ocean, wave and pressurized water technologies, and by adding hydro power at existing non powered dams.

Many believe this is just the beginning of the industry's potential expansion. U.S. Federal Energy Regulatory Commission (FERC) Chairman Jon Wellinghoff challenged National Hydropower Association (NHA) members to double installed capacity, adding more than 90,000 megawatts by 2030.

In fact, FERC is already reviewing more development projects than it has in a decade, reviewing projects that could add some 30,000 megawatts of new capacity.

Strong committment needed

FERC reports interest in all sectors, including proposals for 2,700 megawatts of new capacity at existing conventional facilities, 20,000 megawatts of pumped storage, and approximately 10,000 megawatts of proposed ocean, tidal, and instream hydrokinetic technologies.

This fast-growing industry demands a strong commitment from both public and private partners. FERC is already showing its leadership through efforts like its policies that allow developers of hydrokinetic projects to connect to the electric grid during pilot testing – an approach that speeds energy to consumers and gives developers revenue to support their work.

The U.S. Department of Energy's (DOE) research efforts are also showing dividends. DOE's Advanced Hydropower Turbine System program helped to bring the Voith Hydro Kaplan fish-friendly turbine design out of testing and into commercial use at Grant County (WA) Public Utility District's Wanapum Dam, where it has replaced existing units and created additional capacity.

The industry is urging DOE to begin full-scale testing of a second turbine, the Alden Laboratory design. Brookfield Power has offered its School Street Project as a site in New York for testing the design's potential for addressing eel-passage issues in the Northeast.

NHA members are also active in testing applications that don't require water impoundments, such as Voith Hydro's Wavegen technology. Companies are testing promising wave, tidal, and combined wind/hydro projects all along U.S. shorelines.

But, as EPRI noted in its landmark 2007 report, continued federal funding for R&D is critical to expanding the U.S. industry. Congress demonstrated its support for this work by approving 40 million U.S. dollar in funding for next year – four times the current federal funding level. NHA is working with DOE and industry to propose projects that will use these resources to build clean-energy resources.

As part of the recent Recovery Act, Congress approved an extension for production tax credits for renewable energy, through 2013, as well as creating investment tax credit and grants from the U.S. Treasury. With NHA members reporting that tax incentives drive between 20 and 50 percent of their development work, hydro development can play an important role in economic development. NHA, its members, and other renewable energy organizations continue to press for long-term extensions to these provisions.

NHA is also working with the new presidential administration. President Obama has stressed his commitment to building the country's energy portfolio through renewables and other clean-energy and domestic resources – descriptions tailor-made for waterpower technologies. With a fleet of new technologies and approaches at the ready, the U.S. hydro power industry stands ready to serve.

About NHA

NHA is a member-driven association that accomplishes its policy work and outreach through standing committees. NHA's Board of Directors serves as the association's policy board and uses recommendations from the standing committees to base their decisions. Representatives from NHA member organizations across the country serve on these committees, providing expertise and recommendations to ensure that NHA's initiatives serve the interests of the hydro power industry.

E. Mark Garner, President & CEO of Voith Hydro York, is currently serving as a Director of NHA.

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Overhaul of Bath County Pumped Storage Station

Voith York is nearing completion of an overhaul of the Bath County (Virginia) Pumped Storage Station which is owned by Dominion Generation and Allegheny Energy. The station's six pump-turbines and motor-generators have been overhauled, providing increased unit reliability of the 23-year-old facility.

Installed in 1985, the six pump-turbines and motor-generators at the Bath County Pumped Storage Station are now being overhauled to enhance the long-term serviceability of the facility's electric generation capacity. This facility is recognized as one of the largest pumped storage stations in the world.

Working in partnership, Dominion Generation and Voith Hydro staffs reviewed the operational characteristics of the station to determine the long-term operational goals and generation capabilities. These early work sessions developed what changes should be considered for the station's equipment.

The major goal was to overhaul the facility to extend the operational life of the equipment. During this process, a slight increase in the minimum dependable capacity of the units also was established as a goal, generating 407 MW each.

A significant challenge faced by Voith Hydro design engineers was the transportation of the enormous turbine components from the York, Pennsylvania, manufacturing plant to the station located in Mountain Grove, Virginia. The major components to be transported weighed approximately 100 tons. Transporting these items 250 miles over highways and back roads required a special 19-axle truck.

Voith Hydro York completed the Bath County Pumped Storage Station overhaul in March 2009.

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Work continues on Rock Island hydro project

The generator refurbishment and upgrade project for the Rock Island hydro project awarded to Voith Hydro in December 2007 is proceeding on schedule.

The installation of four modernized generators at the Rock Island hydro project, located 12 miles downstream on the Columbia River from Wenatchee, Washington, began in late March 2009. Voith Hydro York is working closely with colleagues at Voith Hydro São Paulo, Brazil, and Mississauga, Ontario, Canada, to supply necessary equipment to replace the support structure of the generators' core. This includes updating generator stator frames and stator cores, as well as replacing stator windings.

The Voith Hydro processes will ensure the coordination between operating units so that parts are "ready to assemble" in the field.

Operated by Chelan County Public Utility District No. 1, the Rock Island hydro project was the first hydro power station on the Columbia River. Work began on the first four power units in January 1930 and the power station entered operation in February 1933. Powerhouse expansion and installation of six additional units by Chelan County Public Utility District began in July 1951 and was completed in April 1953. Construction of the Second Powerhouse, with its eight turbine generators located on the west bank of the river, began in August 1974. The Second Powerhouse was placed in commercial operation in August 1979. The current project has 19 total power units.

When Voith Hydro York completes the Rock Island project in 2014, the power output of the four refurbished generators will increase the original nameplate rating of 16.7 MVA to 23 MVA.

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Historic renovation almost complete in Bonneville

Voith Hydro is completing a major rehabilitation of the Bonneville Lock and Dam First Powerhouse, a National Historic Registry site located in Cascade Locks, Oregon.

The First Powerhouse was built in the late 1930s by the United States War Department under President Franklin D. Roosevelt's administration. The hydroturbine/generator units at Bonneville had never been out of service for a major rehabilitation over the nearly 60 years of operation when the Voith Hydro renovation project began in 1994. The dam's generating unit continued to operate smoothly while eight turbine generator units were replaced. The rehabilitation work is more than 50 percent complete on the ninth of 10 units and work is underway on the tenth unit.

One of the first dams built on the Columbia River, Bonneville Lock and Dam has required special attention during its renovation. The First Powerhouse at Bonneville is listed on the National Historic Register and is a tourist attraction in the northwestern United States. Thus, Voith Hydro had to take great care in protecting the working environment of the facility as the power generation units were replaced, including protecting all of facility's historic ceramic tile floors.

The major goal of the project has been to increase the reliability and survivability rate of fish passage through the turbines. Voith Hydro's patented fish-friendly equipment has raised fish survivability to approximately 98 percent, a major improvement. In addition to becoming more fish-friendly, the Bonneville project is designed to provide for electricity generation, river barge navigability, and enhanced tourism for the northwestern United States.

Voith Hydro anticipates completing the Bonneville Lock and Dam First Powerhouse major rehabilitation project in calendar year 2009.

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Voith Hydro refurbishing generators at Conowingo Dam

Voith Hydro York has begun work on refurbishing three generator units at Exelon Power's Conowingo Dam in Darlington, MD. This 22 million U.S. dollar project continues a 20-year relationship of providing service and equipment to Exelon Power.

For this project, Voith Hydro is supplying new generator stators, surface air coolers and refurbishing the generator rotor poles. The stator frame will be built in York while Voith Hydro Mississauga, Ontario, will supply the new generator windings.

In addition to manufacturing and refurbishing equipment, Voith Hydro will re-work the foundation of the generator stator to accommodate the new stator frame. The stator will be pre-assembled off the critical energy pathway and then installed, saving down-time and lowering costs for the customer.

The Conowingo Dam project began in February 2009. Replacing one generator per year, the entire rehabilitation project will be completed in the summer of 2012. Individual unit outages will be finished in 51 working days. When complete, these three units at Conowingo Dam will boast a 75 MVA rating, up 20 percent from the current 61.8 MVA rating.

Conowingo Dam is a large hydroelectric dam located on the Lower Susquehanna River. Originally built in 1926, this facility features 11 units (seven original and four newer units) with a total capacity of 512 MW.

Spanning the Cecil and Harford Counties border in Maryland, Conowingo Dam also serves as a bridge for U.S. Route 1 across the Susquehanna River.

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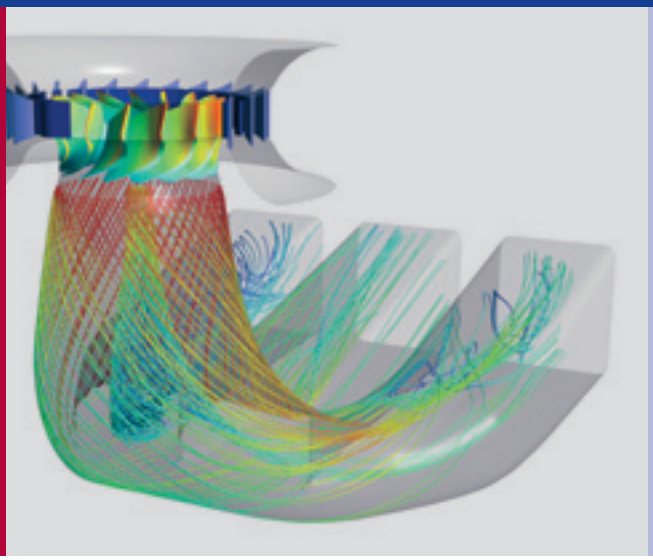

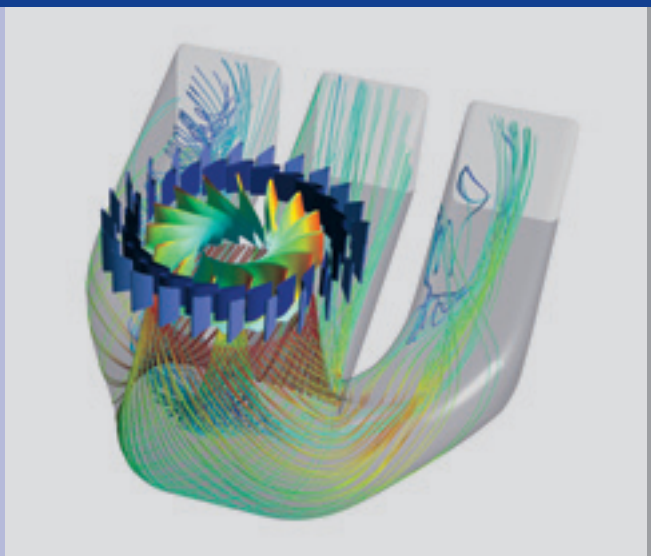

Voith Hydro begins model testing for Folsom Dam project

Model testing for the Folsom Dam project began in April 2009 at the Voith Hydro Inc. North America headquarters in York. Systems engineers will be testing the new turbine runner designs that will be used to upgrade the facility's three hydro power generation units. Each unit will receive a new turbine runner, coupling hardware and shear pins.

To prepare for the model test, Voith Hydro engineers reviewed existing drawings of the facility's water passageways and created model drawings for constructing a scaled-down replica of the Folsom Dam. The model has been constructed and is being prepared for testing at Voith Hydro's S. Morgan Smith Model Testing Laboratory. Testing should be concluded by the end of June 2009.

In September 2008, the U.S. Bureau of Reclamation selected Voith Hydro to perform the 7.1 million U.S. dollar refurbishment of Folsom Dam. All equipment manufacturing and model testing for the project will take place in York.

Folsom Dam is located about 23 miles northeast of Sacramento, CA, on the American River. The multipurpose project was built by the U.S. Army Corps of Engineers and is operated by the Bureau of Reclamation. Each of the dam's power generation units will have a new rated output of 70.8 MW of electricity.

Refurbishment of the entire Folsom Dam power generation facility will be completed in 2013. The first refurbished turbine will be delivered in April 2011. The remaining turbines will be delivered in 2012 and 2013.

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Four work together to refurbish Lookout Point project

Four Voith Hydro Operating Units are collaborating to complete the refurbishment of the hydroelectric equipment at Lookout Point Dam in Lowell, OR. The project includes replacement of runners and rehabilitation of turbine equipment for two of the facility's three power generating units, with an option to extend the project to include the third unit.

The 19.1 million U.S. dollar contract is the largest U.S. Army Corps of Engineers award that Voith Hydro has received since 1994. Voith Hydro was selected from six bidders because it presented the best technical solution demonstrating a superior understanding of the project challenges and the lowest risk for performance success.

Voith Hydro's York unit will oversee the project's management, field engineering and overall completion, as well as manufacturing the runners and rehabilitating the majority of the turbine equipment. The São Paulo Operating Unit will manufacture the replacement turbine runner blades and Voith Hydro's Brunnenmühle staff will perform the project's systems engineering and model testing. The Peak Hydro Solutions Operating Unit, located in Eugene, OR, will handle the project's field machining needs.

Lookout Point Dam is located on the Middle Fork of the Willamette River and has been in service since 1954. Each hydro power generation unit produces 47 MW of electricity. Operated by the Bonneville Power Authority, the dam's primary purposes are flood control, power generation, navigation and irrigation. The facility also provides fishing, water quality control and recreation.

The Lookout Point rehabilitation project is scheduled to be completed by 2012.

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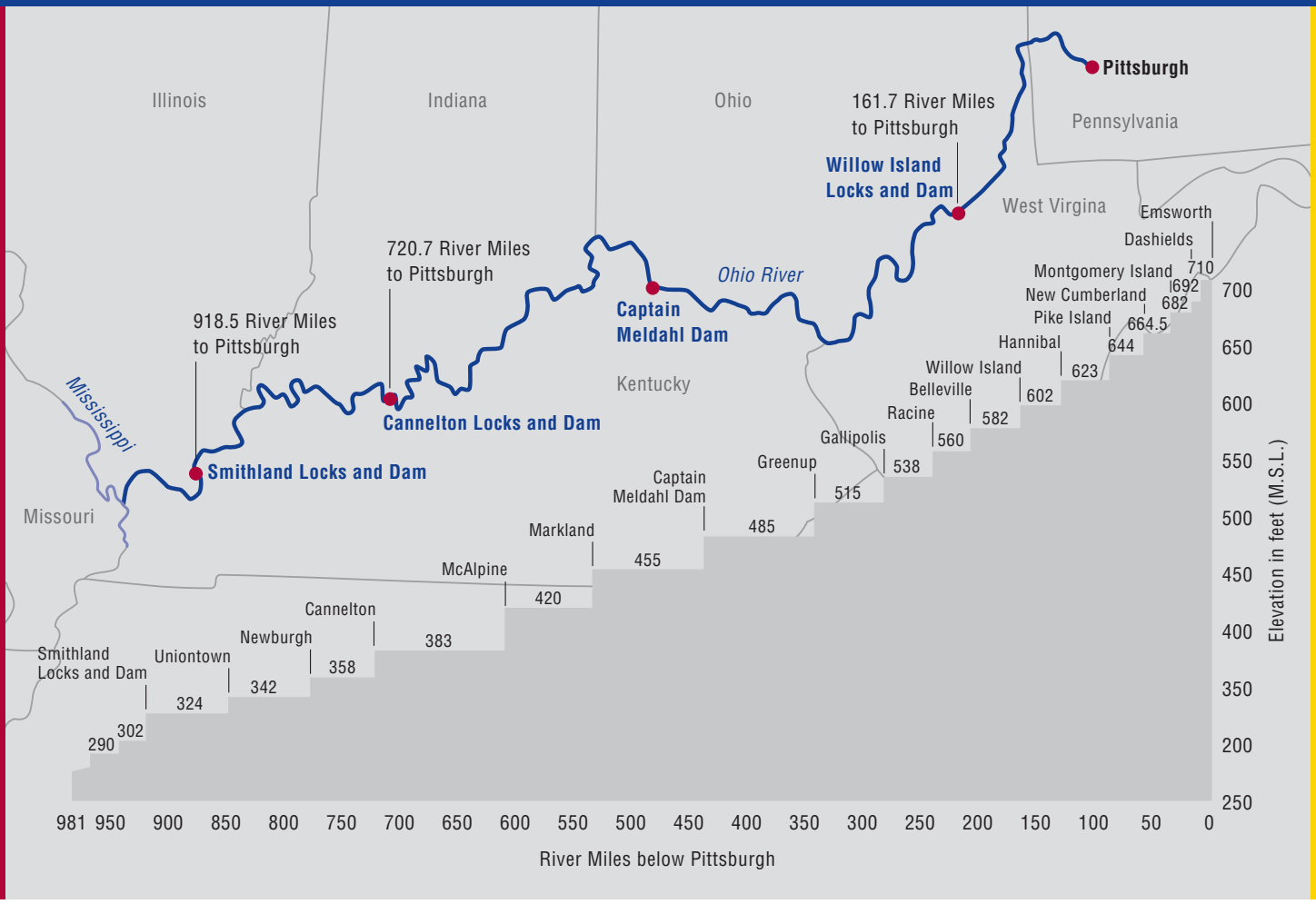
View on the Ohio River in Cincinnati.

Voith Hydro selected for AMP-Ohio projects totaling 423 million U.S. dollar

Voith Hydro Inc. has received contracts totaling 423 million U.S. dollar to provide the equipment for several hydroelectric projects that will add 313 MW of emission-free generation to existing dams on the Ohio River. Voith Hydro's scope of supply includes generators, turbines, automation equipment and the balance of plant mechanical and electrical equipment.

American Municipal Power-Ohio is developing four run-of-the-river hydroelectric plants at existing dams on the Ohio River. The first three sites are Willow Island Locks and Dam near Waverly, West Virginia; Cannelton Locks and Dam near Cannelton, Indiana; and Smithland Locks and Dam in Livingston County, Kentucky.

Combined, these three projects include eight bulb turbines with an expected capacity of 208 MW. A fourth project on the Ohio River is jointly developed by AMP-Ohio and the city of Hamilton, OH. The partners are constructing the Captain Meldahl Dam project as a part of an aggressive hydroelectric generation development program.

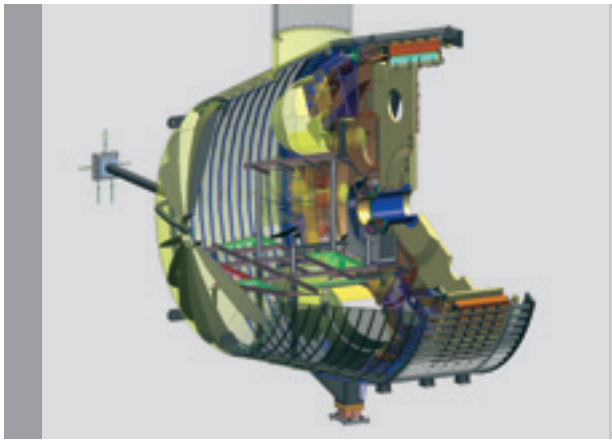


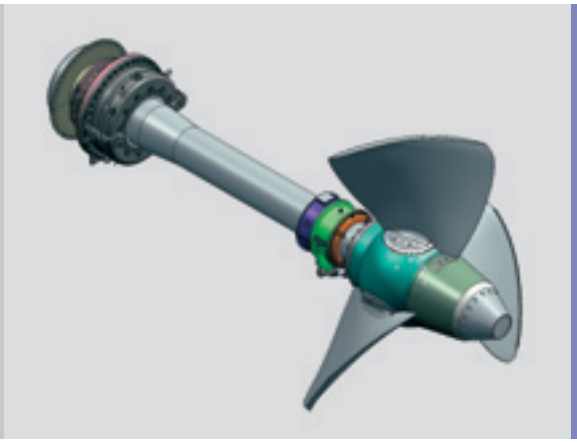
One river – four states – one goal. Four projects along the Ohio River to add hydro power generation to existing dam sites.

Meldahl Dam is expected to have a capacity of 105 MW and is the largest of the four hydroelectric projects AMP-Ohio currently has under development. These projects represent the newest large hydro-electric developments in the United States since the 1980s.

"AMP-Ohio believes in the value of hydroelectric generation", said AMP-Ohio President/CEO Marc Gerken. "Our hydro projects are a part of an asset development effort designed to reduce our member communities' current over-exposure to the volatile wholesale market.

3-D design of generator and turbine components.





This asset development effort, in addition to these significant hydro projects, also includes new fossil fuel development, as well as wind and solar. From our experience in building and operating the Belleville Hydroelectric Plant, we know that hydro power is reliable, predictable and affordable. We're pleased to be able to pursue these projects on behalf of our member communities."

"Voith Hydro is thrilled to be part of this exciting development of renewable energy in the United States. These projects represent the largest order in our 132-year history in the United States. This also clearly demonstrates our ability of total plant expertise beyond equipment know-how", said E. Mark Garner, Voith Hydro York's President and CEO.

"We recognize AMP-Ohio's national leadership in developing new, clean hydroelectric capacity. Hydro power is and will continue to be America's largest, most flexible renewable resource and it has no carbon emissions. This is a good move for AMP-Ohio, its members and their customers."

Voith Hydro was selected for these projects over several other international competitors because it provided the best technical solutions for AMP-Ohio's needs. Specifically, Voith's three-bladed bulb turbines deliver world-class efficiency and performance for a wide range of water flow conditions.

Model tests for the projects were completed in January 2009 and final reports were submitted in March 2009. The power plants are scheduled for completion by late 2012.

AMP-Ohio is the Columbus, Ohio-based nonprofit wholesale power supplier and services provider for 126 member municipal electric systems in Ohio, Pennsylvania, Michigan, Virginia, West Virginia and Kentucky. The organization provides a diverse mix in its wholesale generation resources, which includes fossil fuel, wind, hydroelectric, landfill gas and distributed generation.

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Ohio River.

Willow Island Locks and Dam.

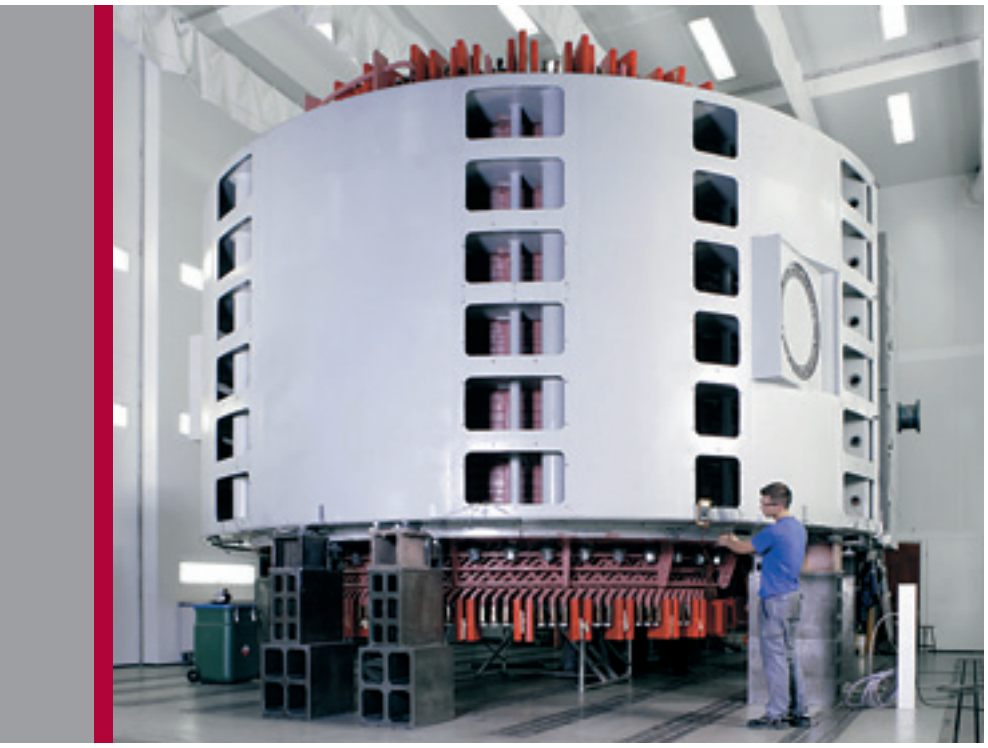
Cannelton Locks and Dam.

Expertise in generators further enhanced

The year 2008 saw additions to the company's generator expertise in engineering and manufacturing capabilities and capacities. Two new electric generator workshops in Heidenheim, Germany, and Shanghai, China, were officially put into operation. Voith Hydro now, together with the locations in Mississauga and São Paulo, has four large locations for generator manufacturing around the globe.

These four workshops have been set up specifically in the strategic markets in the vicinity of customers: Manufacture, rehabilitation and services are most efficient and successful when carried out close to the owners and operators in order to enhance transport cost, short delivery and flexibility.

Preparations for the high-voltage test of Wehr's motor-generator stator. The stator windings' insulation has to withstand 45,000 Volt.



"The aim of Voith Hydro's investment in new infrastructure for the manufacturing of generators is the capacity and capability expansion of our workshops to deliver excellent hydro power units", said Dr. Roland Münch, CEO of Voith Hydro.

Operational excellence at its best applies for all Voith Hydro locations: All workshops manufacture according to the same guidelines and highest standards regardless of their location in the world.

For a few years now, the European hydro market experiences a boom in service business. Amongst others, this is due to the implementation of Germany's Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz, EEG). Voith Hydro Heidenheim's response to this boom was an expansion and restructuring of its workshop to also serve modernization of generators.

The expansion of the generator workshop took place in two steps. The first step was to implement a new work area for the rehabilitation of generator stators and rotors. Heart of the workshop is a 1,000 tons press which is an in-house development for the manufacturing of rotor coil windings. Stacking of new stator cores, assembly of stator windings and re-insulation of poles was feasible from spring 2007 on.

In a second step a new workshop area was extended as well as an area for the assembly of coils and pole cores was established. A special assembly cell for generator windings was designed and installed.

Having the new workshop complete, Voith Hydro Heidenheim offers full-service for generators and turbines to be viewed by visitors first-time during festivities of the Brunnenmühle's 100th anniversary (see backflap).

The first motor-generator in the new German workshop was the unit of the pumped storage plant of Wehr in Germany's south. With 300 tons and 300 MVA, the machine is one of the largest of its kind in Europe, and in operation since 1976. The generator stator was newly manufactured and tested thoroughly. In the final voltage test, the stator windings' insulation had to withstand 45,000 Volt, more than twice the rated voltage during operation.

The giant left the Heidenheim workshop in August 2008, while its generator poles were still being overhauled in Heidenheim. Martin Andrä, CEO of Voith Hydro's German Operating Unit, was pleased to see the generator leaving the workshop: "The delivery of this generator clearly signals our ability to competitively supply from our German workshop new or modernized electrical components for such high-performance generators."

The new electric generator workshop at the manufacturing facilities in Shanghai opened in October 2008. Over 80 high rank representatives from trade and industry as well as from federal, state and local governments attended the opening ceremony.

During the opening festivities in Shanghai, employees demonstrate insulation of stator bars which is the heart of stator bar manufacturing.

Assembly of stator windings requires extremely thorough work to assure safe and highly reliable performance of the windings during operation.

The Chinese workshop offers 3,500 square meters for the manufacture of generator poles and stator bars and is equipped with machinery for the manufacture of units up to 700 MW. This is the equivalent of one coal-fired power plant. The workshop will meet the growing needs for large-capacity and high-quality generators in the booming hydro power markets of China and other Asian countries. At the moment, the generator for Xi Luo Du (see page 51) is produced in the new workshop.

"With new infrastructure and modern tools we feel ourselves very well equipped to meet our customers' demands", said Dr. Roland Münch. "It strongly emphasizes our position as a full-line supplier for hydro power units."

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Signing of the contract in Johannesburg.

The plant will be built close to Ladysmith, South Africa.

Equipment for South African Ingula pumped storage scheme

Eskom, the major South African utility, has awarded a contract to Voith Hydro for the equipment supply to the Ingula pumped storage project. Order value runs up to 140 million Euro. Contract signing between the two parties took place in Johannesburg.

Voith Hydro will supply the complete electro-mechanical equipment with the four pump-turbines at a rated output of 342 megawatts each, four motor-generators and the complete automation and control system for commissioning in 2013. The company's German and Japanese Operating Units are joint partners in this project to design and manufacture the equipment, with the motor-generators coming from Kawasaki in Japan, while the pump-turbines will be supplied from Heidenheim, Germany.

The Ingula pumped storage plant is being built close to the city of Ladysmith in eastern South Africa. This region contributes a major share to the country's electricity generation. The Bedford Stream will serve as an upper reservoir and will be connected to the power house by a headrace tunnel of around two kilometers in length. A tunnel of similar length will be built in the tailrace area to lead the water into a lower reservoir towards the Braamhoek River.

With commissioning in 2013, Ingula's four pump-turbine units will significantly contribute to grid stabilization by pumping water from excess electricity during low demand periods to the upper reservoir and releasing for peaking energy generation.

Ingula is the first new pumped storage scheme in South Africa in 25 years. In 1983, Eskom built and started the Palmiet pumped storage plant in the Western Cape Province. Pump-turbines and motor-generators in this plant were also supplied by Voith Hydro.

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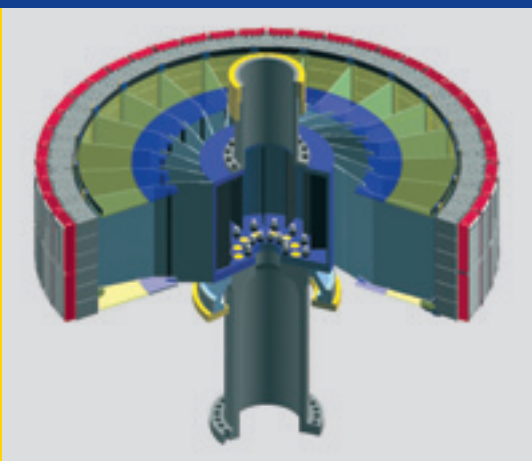

Two new hydro power plants in China's national energy development strategy

Growing more rapidly than others, China is currently one of the most important hydro power markets in the world. With the awards of Xi Luo Du and Li Yuan on the Jinsha or "Golden Sands" River, Voith Hydro has again received the go-ahead for two large hydro power stations in the provinces of Yunnan and Sichuan.

Xi Luo Du will be equipped with three generators and three Francis turbines at a rated capacity of 784 MW each. Upon completion, Xi Luo Du will be one of the biggest hydro power plants worldwide with an overall capacity of 12,600 MW. It will be operated by the China Three Gorges Project Corporation.

In spring 2009, the first design liaison meeting with the customer and the consultant took place in Germany. After two weeks of intensive work they agreed on the layout of the generating unit and the basic design of major components.

Li Yuan will be built in the middle reaches of the Jinsha River which plays a vital role in China's electricity strategy. This strategy aims to supply the densely populated east of the country with electricity from the sparsely populated west. From 2013 on, the plant will generate low-carbon energy with a rated capacity of 2,448 MW. Voith Hydro delivers four sets of turbines, ring gates and further equipment. The contract has a volume of around 80 million Euro. One of the key challenges for project execution is the tight delivery schedule.

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New developments in ocean energies at Voith Hydro

Early in 2009, the Scottish Government granted consent for the world's largest wave power project. With it the Siadar wave energy project on the Scottish island of Lewis should be one of the first projects to operate under the Scottish Government's proposed multiple Renewable Obligation Certificates scheme, the revenue support system to promote the development of marine energy generation.

"It is an important step on the way to the full commercial employment of wave energy", said Matthew Seed, CEO of Voith Hydro Wavegen. The operator of the planned facility will be RWE npower renewables, a UK-subsidiary of RWE Innogy. RWE npower renewables and Voith Hydro Wavegen have been working together on the project since 2006.

The scheme will harness power from the Atlantic waves in Siadar Bay to generate electricity from 4 MW of installed capacity. The produced energy could meet the average annual electricity needs of around 1,500 homes in the Western Isles.

Last summer, Jim Mather, Scottish Government Minister for Enterprise, Energy and Tourism, officially started operation of Voith Hydro Wavegen's new 100 kW turbine.

Picture courtesy of RWE npower renewables

It will not only be deployed in the Siadar scheme but in future wave energy projects worldwide. It applies Voith Hydro Wavegen's oscillating water column technology and was developed with support from the Scottish Government's Wave and Tidal Energy Support (WATES) scheme.

At that time Matthew Seed was already convinced that Voith Hydro Wavegen had extended the range of application for wave energy plants with this turbine to include more energetic and hence more economically attractive environments.

First experiences proved him right: "The 100 kW turbine is showing similar reliability to the well proven 20 kW machine. It is also extracting much more power and operating at close to rated power even with the limited capture width of the Limpet plant on Islay."

But the Siadar project is not the only common activity in ocean energies with RWE Innogy.
In February 2009, Voith Hydro and RWE Innogy have announced the formation of the joint venture of Voith Hydro Ocean Current Technologies.

With the new company, both partners will accelerate the development, manufacture and marketing of ocean current technologies.

RWE Innogy will make a significant capital investment and hold 20 percent in the new company while Voith Hydro will be the majority shareholder with 80 percent. The total investment guaranteed by both partners over the next few years equals over 30 million Euro. The establishment of the joint venture is already approved by the relevant anti-trust authorities.

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The IHA World Congress will take place in Reykjavik, Iceland.

Sustainability in hydro – first HSAF consultation phase now completed

The Hydropower Sustainability Assessment Forum (HSAF) of the International Hydropower Association (IHA) has presented the outcomes of the first consultation phase of the current Sustainability Assessment Protocol development process.

Constituted in March 2008, the 14 members from different sectors have made considerable progress in several follow-up meetings all over the world, concluding the first year of work with an intense consultation.

The objective of the Forum is to review and refine the existing IHA Sustainability Assessment Protocol in relation to the development and operation of hydro power plants, aiming to establish a broadly endorsed assessment tool.

Experts on environmental, social and economic aspects, together with government representatives of Norway, Iceland, China and Zambia support the Forum over its two years.

The Forum comprises several NGO groups, including the WWF, Oxfam, Transparency International, and the Nature Conservancy, commercial and development bank representatives, and the IHA.

Sustainable hydro power stations whether planned, implemented or operated – will be of the essence to global energy demand for clean and renewable energy generation. Development of a certification tool that measures what is – or is not – sustainable in hydro power projects is the major task for the industry to achieve a global and unified standard.

The outcomes report and Forum responses are now available in IHA's website www.hydropower.org/sustainable_hydropower/hsaf.html. The Forum is coordinated by Dr. Helen Locher who can be reached at lh@hydropower.org.

A broad report on further outcomes will also be presented by the Forum IHA's 2009 World Congress from June 23-26, 2009 in Reykjavik, Iceland.

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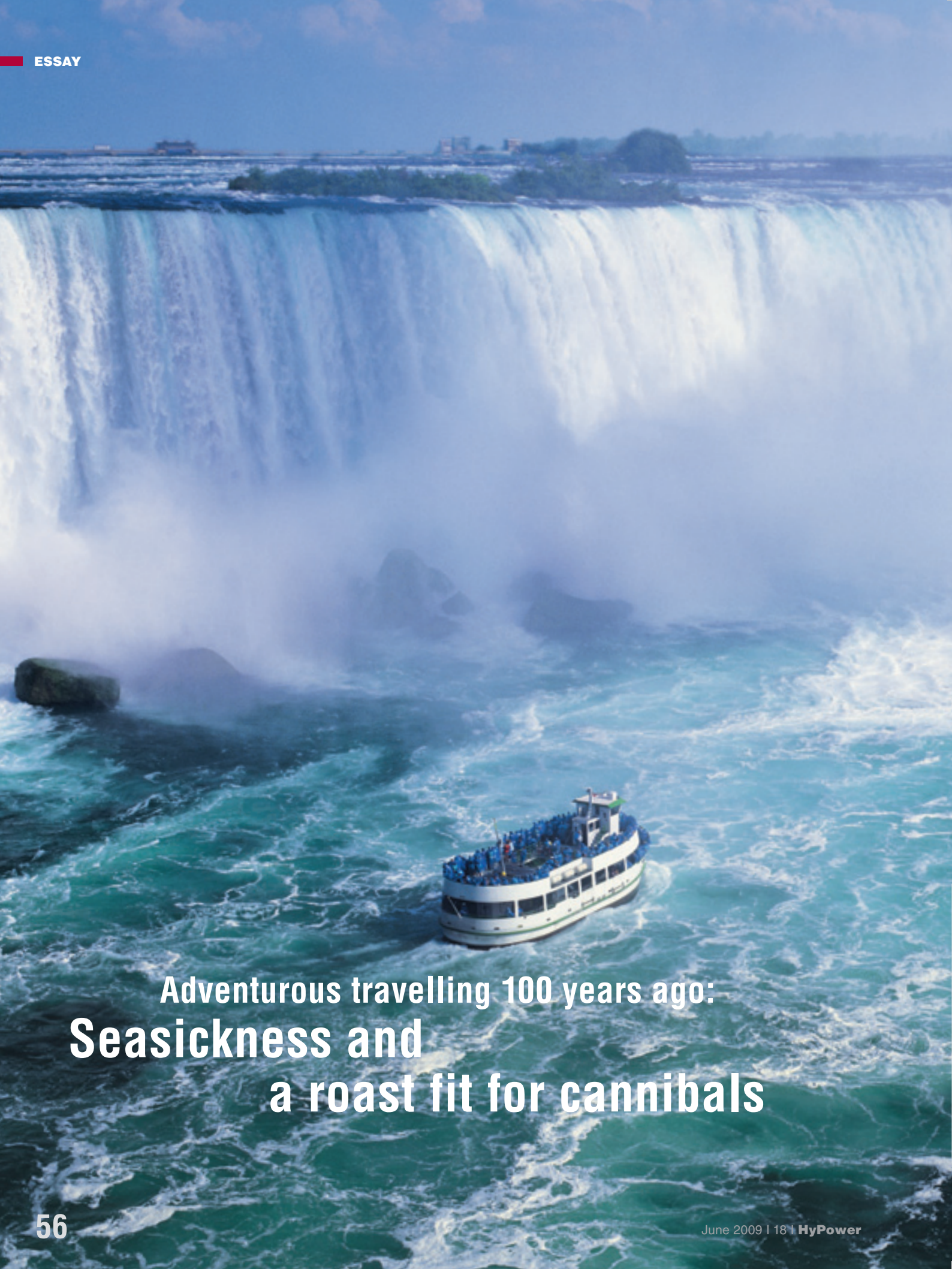
Conferences, seminars and symposia

Date	Event/Further information
June 16 - 17, 2009 Kathmandu, Nepal	**Workshop on Regional Cooperation in Sediment Management in Hydropower Projects** Voith Hydro paper presentation
June 23 - 26, 2009 Reykjavik, Iceland	**Advancing Sustainable Hydropower** **Congress of the International Hydropower Association** www.ihacongress.org Voith Hydro panel participation
July 27 - 30, 2009 Spokane, USA	**Waterpower XVI 2009** www.waterpowerconference.com Voith Hydro paper presentations Please visit us at booth no. 1000.
August 16 - 22, 2009 Washington, USA	**7th International Symposium on Cavitation** www.cavitation.engin.umich.edu Voith Hydro paper presentations
September 24 - 25, 2009 Bozen, Italy	**Zwölftes Internationales Anwenderforum Kleinwasserkraftwerke (OTTI)** www.otti.de Voith Hydro paper presentation
October 14 - 16, 2009 Brno, Czech Republic	**3rd IAHR International Meeting for Cavitation and Dynamic Problems in Hydraulic Machinery and Systems** http://khzs.fme.vutbr.cz/iahrwg2009 Voith Hydro paper presentations
October 26 - 28, 2009 Lyon, France	**Hydro 2009** **Progress – Potential – Plans** www.hydropower-dams.com/hd_72_0.htm Voith Hydro paper presentations Please visit us at booth no. 92.



Adventurous travelling 100 years ago:

Seasickness and a roast fit for cannibals

These are the impressions of a Voithian who traveled to Niagara Falls in 1909. One hundred years ago, the turbines at Niagara Falls made Voith world-famous. They were the largest units of their time and are still operational. These turbines are an excellent example for the legendary Voith reliability or, as one would say today, "Engineered reliability".

While the journey from the Heidenheim headquarters to Niagara Falls takes less than a day now, it was a true adventure lasting several weeks 100 years ago.

This is when Albert Ungerer set off to attend a meeting, leaving to posterity a humorously written dairy, which, like all Voith documents of historical value, can be enjoyed at the Business Archives in Stuttgart. Albert Ungerer joined Voith on 3rd January 1898 at age 23. Later he was a director in the turbine construction department.

Here are some amusing treats from his traveling journal:

22nd September 1909 – at sea

Sea purple, half rain, half sun; mankind appears to develop a huge appetite – if this continues, everybody will be suffering from gout by the time we reach New York.

23nd September 1909 – at sea

We have been cruising around on the ocean for some hours. After consulting the steward, we have opened the portholes in the cabin, in order to enjoy the sea air as unhindered as possible, even during our sleep. There are clothes hooks on both sides, I have chosen the ones on the bow side and lo, it was good.

Albert Ungerer crossed the Atlantic by ship in 1909. His experiences are written down in his diary.

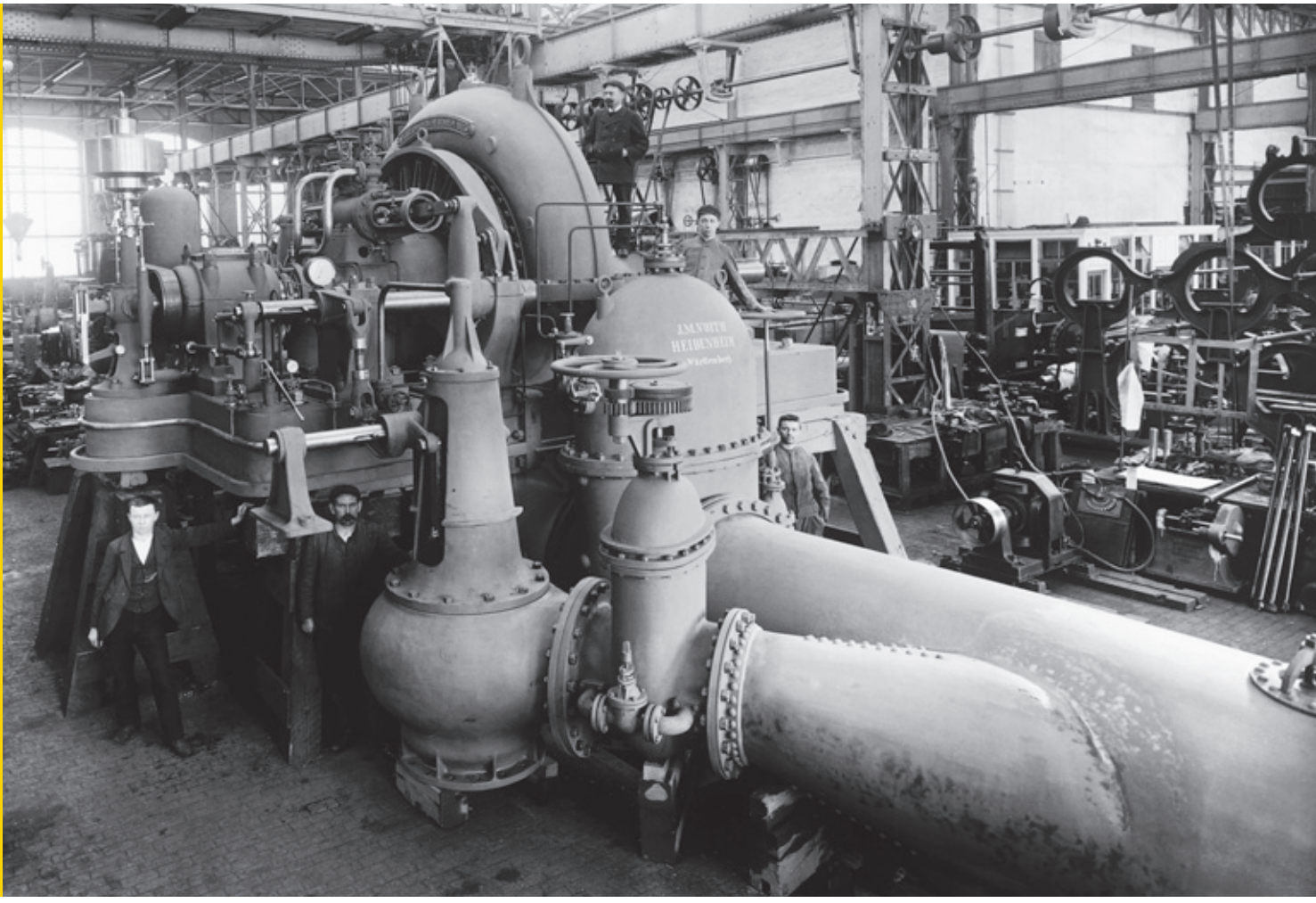
At dawn I am awakened by gently rushing waters, at the same time my position in the berth changes. I jump up – too late. Splish-splash, a curious wave slips through the window and Mr. Siedenburg's (a co-traveler) wardrobe is pickled in brine. As a precautionary measure against a repeat, I close the hatch and am pleased with myself. Next time, I will again hang my clothes to the front. In plain clothes, Miss Farrar (a former star of Berlin opera) is not exactly a paragon of heavenly splendor and beauty, but there is something very likeable about her appearance.

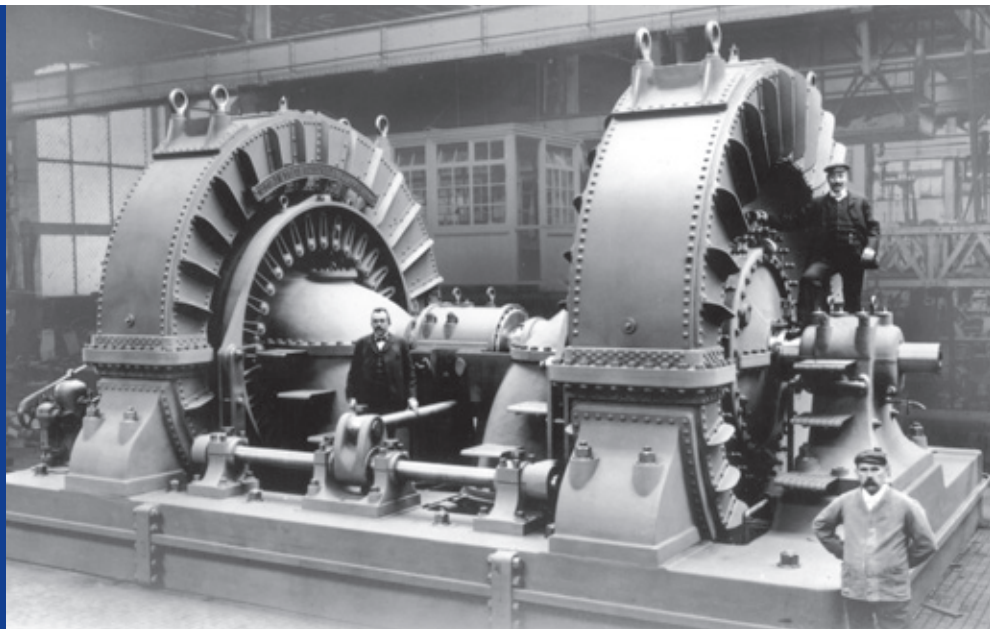
She manifests a certain amount of tastelessness by wearing a spooky skunk bonnet, which is possibly very precious, but also simply disgusting, and also by an even more disgusting lapdog, black with yellow spots, probably a cross between a bulldog and a fire salamander.

24th September 1909 – and what had to happen, happens

The ship is rolling heavily, attendance at mealtimes is sparse.

Gigantic: the turbines for the Niagara Falls helped Voith to gain worldwide fame 100 years ago. They are still in good operating condition. The second man from the right is the young Hanns Voith.





25th September 1909 – and it gets worse

Our suitcases perform witches' dances in the cabin, the walls groan and creak, it is impossible to get any sleep, therefore out! One cannot stand up, one needs to dress whilst sitting down and I feel very peculiar with every move. Will give shaving a miss, I'd rather attend dinner as a porcupine than with a half-amputated nose. I have to forego the morning bath – just get on deck and into the fresh air. The ocean looks magnificent in its wildness, it resembles a moving mountain range, and the waves play with the ship colossus as if it was a shuttlecock. If one asks people about their well-being, they just utter "ugh" and poke their tongue out.

Despite the turbulences at sea, Albert Ungerer reaches New York unharmed.

29th September 1909 – grilled steak – a grim affair

I am ordering tomato soup and a sirloin steak, whereupon he (the waiter) starts by planting a small table in front of me, and then brings bread, butter or rather – well, let's call it butter –, iced water and the soup – a horrible, reddish, floury broth mixed with sugar. Afterwards, a delightful blacksmith aroma wafts through the room and a complete ox rib appears, approximately two kilograms, burnt on the outside and dripping with blood on the inside. They call it "grilled" – it is a grim affair! I cut a piece off this cannibal roast and apply a generous measure of mustard, salt and pepper, in order to overcome the outer taste of charcoal and the inner taste of nothing at all… ■

Voith Turbo

Optimized cost and fuel consumption, fewer emissions

Apart from various hybrid solutions for the rail vehicle industry, Voith Turbo also offers solutions for optimized fuel consumption and lower emission outputs of existing fleets. With Voith EcoConsult, the drive systems manufacturer has created such a tool.

The Voith eco-solutions currently consist of the Voith HydroBrid with a hydrostatic and an electric recuperation unit, the Voith MicroBrid with stop-start function, and the exhaust heat utilization system SteamDrive. These solutions can be developed further individually both for railcars and locomotives.

In parallel, Voith Turbo has also developed relevant configuration and simulation tools. These allow establishing and analyzing the individual operation conditions of rail vehicles. On the basis of this data, it is possible to identify the most economical process for reducing life-cycle costs (LCC) and fuel consumption. As a result of improved fuel consumption, CO_2 emissions can also be significantly lowered.

With the new Voith EcoConsult toolbox, Voith Turbo offers a consultation program that identifies optimum solutions from the portfolio of innovations. At the same time, vehicle operators can also further improve the performance of their existing fleets. ■

Voith Industrial Services

Acquisitions 2008

Voith Industrial Services widens the portfolio with two major acquisitions. It acquired a majority stake in the engineering company CeBeNetwork and thus expands its service portfolio in the engineering segment. Simultaneously it acquired new competencies in the aviation industry.

CeBeNetwork is an engineering company specializing in complex development projects. With 360 employees and a turnover of around 52 million Euro, it is one of the largest providers of engineering services to the aerospace industry in Europe, and with its network of 35 cooperation partners, has access to the knowledge and expertise of 5,000 engineers and technicians all over the world. EADS is one of the most important customers of CeBeNetwork.

Voith Paper

Voith Industrial Services further forged ahead with its expansion strategy and acquired the German Ermo group with 750 employees and a turnover of 80 million Euro.

"With Ermo, we have acquired a company that not only supplements and complements our portfolio but also matches our company culture perfectly", says Markus Glaser-Gallion, Member of the Board of Management of Voith Industrial Services Holding GmbH. Ermo is a premium provider of technical services primarily for the petrochemical industry and for power plants. In Europe it is leading in shutdown management and maintenance, and like Voith Industrial Services, it also provides services to the chemical as well as to the pulp and paper industry. ■

acquired Canadian Yankee hood supplier PremiAir

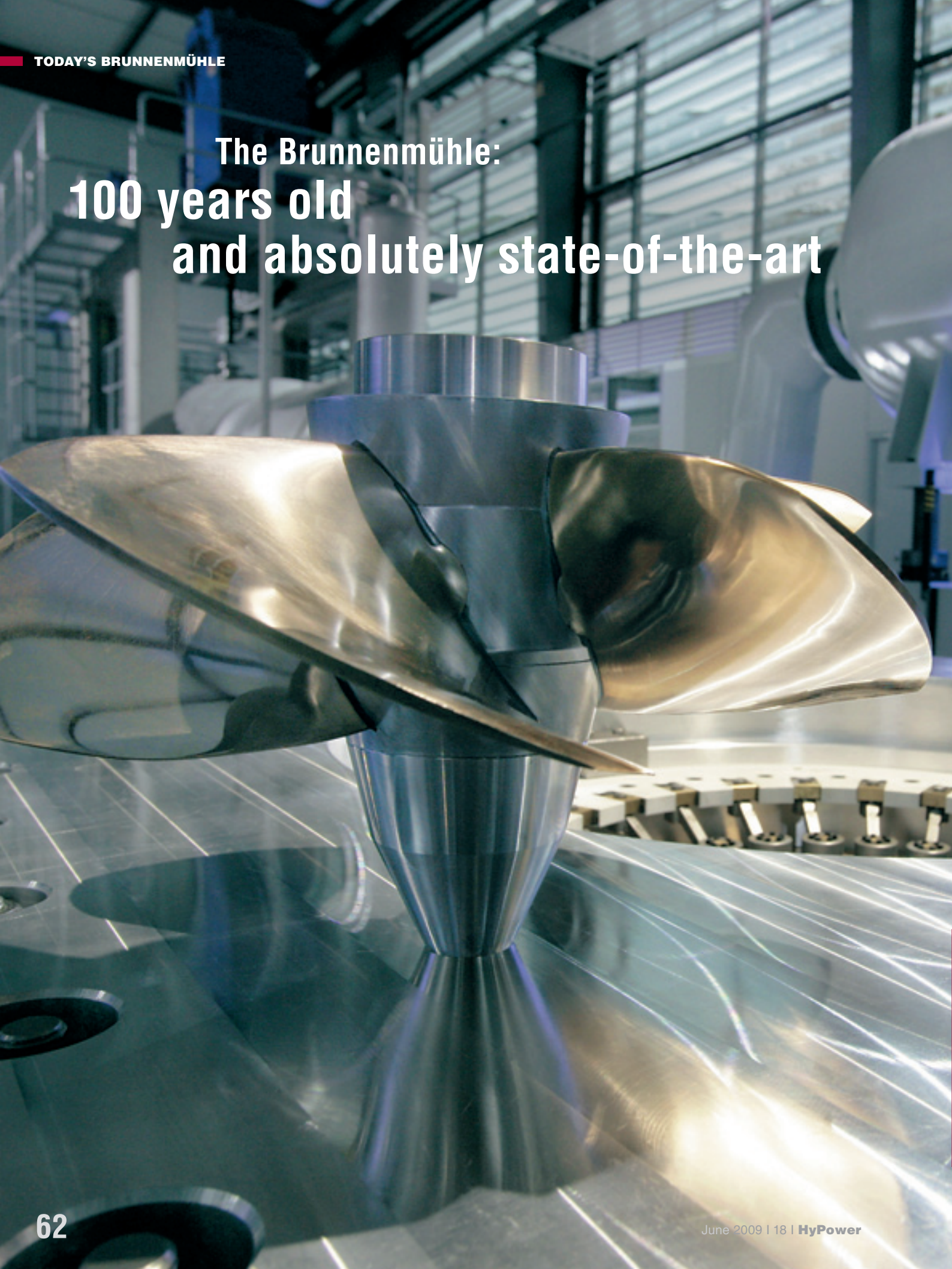
Voith Paper has acquired PremiAir Technology Inc., Montreal, Canada on October 1st, 2008. PremiAir who is active in the area of air systems for the pulp, paper and tissue industry is well known for its extensive know-how and high level of technology in engineering, designing, manufacturing, and servicing of Yankee drying hood systems.

PremiAir started its business 23 years ago. The Yankee drying hood systems have a very high reputation. Their Yankee hood "The Ultra" sets standards when it comes to high temperature hoods. Several hood references operating at temperatures up to 650 °C (1200 °F) are established, offering the potential to increase productivity (for rebuilds) as well as improved tissue quality compared to standard hoods.

Dust and mist removal systems, heat recovery systems, and all services to assess and improve existing installations are part of the product and service portfolio.

PremiAir will be embedded in Voith Paper's Air Systems Group with locations in Bayreuth, Mönchengladbach (both in Germany) and now in Montreal, Canada. By this acquisition Voith Paper Air Systems completed its portfolio with regard to products and services in all areas of air systems for the pulp, paper, and tissue industry. Voith Paper's Tissue division is now able to provide complete tissue machines starting from stock preparation and ending at the rewinder/roll transportation system. ■

The Brunnenmühle: 100 years old and absolutely state-of-the-art

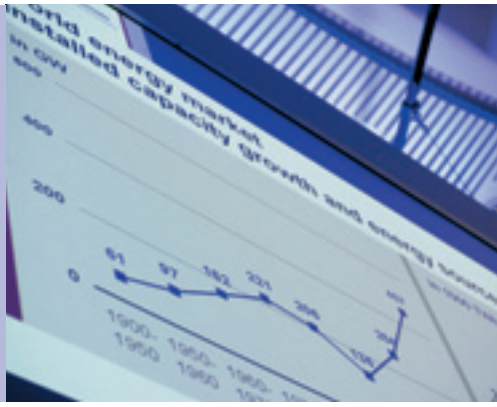


Around 200 customers and partners from 25 countries came to celebrate the anniversary and the re-opening of the laboratory. A symposium opened the event, providing a comprehensive view on hydro power's range of offers and opportunities in the background of global growth and related increase in energy demand. Apart from new views on hydro power and ocean energies, it also set focus on the growing importance of sustainability, safety and environmental issues in hydro power implementation.

The next day brought guests to the re-opening of the modernized Brunnenmühle where they had the opportunity to see and feel the laboratory.

Dr. Roland Münch said in the opening ceremony: "Although everybody of us hopes that we don't need model tests anymore in 100 years time: We certainly feel well prepared for the future. Happy Birthday, Brunnenmühle!"


November 14, 2008
2008
Ohio River, USA
Addition of new hydro power plants to existing locks and dams
2007
100 Years Brunnenmühle
100 Jahre Brunnenmühle



The new test stand equipment also includes the HyCon™ 400 automation package which was developed in-house, as well as high-performance computers.

Test rig team enjoys the new set-up.

Voith Hydro's central technology location for hydro power, the Brunnenmühle, turned one hundred in mid-November 2008. For the occasion the laboratory had been completely modernized and expanded, with a new office building added to match growth and to be prepared for the continued boom in hydro power business.

The laboratory and the new office building had seen an overall-investment of more than 20 million Euro. Today's testing capacities have doubled and provide significantly shortened cycle times.

New super-computers allow for even more precise simulations for prediction of flows in hydraulic, magnetic and electrical fields of hydro power units.

Today, as during its commissioning one hundred years ago, only the newest technologies are applied in the Brunnenmühle – making it one of the world's most modern and high performing test laboratories.

The six test stands in the hydraulic laboratory of Brunnenmühle in Heidenheim after refurbishment

Test rig	Turbine type	Max. turbine output	Max. head
Universal high pressure test rig (UHD 1)	Francis and Kaplan turbines	1000 kW	200 m
Universal high pressure test rig (UHD 2)	Pump-, Francis and Kaplan turbines	1200 kW	240 m
Universal high pressure test rig (UHD 3)	Francis and Kaplan turbines	600 kW	150 m
Low pressure test rig	Kaplan turbines	220 kW	60 m
Pelton test rig (horizontal)	Pelton turbines	750 kW	200 m
Pelton test rig (vertical)	Pelton turbines	750 kW	200 m

Voith Hydro

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