



Kössler Report

Newsletter | Issue 21 | 07/2016

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Dear Customers, Valued Business Partners,

It gives us great pleasure to present you with the latest edition of our Kössler Report and inform you about our most recent projects and developments. Due to low energy prices and ever more complex operating directives, the framework conditions for power station operators are more difficult than ever before. Frequently, projects are being postponed because of a lack of economic efficiency or endless approval procedures. As a result of the European Water Framework Directive, direct investments are mainly targeted at ecological measures in existing plants. Yet despite this difficult market environment for small hydro in Europe we can be quite satisfied with our order situation. Some of our latest projects will be described in this edition. Thanks to our innovative technology, our know-how and the commitment of our employees we were able to win the trust of our customers again and again, be it in the area of new plants or the increasingly growing service and refurbishment segment for existing power stations.

We are also pleased to introduce Uwe Wehnhardt, the new CEO of Voith Hydro. In an interview he provides a general outlook on the developments of the hydro power industry, the importance of small hydro and his plans with Voith Hydro in general. Meanwhile, Dr. Roland Münch, the former Voith Hydro CEO, has moved on to manage the newly established Group Division Voith Digital Solutions. This new Division pools our worldwide digital and automation activities and supports us on our way to becoming a company that will be playing a significant role in shaping the digital change in our industries and markets.

We at Kössler are convinced of the importance of hydropower and, despite a challenging environment, will continue to supply the market with new and innovative products, for example the StreamDiver. At present, Voith is setting up a model power station for viewing and training that will be fitted with this compact turbine generator unit. A report about this

project can be found in our Kössler Report.

We hope that you are going to enjoy this issue. If you would like more detailed information on some of the articles, our employees will be happy to answer your queries.

With our best wishes
The Kössler Management Board



Interview with Voith Hydro CEO Uwe Wehnhardt



Uwe Wehnhardt, CEO Voith Hydro

Mr. Wehnhardt, you have been CEO (Chief Executive Officer) of Voith Hydro since the beginning of this year. The Group Division is very successful. What are you going to do to continue this success story?

Voith Hydro is indeed excellently positioned. My declared goal is to build on these achievements. In this process, customer satisfaction is at the heart of our activities: we want to provide outstanding services to our customers. This refers to our technical performance as well as our services in terms of project management, production, assembly, commissioning and after sales. In this respect, we can draw on our comprehensive experience in the hydropower business and our innovative power. At the same time we are focusing on becoming better and better. Completing each and every project at the highest level and offering outstanding service – this is our promise to the customer.

This perspective may be suitable for large plants – but small hydro is surely subject to different rules?

Hydropower has an incredible performance bandwidth, but I certainly admit that individual projects can differ greatly. Yet there is one thing that unites our customers, be they operators of large or small hydropower plants: they make a significant investment and their goal is to generate electricity reliably, profitably and with maximum availability. We take ownership of this goal, and our values and principles therefore apply to all projects, whatever their size.

And what are these principles?

Our goal is excellence in terms of delivery and quality. The quality of our processes must in no way be inferior to the quality of our products and services. Improving our delivery schedules would definitely contribute to faster commissioning procedures for hydropower plants – a true advantage for the customers.

For this purpose we invest in our locations and we work intensively on the continuous improvement of our project management and production processes. We invest in our locations and employees. At Kössler we have expanded the engineering center of the location – based on the highest standards. This is an investment in the future, because we want to strengthen the small hydro sector at Voith even further.

Are these plans to boosting small hydro supported by the market developments?

The framework conditions for small hydro could and should be better – there is a lack of subsidies and promotional schemes, although the potential is considerable. According to estimates by UNIDO, the organization for industrial developments at the United Nations, the worldwide small hydro potential for plants up to 10 MW amounts to about 173 GW. Only 43 % have so far been developed. Hydropower is a highly reliable



ble electricity source; especially in regions with emerging industries it can make a major contribution to improved living standards of the population. As a renewable and low CO₂ energy source, hydropower also protects the climate.

Yet investment costs are often quite substantial ...

In this respect there are new opportunities, not least due to technical progress. With innovations such as the Voith StreamDiver we are in a position to make locations with particularly low heads commercially viable. This technology is suitable for existing dams and weirs and, if required, it can function without fixed structures. Apart from reducing costs, it therefore also reduces any negative impact on the environment, so that even locations in conservation areas can be utilized. Interesting potentials for this kind of plant exist, for example, in North America, South East Asia, as well as Northern and Eastern Europe.



Small hydro project Blaichach, Germany

Why is it worthwhile to invest in hydropower?

Hydropower plants operate reliably over generations. Many plants that were built decades ago are still in service and contribute to the energy mix. As long as service and maintenance are right, follow-on investments are easily manageable.

With modernizations, even power plants built at the beginning of the twentieth century can be updated to the latest state of technology and significantly increase energy outputs. The long-term profitability of hydropower plants is still unparalleled. //



Small hydro project Övre Forland, Norway

Groundbreaking Ceremony for Small Hydro Plant „Alte Bleiche“ on the Voith Premises in Heidenheim

Voith is building a small hydro plant on its works premises in Heidenheim, which will serve as a showpiece for customers, employees and the interested public. The plant uses an innovative power generation concept, where a compact and eco-friendly turbine is installed in the river Brenz. The project involves a large number of Voith apprentices.

After a preparation time of about twelve months, the construction work for the small hydro plant “Alte Bleiche” started on 26 April 2016 with a traditional groundbreaking ceremony. The plant and an associated showroom and technology center are to start service as early as the end of this year.

“With an installed power of 35 kW, the power station will generate 286.000 kWh of green energy per year, which we will feed straight into our production lines,” explains Klaus Schädler, head of the Small Hydro Division.

The small hydro plant “Alte Bleiche” will be installed into an existing weir in the

river Brenz and fitted with the Voith-developed turbine-generator unit StreamDiver. The latter was designed specifically for river structures with low heads and is therefore excellently suited for the Heidenheim location at the Brenz.

Compared to conventional turbines, the StreamDiver is an oil-free compact submersible turbine, allowing a near natural, standardized and cost-efficient power station concept. It helps to reduce any impact on the environment during the installation to a minimum.

The planned shaft power plant represents an ecologic solution, where turbine and generator are situated below the water surface in a single shaft installed in the riverbed. By utilizing existing structures and the absence of a power plant building, the plant can be built with maximum cost efficiency. In addition, there are no noise emissions from the building or impairments to the scenery, which increases the general acceptance of the unit.

A special feature of the project “Alte Bleiche” is the high integration of the technical Voith trainees and the Kössler apprentices. They are, for example, involved in the construction, production and assembly of the turbine and look after the construction of the switch cabinet. The project therefore offers an excellent opportunity for an exchange between the training centers in Heidenheim and St. Georgen. “The small hydro plant “Alte Bleiche” is an important major interdisciplinary project for our trainees, who are making a significant contribution to the success of the unit. In addition, the project also strengthens our reputation as an attractive training company,” says Erwin Krajewski, head of Voith Training. //



From left: M. Stiegeler, E. Krajewski, D. Schöttle, M. Fetzer, K. Schädler, M. Richter, C. Frank, F. Scherr, T. Mayer, J. Lochschmidt

VOGLAUER, AUSTRIA – Producing Upmarket Furniture with Hydropower

The renowned furniture company Voglauer has been building premium-class natural wood furniture and hotel room fixtures in Abtenau in Austria's Salzburg region for over 80 years. Sustainability and the responsible handling of resources play an important role in the company's mission statement. In compliance with this policy, the company, which is based in the Lammer Valley, operates its own hydropower plant. About 60 % of the energy required for production purposes are covered by this system. Since 1985 a Kaplan spiral turbine from Kössler with a runner diameter of 630 mm has been in service here.

In order to ensure optimum availability of the machine also in the future, Kössler received an order for the complete overhaul of the plant. Apart from the runner and the wicket gate mechanism, the modernization also includes the runner adjustment mechanism and the inlet valve, which was refurbished and fitted with new seals. //

Technical Data

Output: 485 kW
Head: 26 m
Type: Kaplan spiral turbine



GRAGGABER, AUSTRIA – Modernization in the Salzburger Land Region

Unternberg in the Salzburg Tauern mountain range is the home of Graggaber power station, which was built in the 1980s. Since then, two Francis spiral turbines with runner diameters of 530 mm and 360 mm respectively have been generating clean energy for the region. After over 30 years of operation, the operating company Graggaber E-Werk GmbH decided to go for an electro-mechanical overhaul of both machines.

The first turbine had already been completely refurbished in 2014. Now Kössler performed a general overhaul of the runner, the gap and sealing dimensions and the wicket gates of the second machine set. The hydraulic contours of the runner were repaired, the wicket gate mechanism was renovated and the optimum performance of the plant was restored. In order to increase the ser-

vice life and the reliability of the machine, the wicket gates were also replaced by stainless chrome steel elements. Since its successful recommissioning in March, the power station produces an annual output of some 3.2 GWh. //

Technical Data

Output: 541 kW und 260 kW
Head: 40.25 m
Type: Francis spiral turbine



TISLEIFJORD, NORWAY – Austrian Technology at the Tisleifjorden Dam

At Tisleifjorden Lake, a 13.5 km² reservoir in the central Norwegian province Oppland, a dam was built between 1940 and 1950 to regulate the water inlet into Lake Bløytjern. Since then, the reservoir has also been utilized for power generation. In the course of the modernization work at the dam, the operator Skagerak Energi AS also decided to incorporate a new small hydro plant. The machine set was installed in the Tisleifjorden dam, in order to use the hydro-energy potential of water flowing into Lake Bløytjern.



With its Kaplan S bulb turbine, Kössler was able to offer the optimum solution for the strongly fluctuating head and received the order together with Voith Hydro in Oslo. The plant was designed in such a way that its operation is maintai-

ned for as long as possible even during the periods when the reservoir is drained. As a result, the machine can produce an average of 6.5 GWh of electricity per year. //

Technical Data

Output: 1.6 MW
Head: 11 m
Type: Kaplan S bulb turbine

VÄSTERKVARN, SWEDEN – New Machine Sets for Traditional Plant



Västerkvarn hydropower station at the Kolbäckån River in south Sweden has been used for generating power ever since the beginning of the twentieth century. It consists of a total of three machine sets.

In 2013 the operator Mälarenergi Vattenkraft AB decided to go for a complete refurbishment of the electro-mechanical equipment on the occasion of the 100th anniversary of the plant. Kössler received an order for the modernization of the entire turbine units including inlets and generators. One of the conditions was to adapt the three new machine sets to the existing structures.

In cooperation with Voith Hydro Sweden Kössler delivered and assembled the new Kaplan turbines for the refurbishment project, which are able to make optimum use of the existing water volume of 45 m³/s. As a result, the output of the power station could be raised to 2.5 MW. //

Technical Data

Output: 3 x 850 kW
Head: 6.6 m
Type: 3 vertical Kaplan turbines

FRITZBACH, AUSTRIA – Small Hydro in the Pongau Region

Between Hüttau and Pfarrwerfen in the Pongau region near Salzburg, Salzburg AG and Austrian Federal Forests AG set up their 29th power station. The plant is supplied with water from the Fritzbach River via an 8,700 meter-long penstock. To make optimum use of the water available at the location, Kössler designed a six-nozzle Pelton turbine with an output of 5.4 MW for the small hydro plant. The power station has been in service since August 2015. Every year, about 28 GWh of electricity are generated and some 7,300 households are supplied with renewable energy.

Ecological compatibility had first priority during the implementation. The penstocks are, for example, laid beneath the existing main road, ensuring that there was virtually no negative impact



on the environment. In addition, a fish ladder also ensures that fish can pass the water intake without problems. //

Technical Data

Output: 5.4 MW
Head: 143 m
Type: Pelton turbine

PSYTTALIA, GREECE – Clean Water, Clean Electricity

On the small island of Psyttalia, about two kilometers west of the port of Piraeus, Aktor S.A.-Athena S.A. built a hydropower station as part of one of Europe's largest sewage treatment plants. Due to the size of the plant and its proximity to Athens, huge volumes of water have to be cleaned here, on average 720,000 m³ per day. The treated water is then directed into the Saronic Gulf via two underwater pipelines situated at a depth of 65 meters.

In order to use the treated water energetically, the operators decided to install a small hydro plant for the cleaned waste water back in 2004 when the sewage system was built. Relevant struc-

tural arrangements were put in place at the time, until the plan was officially put into practice in 2015. Kössler received an order for the delivery and the assembly of a Kaplan turbine with a four-blade runner and an output of 489 kW. Commissioning took place in July 2015. Since then, the sewage plant not only supplies clean water but also clean electricity. //

Technical Data

Output: 489 kW
Head: 5.45 m
Type: Kaplan turbine



TULILA, TANZANIA – Power Generation for a Benedictine Convent



The African Benedictine Sisters of St. Agnes Convent in Chipole, Tanzania, have been running a hydropower plant with a Kössler turbine from as early as 2005 to cover the power requirements of the convent and a maize mill (donor Robert Fuchs, Schindellegi, CH). The convent itself is home to schools for

about 2,000 pupils, a health clinic, a kindergarten, and an orphanage. In order to support the charitable activities of the Benedictine nuns in Tanzania further, the Swiss investor Albert Koch has now implemented the hydropower project Tullila.

For this new plant, Kössler delivered two Kaplan bulb turbines with a runner diameter of 1,600 mm, as well as generators and the electro-technical equipment. Since commissioning in September 2015, the generated electricity is sold to the parastatal stand-alone grid operator Tanesco. After deduction of all credit services, the generated high income from the power station project is donated to the charitable work of the Benedictine convent. //

Technical Data

Output: 2 x 2,581 kW

Head: 21.7 m

Type: Kaplan bulb turbine

Imprint

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