



# Kössler Report

Newsletter | Issue 22 | 05/2017

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## Dear Customers, Dear Business Partners,

No doubt we are all looking forward to the glorious summer months lying ahead, but the past few winter months have once again demonstrated that there can be seasonal power shortages in Europe. With short-term electricity imports network operators were able to prevent regional power cuts, and a few thermal power stations that had already been shut down had to be restarted, in order to make up for missing power generation. A scenario that energy producers and distributors have predicted for some time, but which nobody really wanted to believe in. Yet contrary to all previous assumptions there is indeed something like a seasonally occurring decrease in power station capacities. At the same time, applications for the construction of new small hydro plants are stuck in the loops of lengthy approval procedures, and often doubtful objections prevent the construction of new power stations altogether. Power station operators have long been convinced by the importance of energy generation

from hydropower, and therefore many investors are currently focusing on the upgrading and modernization of existing plants.

Thanks to our broad product portfolio, our knowhow in the refurbishment sector and our international business activities we are able to ensure that our plant operates at full capacity. At the same time we are taking the increasingly difficult framework conditions for our customers very seriously.

As a member of the Voith Group, 2017 is a very special year for us. Voith celebrates its 150th anniversary, which will be commemorated at all locations worldwide – and of course also by us and our colleagues from the site in St. Pölten. Alongside enjoying years with excellent business results, a company with a record spanning 150 years also has to master challenging periods, but the history of Voith, like the history of Kössler, has always been characterized

by steady growth. The continuous quest for innovation and new technologies, coupled with the loyalty of our customers, has made this long and successful company history possible. And this is the spirit in which we would like to continue also in the future – together with our customers, employees and business partners.

With best wishes  
Josef Lampl, CEO



## HEPP Långed - Sweden

### Hundred Years of Power Station Tradition in Dals Långed



The energy supplier Vattenfall runs a total of 39 small hydro power stations in Sweden, which use altogether 69 turbines for energy generation. One of these power stations is the small hydro plant Långed in west Sweden. Named after

its location, it has been used for over 100 years for producing energy from hydropower.

In 2010 work started to renew the existing seven machine sets - a project that

Kössler completed in close cooperation with Voith Hydro Västerås. The delivery consisted of two complete vertical Kaplan units, each with a runner diameter of 2.5 m. Kössler supplied all the turbine equipment and the generators were supplied by Voith Hydro Västerås. As part of the modernization, the operator also renewed the power station building and large sections of the dam construction. Since its re-commissioning in autumn 2016, the power station has been supplying Swedish households with clean electricity from small hydro power.

#### Technical Data

Output: 3,947 kW  
Head: 12.3 m  
Type: Vertical Kaplan Turbines

## HEPP Cotlan - Switzerland

### Energy Production Times Two

The construction work for the small hydro plant Cotlan in the Swiss Canton of Glarus started as early as 1936. The goal: supplying the machines in a nearby cotton mill with electricity. After some 80 years of reliable operation, the plant underwent a complete modernization in 2016.

During the bidding phase for the Cotlan refurbishment project, Kössler was able to convince the customer with a 6-blade Kaplan bulb turbine and received the order for the complete electro-mechanical equipment. The machine set utilizes the drive water of the upstream power station. The water is guided through a penstock with a length of approximately

1.2 km and is then re-used for power generation. As a result, some 2,600 households will be supplied with clean energy. Due to the direct water transfer, the new power station concept allows the removal of weir constructions that are no longer required. Consequently, a number of fish migration obstacles are also eliminated.

#### Technical Data

Output: 2,537 kW  
Head: 18.74 m  
Type: Kaplan Bulb Turbine

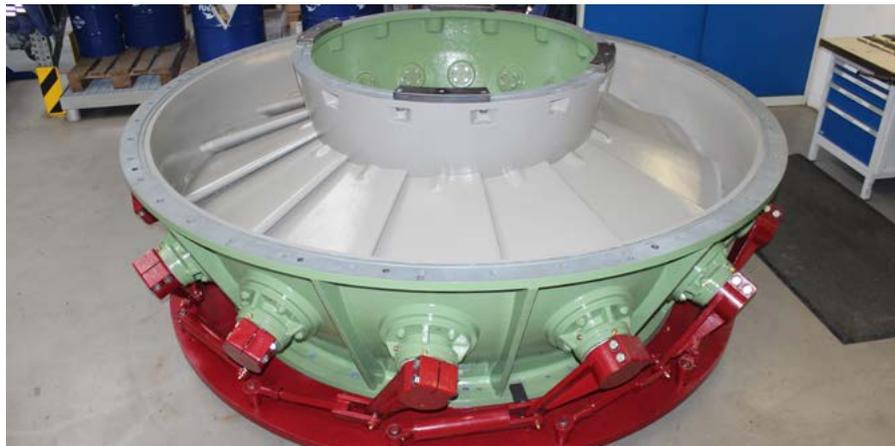


## HEPP Erl - Germany

### Reliability for Decades to Come

In Altenmarkt on the River Alz in Upper Bavaria, a site that has been used for supplying a mill with energy in bygone days, a horizontal Kaplan turbine is now producing electricity for the entire region.

After 25 years of trouble-free production the operating company Martin Erl GmbH & Co. KG decided to have the plant completely refurbished. Kössler received an order for equipping the machine with new seals, renewing the sleeves at the shafts with stainless steel units and coating the turbine inside and outside. The bearings of the bevel gears had also reached the end of their service life. They were exchanged and newly sealed, and the gear was thus fully restored. The installation also included maintenance-free bushes.



Apart from increasing the eco-friendliness of the turbine, the general refurbishment also significantly improved the wear-resistance and the life cycle of the turbine.

#### Technical Data

Output: 756 kW  
Head: 4.5 m  
Type: Horizontal Kaplan-A-Bulb Turbine

## HEPP Mangfall - Germany

### Increased Output Thanks to Modernization

The turbine of Mangfall power station in Upper Bavaria was initially designed for driving wood grinders in a paper mill. After the paper production at the site was discontinued, the plant was converted for electric operation. The bevel gear was retained and the generator driven with an additional helical gear. In addition, the proprietors – the Emmer family – recently renewed the hydraulic steel structures, in order to ensure flood-proof operation of the plant. It was also decided to optimize the heart of the power station and to eliminate any compromises originating from previous rebuilds. Both gears were thus removed and a slow-running water-cooled PM generator with slide bearings was directly coupled with the turbine.

Kössler also renewed the runner adjustment with servo motor and rotary transmission, the hydraulic unit and the guide vane servo motor, and fitted the automatic unit with a modern, computer-programmable control and visualization system. These measures resulted in an output increase of more than 10%, providing the plant with an outstanding overall efficiency rating. The owners also benefit from significantly improved plant availability and much lower maintenance requirements.



#### Technical Data

Output: 430 kW  
Head: 5.65 m  
Type: Vertical Kaplan Turbine

# KW Ardtalnaig, Glen Fada, Liatre Burn, Allt Mullardoch - Scotland / United Kingdom



The Scottish company Green Highland Renewables Ltd. has concentrated on the construction of hydro power stations for generating electricity from renewable energy since 2007. The focus is on small hydro, which has enjoyed an enormous revival in Scotland over the past few years. As a result, the company completed a number of projects, most of them small hydro plants with minimum impact on their natural surroundings. Instead of large dams and reservoirs, these small hydro plants utilize the water of the Scottish burns. Subterranean penstocks lead to often remote power houses that blend in with their environment as harmoniously as possible. In terms of space requirements, all constructions have a minimalist design and some buildings are even set up underground.

This is the basis on which Green Highland Renewables, in partnership with Kössler, has completed as many as eight small hydro plants in the Scottish Highlands, a popular tourist destination. Kössler also received an order for another four projects, covering the delivery of the complete electro-mechanical equipment. So far, the projects Ardtal-

naig, Glen Fada, Liatre Burn and Allt Mullardoch have successfully entered service.

All of these newly built plants were fitted with Pelton turbines, which allow full utilization of the highly fluctuating water supplies across the entire operating range with maximum efficiency. Kössler impressed with a vertical and seven horizontal designs that perfectly meet the requirements of the respective sites. Regarding the number of jets, their number varies between two and six. The project Glen Fada takes up a special position with its 6-jet turbine currently being the one with the highest output and the only such unit at Green Highland Renewables.

Apart from the turbines, Kössler also supplied the generators, the major shut-off devices and the hydraulic units. Consequently, further small hydro projects in the Scottish Highlands could be successfully completed, while sustainable power generation has been further expanded without any major negative impact on the environment.

## Technical Data Ardtalnaig

Output: 2 x 997.5 kW  
Head: 217.70 m  
Type: 2 x Horizontal Pelton Turbines

## Technical Data Glen Fada

Output: 1,240 kW  
Head: 129.45 m  
Type: Vertical Pelton Turbine

## Technical Data Liatre Burn

Output: 495 kW  
Head: 190.72 m  
Type: Horizontal Pelton Turbine

## Technical Data Allt Mullardoch

Output: 495 kW  
Head: 137.54 m  
Type: Horizontal Pelton Turbine

## HEPP Varaždin - Croatia

### Renewal of a Residual Water Turbine

The town of Varaždin and the eponymous power station are located in the north-west of Croatia. The power station is one of three such plants that were built along the River Drau at the end of the previous century. Varaždin was built as early as 1975 and features a total of three machine sets. These consist of two large Kaplan turbines, each with an output of 47 MW, and a residual water turbine with an original capacity of 580 kW. The power plant is supplied via the Ormož reservoir that is not only used as a recreation area but also serves as a habitat for rare bird species.

In order to ensure the reliability of the residual flow machine for the next few decades, the operator HEP - Proizvodnja d.o.o. decided in 2014 to have it completely renewed. Kössler was able

to convince the customer with a 4-blade Kaplan bulb turbine that was optimally adapted to the existing construction in the inlet area. Only the suction pipe had to be rebuilt to suit the requirements of the new turbine, in order to achieve optimum efficiency. Apart from the turbine, Kössler also delivered the respective bevel gear and the hydraulic unit.

With the new residual water turbine, the output could be increased to 635 kW. Every year, the entire power station generates about 476 GWh of clean energy.



#### Technical Data

Output: 635 kW  
Head: 6.80 m  
Type: Kaplan Bulb Turbine

## HEPP Jenny - Switzerland

### Major Overhaul in the Canton of Glarus

The textile company Daniel Jenny & Co. has been producing cotton cloths in Haslen on the River Linth in the Swiss canton of Glarus since 1846. The prospect of being able to utilize the existing hydropower facilities for energy generation has been a major factor when the newly founded company looked for a suitable location.

Since the mid-sixties, the plant has been utilizing a horizontal Francis spiral turbine from Kössler with a tangential runner for power generation. After nearly half a century of operation, the company decided to refurbish the plant, in order to ensure the availability of the turbine also in the future. In the course

of this refurbishment project, Kössler replaced the runner chamber, which now consists of stainless steel. In addition, the customer also ordered a general overhaul of the guide vanes, which were fitted with stainless steel sleeves and maintenance-free plastic bushes. To guarantee trouble-free operation of the machine for the next few decades, the guide blades and the turbine cover received high-performance anti-corrosion treatment, and the blades of the runner were welded, reducing the runner gap and thus optimizing the efficiency of the machine.



#### Technical Data

Output: 148 kW  
Head: 10 m  
Type: Horizontal Francis Spiral Turbine

# Welcome to the Next 150 Years - From a Locksmith's Workshop to a Global Technology Group

Voith is celebrating its 150th anniversary in 2017. On January 27, 1867, Friedrich Voith took over the locksmith's workshop owned by his father, Johann Matthäus, which was located in Heidenheim on the river Brenz. That was the beginning of the family-owned company's global success story. "We don't know what Friedrich Voith imagined at the time," says Dr. Hubert Lienhard, President and CEO of Voith, "but today we see what became of his ideas and dreams as a result of hard work, passion, and the dedication of generations of Voith employees: a global technology company with around 19,000 employees in more than 60 countries, which has made industrial history in many of its markets over the last 150 years. A family-owned company with strong values and a unique company culture."

"We are proud of our rich, successful history. But in our anniversary year, we will primarily be looking to the future," says Voith CEO Lienhard. "That is what we mean when we say 'Welcome to the Next 150 Years.' Friedrich Voith saw the major opportunities in his time, and seized them decisively. We have preserved this entrepreneurial and pioneering spirit. We want

to take a decisive role in shaping the fourth industrial revolution in the 21st century following the example of our grounding father Friedrich Voith, who was one of the pioneers of the first industrial revolution."

The company is targeting an additional expansion in 2017, in particular through digital applications. For this end, the company built the new Voith Digital Solutions Group Division in which the company brings together its activities in the fields of IT, automation, software and sensor technology.

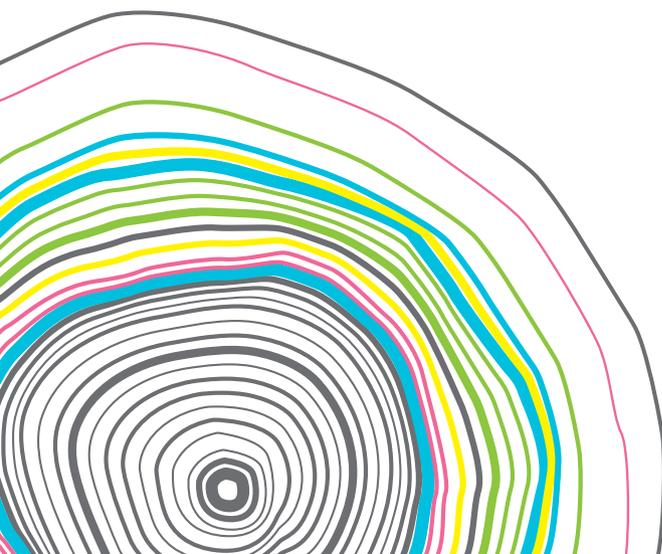
"In our founding year, 1867, electricity, paper and mobility were restricted to a limited number of people. The world was a different place. Since that time, Voith technologies have helped to change things," Lienhard says. "Today, we are on the threshold of major new opportunities. The world of industry is becoming a digital one. We are looking forward to that. The people at Voith are at home with change – there is no other way to grow that old."

**The Voith story – innovations, internationality and sustainable corporate leadership**

As a visionary and courageous entrepreneur, Friedrich Voith recognized the enormous opportunities that industrialization offered in the second half of the 19th century: Voith became known as a global pioneer in hydropower. The first Voith turbine left the factory in 1870. In 1903, the company shipped what was at the time the world's largest turbine for a hydropower plant in Niagara Falls. In 1910, Voith constructed China's first hydropower plant.

The company's innovative power and internationalization continued into the 20th century: groundbreaking innovations like the Kaplan turbine or developing the hydrodynamic principle (Föttinger principle) are inseparable from the Voith name and are now considered industry standards.

Today, the Voith technology group is active in five markets: Energy, Oil & Gas, Paper, Raw Materials, and Transport & Automotive. With approximately 4,000 active patents, the company is the technological leader in many fields of industry.



Welcome to the Next 150 Years

## Imprint

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