

HOBAS® Hydropower | Part 2

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HOBAS® Penstock in Chile: How History Repeats Itself



The first HOBAS Pipeline was installed over 50 years ago in Switzerland. It was a penstock realized in inconveniently steep and hardly accessible terrain which is today still in excellent condition and service. Now, half a century later, HOBAS, hydro and Switzerland meet again at pretty much the other end of the world: In southern Chile, close to the Argentinian border, a local Swiss client chose HOBAS Pipes for his hydropower project. Following numerous successful hydropower projects all around the globe, this is the first HOBAS Hydro Pipeline installed in Latin America.

The hydro power plant San Miguel is located in the region Alto Bio Bio southeast of Concepción in the Andes. There are already quite a few storage and run-of-river power plants in this area abundant with water.

The client's reasons for choosing HOBAS reminded of those 50 years ago: Since the terrain was steep and difficult to access, the pipes had to be light and easy to install. Thanks to the HOBAS Couplings which accommodate angular deflections there was also no need for fittings. With short section pipes the client saved on 16 bends and the time-consuming as well as costly construction of thrust blocks. Long drawn curves enabled an optimal adaptation of the pipeline to the territory without sharp changes in direction which would have affected the hydraulics. HOBAS offered support already during the planning stage to optimize the routing and transportation. In the first two weeks a HOBAS Installation Expert accompanied the construction works on site.

Year of construction **2012 - 2013**
 Total length of pipe **1414 m (sections at one, two and 5.8 m)**
 Diameter **DN 600, 700, 800**
 Pressure class **PN 6, 10, 16, 20**
 Stiffness class **SN 5000 and 10000**
 Capacity **1.1 MW**
 Installation **Open Trench**

Client and building contractor **Otto and Verena Wild, Eléctrica San Miguel SpA**
 Constructor **Philipp Wild, Constructora Wild Ltda**
 Designer **INTE & JMS**
 Advantages **Light weight pipes, angular deflections in couplings, easy installation with minimum impact on nature**

This way, around 1.4 km HOBAS Pipes DN 600, 700 and 800 in the pressure classes PN 6-20 and lengths of one, two and 5.8 m were easily and successfully installed. The supplied product range also included reducers, masonry couplings and a T-piece. The client and contractor imported the first walking excavator to Chile in order to master the steepest sections of the route. Since the light-weight HOBAS Pipes did not require any further heavy equipment the construction area could be reduced considerably and the impact on nature was kept to a minimum.

The Swiss contractors were enthused about the pipes' easy installation and their light weight as well as the possibility to safely establish curves via angular deflection in the couplings: "Many thanks to the entire HOBAS Team for their professional support, especially during the planning stage and installation. We can warmly recommend HOBAS to every power plant constructor."

Fmd: americalatina@hobas.com



Green Energy for Schladming

HOBAS® Pressure Pipes DN 1800

feed water to power plant Talbach, AT

In the Austrian city Schladming, two over 90-year-old hydropower plants have been replaced with a modern one. The new facility is designed for a flow rate of 5800 l/s, has a head of 10.8 m and a capacity of 467 kW. A 60-m-long HOBAS Pressure Pipeline DN 1800, SN 10000, PN 2 ensures the reliable energy output.

The two old hydropower plants owned by the families Seebacher and Kraiter have been built in the years 1895 and 1923. The power station Seebacher was even the oldest electricity plant in the Austrian region Upper Styria. Since the necessary water consents for both power plants would have expired within the next years, it was decided to shut down the power plant Seebacher and to renovate and expand Kraiter. Construction works started in September 2011.

During the planning phase the focus was on the choice of pressure pipeline. There were several arguments that supported the use of HOBAS Products: Their excellent hydraulic properties and minimal friction loss due to the mirror-like inner surface as well as the high abrasion and corrosion resistance represent a long service life. Another decisive advantage is the low weight of HOBAS Products.

The site conditions made the installation quite complex and time-consuming. The pipe route leads closely past the residence of family Kraiter and then right through a sawmill from the 19th century, and both the structure of the house and the old mill were to be preserved. The pipes had to be lifted above the family residence and then pulled through a narrow opening into the sawmill building, where they were mounted on concrete supports. The simple handling and low weight of HOBAS Products made the difficult installation works a lot easier.

Construction works were successfully completed in December 2012 and the small hydropower plant Talbach was put into operation right on time for the Ski World Cup 2013. Today, it produces almost four times as much clean energy compared to the two old power plants.

Fmd: hobas.austria@hobas.com



Year of construction
2011 - 2012
 Total length of pipe
approx. 60 m
 Diameter
DN 1800
 Pressure class
PN 2
 Stiffness class
SN 10000
 Installation
Open Trench
 Contractor
Kieninger Bau
 Designer
BHM Ingenieure
 Advantages
Easy handling and low weight of HOBAS Pipes, long service life, abrasion and corrosion resistance, mirror-like inner surface



HOBAS® XL Diameter Hydropower Line in the Apennines of Reggio Emilia, IT

End of 2012, some businessmen of the Italian region Reggio Emilia held the permission for the building of a new hydropower plant in their hands: A project of which the environment around the Secchia River in the municipality of Castellarano benefitted decisively. The close interplay of three HOBAS Organizations significantly contributed to the great success of this project in the Apennines of Reggio Emilia.

The initial idea of the Engineering Office Adelio Pagotto for the hydropower penstock dates back to 2004 and involved a concrete channel combined with a short steel pipeline. In subsequent stages of refinement, the idea of a concrete channel was abandoned and a steel pipeline for the entire length of 380 m was considered instead. In order to decrease the water flow velocity and reduce head losses, the pipeline was supposed to have a diameter of more than 3 m. The pipes' durability should be ensured by means of a cathodic corrosion protection system.

However, after a thorough analysis and numerous meetings with owners of hydroelectric power plants, both the client and the designer chose to switch from steel to HOBAS CC-GRP Pipes for a variety of reasons. HOBAS Pipes feature superior hydraulic performance and offer decisive economic benefits due to fast installation and minimal maintenance. The HOBAS FW Couplings allow for the pipes to be easily connected and are also flexible enough to compensate for some soil settlement. Since GRP is non-conductive and therefore also non-corrosive and highly durable, HOBAS Pipes do not need any cathodic corrosion protection either.



Year of construction	Capacity
2012 - 2013	3 MW
Total length of pipe	Client
380 m	Idroemilia S.r.l.
Diameter	Designer
DN 3000	Studio Ing. Adelio Pagotto
Pressure class	Constructor
PN 2	Piacentini Costruzioni SpA and Granulati Donnini SpA.
Stiffness class	Advantages
SN 10000	Optimal hydraulic performance, corrosion resistance, minimal maintenance required
Installation	
Open Trench	
Flow rate	
28 m³/s	
Head	
15 m	

The installation of the pipeline started at the beginning of 2013. HOBAS Pipes proved their worth right away: Apart from the excavation works, which took rather long due to the size of the trench and hard soil, the installation of each 6-m-long DN 3000 pipe took less than 30 minutes. The curved route of the pipeline was realized without special fittings but by angular deflection in the couplings. For sections with smaller radii, HOBAS supplied pipes with an angular cut end.

HOBAS Experts provided the installation team with valuable support and assistance. The works have been successfully completed and the hydropower plant was put into operation end of May 2013. The installation of the penstock went smoothly, not least thanks to the global expertise of the HOBAS Group, ensuring that the products are optimally adjusted to the customer's demands. At the hydropower plant Castellarano, the interplay of HOBAS Italy, HOBAS Austria and HOBAS Poland stated a good example of this efficient network.

Fmd: hobas.italy@hobas.com



HOBAS® Sand Trap

Reliable Separation of Solids in Pipelines of Small Hydropower Plants

The sand trap is a key component for removing solids in small hydropower systems. After large stones and coarse woody debris are held back by a screen at the weir, the sand trap separates smaller solids such as gravel, sand and silt from the works water. It thereby prevents sedimentary deposits from building up in the penstock and extends the maintenance intervals of the hydropower plant considerably. Furthermore, the cleaned river water protects the turbine from excessive wear, which in turn increases the power plant's service life.

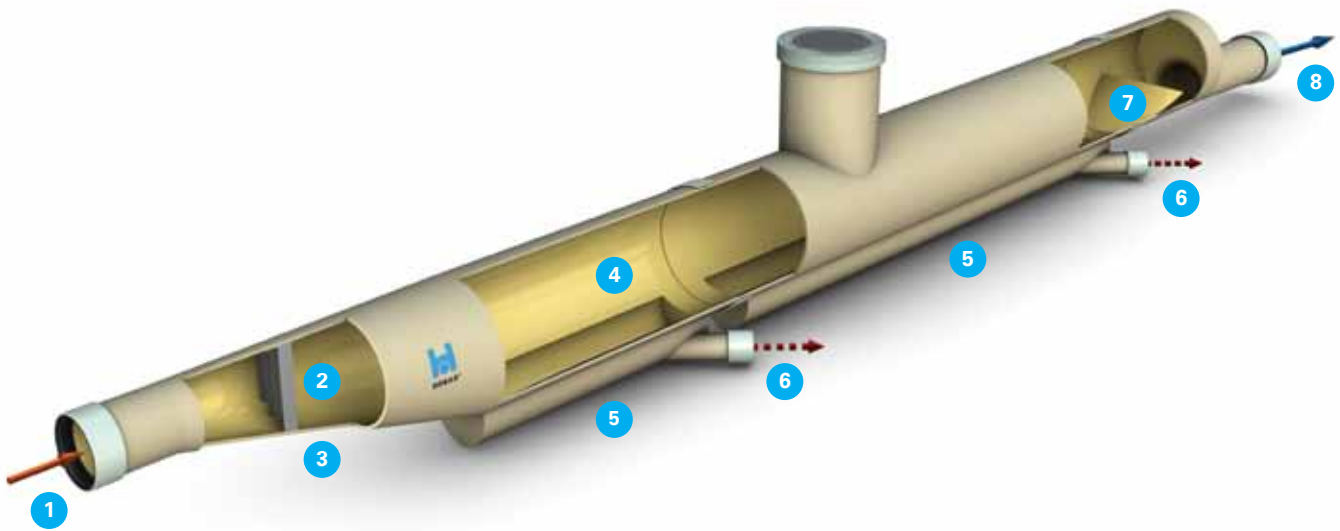
HOBAS has developed a particularly efficient, prefabricated sand trap which is built out of GRP pipes. Thanks to the precast units and low weight, the HOBAS Sand Trap is transported to the installation site and integrated into the power plant system very easily. A flushing unit, which can be fully automated on request, reliably cleans the sand trap from separated solids.

How the HOBAS Sand Trap works

The coarsely screened river water enters the sand trap through an inlet pipe (1). Turbulence in the flow, especially such perpendicular to the direction of flow, is stabilized by means of vertical slats (2). Due to the stilling chamber's cross-sectional enlargement (3), the water flow velocity decreases, causing the solids to settle in the settling chamber (4) and into the sedimentation system (5). The HOBAS Sand Trap is designed in a way to prevent the settled solids from being stirred up and re-introduced into the water very efficiently. The solids are then rinsed out of the sand trap through flushing pipes (6) that can be opened for this purpose. On request, special sensors are integrated to control the flushing automatically. During the flushing process, the turbine continues to operate unhindered, ensuring continuous power generation and maximal plant exploitation.

The cleaned water leaves the sand trap through an outlet pipe (8) which is connected to the penstock. A tilted overflow plate (7) at the end of the sand trap ensures that the suction of the outlet pipe cannot rinse out the settled solids into the penstock. The water is finally conveyed to the power house, where it drives the turbine and helps produce clean energy.





The optimal settling system and the efficient flushing function of the HOBAS Sand Trap have been proven and verified by means of a numerical simulation model at the Czech Technical University (CVUT) in Prague and a hydraulic model at the University of Natural Resources and Life Sciences (BOKU) in Vienna.

Each HOBAS Sand Trap is custom-tailored to the given requirements with regard to numerous factors, including the solids' size and settling time as well as the flow velocity of the river water. This guarantees the best possible settling and flushing performance of the sand trap and an optimal long-term performance of the hydropower plant.

Fmd: info@hobas.com



Click on the video above and learn more about successful HOBAS Hydropower projects.

Green Electricity with HOBAS® Hydropower Pipelines – Clean energy from the power stations Ebriachbach and NockEnergie Glanzer, AT

1270 water bodies, 8000 kilometers of rivers and numerous mineral springs make Carinthia not only the most water abundant region of Austria – it also ranks among the leading provinces for electricity from sustainable sources. Approximately 540 hydropower plants cover around 90 percent of the country's province's total electricity demand. Last year, two noteworthy small hydropower plants have been realized with HOBAS Pipes; they are now contributing to Carinthia's green power production.

Power Plant Creek Ebriachbach

The hydropower of the Ebriachbach Creek in the health resort Bad Eisenkappel is used to produce energy in the identically named power plant. The water is lead from the spring to the power house through a 2660 m long penstock, which has been realized with HOBAS GRP Pipes. The advantages of the HOBAS Angular Cut System were a determining factor for this choice. Thanks to the angular cut pipe segments there was no need for costly fittings and the pipes could be laid very flexibly in accordance with the planned track. HOBAS Experts provided help and advice during the installation of the HOBAS Penstock DN 1200, PN 6, SN 10000. The power plant Ebriachbach was put into service in autumn 2012 and has a capacity of 600 kW.

Power Plant Ebriachbach

Year of construction

2011 - 2012

Total length of pipe

2660 m

Pipe specifications

DN 1200, PN 6, SN 10000

Installation

Open Trench

Contractor

M & R Bauholding GmbH

Designer

Geos Consulting ZT-

GmbH

Advantages

HOBAS Angular Cut

System, low weight,

technical support by

HOBAS Experts



Power Plant NockEnergie Glanzer

Another impressive hydropower project implemented with HOBAS GRP Pipes is the power plant NockEnergie Glanzer in the village of Radenthein. Gerald Glanzer and his son David built a small hydropower plant right on their doorstep at the Kaningbach Creek. It consists of a Tyrolean weir, used to channel the Kaningbach Creek, as well as a sand trap and a screening system. The connected 1400 m long HOBAS Hydropower Pipeline (DN 900, SN 10000, PN 6-14) leads to the powerhouse with several curves that were realized by means of angular deflection in the couplings. At a head of 106 m, the average flow rate is 1.4 m³ per second. Each year, 4 Million kWh of energy will be produced and fed into the KELAG power grid – one of Austria’s leading energy suppliers. Learn more about this project and the advantages of HOBAS in the following interview.



**Interview with David Glanzer,
NockEnergie Glanzer GmbH**

You considered various pipe producers and materials for your small hydro power plant. Why did you choose HOBAS at last?

Glanzer: We wanted to find a high quality product. HOBAS offered us a factory visit in Wietersdorf, we got to know the production and the different testing procedures and could thereby convince ourselves personally of the products’ quality. The incredibly smooth inner liner impressed us right away – you won’t find anything similar from other pipe producers. Our power station has now been in operation for a few months and we can already confirm the excellent hydraulics and the low friction loss: The energy output exceeds our expectations.

Did the advantages of HOBAS Products also facilitate the design of the pipe route?

Glanzer: They did. Our originally planned track would have involved 27 bends. Since HOBAS Couplings can accommodate deflections up to 3°, we were able to plan a new pipe track in agreement with the surrounding property owners, which contains no fittings at all. This reduced the costs of the pressure pipeline considerably.

Please tell us a few words about the installation works.

Glanzer: The installation of the pipeline went smoothly and the decision to opt for HOBAS proved to be the right one again. Since we did not have a big enough storage area for all segments of the 1400 m long pipeline, the delivery had to take place in several stages, which were difficult to predict due to the variable progress of the installation works. HOBAS showed great flexibility and delivered the necessary number of pipes very spontaneously right on demand.

Fmd: hobas.austria@hobas.com



Power Plant NockEnergie

- Year of construction
2012
- Total length of pipe
1400 m
- Pipe specifications
**DN 900, PN 6 - 14,
SN 10000**
- Installation
Open Trench
- Client
**NockEnergie Glanzer
GmbH**
- Designer
**Zivilingenieurgemein-
schaft Ebner-Jaklin**
- Constructor
Fürstauer Bau GmbH
- Advantages
**Optimal hydraulic
properties, long service
life, possibility of angular
cut pipe ends and deflec-
tion in the couplings**



HOBAS® Penstock for the Princely Schwarzenberg Family Foundation Vaduz in Austria

Uniting Sustainability with Economic Viability

Little did Johann Adolf Count zu Schwarzenberg know that his iron ore findings in 1661 and iron production in today's Austrian municipality Turrach would mark the beginning of the region's increased need for energy supply. For a couple of centuries, the main source has been brown coal. Today however – in line with the plan of 34 municipalities to become energy self-sufficient by 2015 – the Schwarzenberg family foundation Vaduz has its sights on the environmentally sound energy source hydropower.

Already 5 years ago, the foundation had entrusted the planning agency Pittino ZT GmbH with a feasibility study to find out which water courses of its territory would be best qualified in regard to environmental sustainability. Two small hydropower plants, Leimingbach and Geissbach, with a joint standard capacity of 1.8 GWh have been erected since. With the experience gained as operator of these two first hydropower plants, the family foundation soon endeavored the erection of a further plant at the stream Turrachbach.

In aiming to unite sustainability (high quality and longevity) with economic viability, particular attention was paid to the choice and design of the approximately 2.5-km-long penstock. HOBAS Hydropower Pipe Systems presented the ideal solution: The highly corrosion and abrasion resistant products have a tested and proven service life of at least half a century while the smooth mirror-like inside surface provides optimal hydraulic properties at minimal head loss. HOBAS GRP Products scored furthermore regarding their practicability in installation: The comparably light pipes, which were delivered in 3 and 6 meter lengths for this project, are easy and quick to install – also in remote areas that are difficult to access. Thanks to the possibility to accommodate angular deflection in the



couplings and the proven and tested method of angular cut pipe ends, most changes of direction were achieved without the use of costly fittings. In other words, the line was optimally adapted to the route predetermined by the country road and narrow valley of the Turrachbach while saving on bends and keeping installation costs to a minimum.

Under the supervision of Pittino ZT, the contractor Felbermayr Bau commenced the construction of the plant with 71 m head in March 2012. The pipeline was laid right after the water inlet, crossing first the stream and then along the right bank up to the power house in open trench with an average cover of 1.5 m. While the upper half of the route was implemented with DN 1600 HOBAS Pipes designed for the pressure classes PN 4 and 5, the lower part was realized with HOBAS Pipes DN 1500, PN 6, 8 and 10. Rocks and ledges dominate the last 100 meters of the penstock so that a cast iron pipe DN 1200 was connected to the GRP line on the last 100 meters of the penstock.

After all necessary tests had been conducted, the cross-flow turbine with a standard capacity of 5.4 GWh went into operation in December 2012. It is currently the foundation's plant with the largest output. Pleased with the result, the director of the Schwarzenberg family foundation, Michael Sterneck, says: "Of course we want these projects to be economically successful. However, to us it is most important to have a solid and environmentally sound construction."

Fmd: hobas.austria@hobas.com



Year of construction
2012

Total length of pipe
2570 m

Product range
6 and 3-m-long pipes with and without angular cuts

3 bends

1 reduction

Diameter
DN 1600, DN 1500

Pressure class
PN 4 – PN 10

Stiffness class
SN 10000

Gross head
71 m

Flow rate
3000 l/sec

Rated output
1727 kW

Contractor
Felbermayr Bau GmbH

Designer
Pittino ZT GmbH

Client
Schwarzenberg Family Foundation Vaduz / Forestry Administration Murau

More Green Energy in Sri Lanka with HOBAS®

Year of construction

2011 - 2013

Construction time

18 months

Total length of pipe

1460 m

Diameter

DN 700 - 1100

Pressure class

PN 1 - 12.5

Stiffness class

SN 5000 and 10000

Head

95 m

Capacity

1.2 MW

Installation method

Open Trench

Client

Wellaway Hydro Power (Pvt) Ltd

Designer

Munex (Pvt) Ltd

Construction company

Dolphin Marine Lanka (Pvt) Ltd

Advantages

Environmentally sound solution, easy handling thanks to light weight, long service life

The vibrant small hydro power industry in Sri Lanka saw a further green accomplishment in the south of the country approximately 2 km from Dehilanda in Wellawaya at the river Kuda Oya. With a capacity of 1.2 MW and approximately 5.7 GWh output per year, which will be fed into the national grid of Sri Lanka Water, the hydropower plant will supply for about 6000 households. The owner, the private company Wellawaya Hydro Power Pvt Ltd, opted for a sustainable and environmentally sane penstock solution with HOBAS CC-GRP Pipes.

Environmental considerations played a crucial role in the decision making process for the best suitable pipe material. "Since the plant is situated in the jungle, we wanted to make sure to best possibly protect flora and fauna. We decided to bury the penstock because it would have otherwise crossed and divided animal trails," says Roshan Prabatha Wickramasinghe, Director of Wellawaya Hydro Power Pvt Ltd. Thanks to the possibility to optimally adapt the line to the terrain, only a 3 meter wide section had to be cleared for trenching. The tested and approved method of angular deflection accommodated in the couplings as well as angular cut pipe ends reduced the number of necessary bends.

The construction of the 1460-m-long GRP pipeline leading to the turbine at a head of 95 meter commenced in 2011. HOBAS delivered pipes designed for different pressure classes ranging from PN 1 to PN 12.5. While gravity pipes were utilized for flatter parts of the route, pressure pipes were installed in especially steep sections, where the comparably light pipe material benefited pipe transportation and handling considerably. Some parts are in fact so steep that a mechanically operated winch had to be employed to pull the pipes to the trench. "This would have proved very difficult if not impossible with other pipe materials which are by far heavier," adds Wickramasinghe.

After 18 months construction time the pressure test was conducted and successfully passed so that the plant could be put into service. Shrubs and trees were quickly replanted along the backfilled trenches so that soon there will be no trace of construction works and nature can take its usual course. Not only is the operator content with the result but also the villagers: Apart from electricity, locals received the opportunity to be trained and to operate the hydro-power plant.

Fmd: info@hobas.com

