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# zek HYDRO

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INTERNATIONAL HYDRO
FUTURE TECHNOLOGY

Photo credits: Limmatkraftwerke AG

# SOUTH TYROLEAN HYDRO POWER TECHNOLOGY SCORES POINTS IN WEST UKRAINE

*Since 2005, the Ukrainian company Kommertsconsult has been actively involved in renewable energies in Transcarpathia, in the western part of Ukraine. Previously the focus had primarily been on exploiting hydro power and gaining various different experiences. Based on these experiences, the managers in charge decided that for their latest power plant project – Shypot 2 – they would place their trust in hydro power technology from the Alpine region. They discovered a highly innovative and pragmatic partner in the form of the South Tyrolean Markus Wild, who was willing through his company Wild Metal to deliver Alpine hydro power technology to Transcarpathia. And this was done with great success: Equipped with high-end hydraulic steelwork from Wild Metal and highly efficient turbine technology from the company Troyer AG, the customer was able to deliver a resoundingly positive verdict on the South Tyrolean-Ukrainian cooperation.*

Both in terms of the external appearance and the hydro power technology installed, the Shypot 2 power plant in western Ukraine compares favourably with modern, Alpine small-scale hydroelectric power plants

Transcarpathia, the most westerly province in Ukraine, is around 40% larger than South Tyrol and has roughly twice as many people living in it. However, the comparison when it comes to hydro power comes down in favour of South Tyrol: Whereas there are around 1,000 hydroelectric power plants in operation in the free province, in Transcarpathia they number just seven. One company which is involved with renewable energies in general and hydro power in particular is the company KommertsConsult, which belongs to the energy group RENER with its headquarters in Uzghorod - the capital of Transcarpathia. The company currently operates three hydroelectric power plants which each generate approx. 1 MW of power and two photovoltaic installations with a maximum output of 5 and 10 MW. In 2005, the first applications to obtain the permits to construct hydroelectric power plants were launched. To be allowed to build such plants, permits from both state authorities in Kiev and from the province are required. The most important element at the start of a project is to win the approval of the local community concerned. In general, 140 permits need to be obtained to implement a hydro power project. For the final permit to start operating the plant and feed power into the public grid, the plant must first have been fully constructed. After this, the plant is inspected by the local authority and - if all of the regulations have been complied with - the operating licence is issued. The water usage permit is awarded for one to three years and must be renewed on a regular basis. The law which guarantees that the electricity produced will be purchased is initially valid until 2030.

## INITIAL EXPERIENCES OF HYDRO POWER

With a great deal of commitment and dedication, the company Kommertsconsult was able in 2008 to obtain the first permit allowing the construction of the Krasna power plant. But a huge problem arose at an early stage here: It was incredibly difficult to find a competent project engineer. Although there are state institutions which in theory offer power plant planning, in actual fact they are unable to boast any experience in the area of small-scale hydro power. Ultimately, a Ukrainian project engineer was found after all. The plant was connected to the grid in 2010 with the first machine producing a maximum of 800 kW. In 2011, there was approval for an expansion with a second Francis turbine which was able to start operating in 2012. The second project to be implemented by the company is located on the Shypot River. In this case, the planning remit was awarded to Armenian engineers. This project involves the use of a Cink cross-flow turbine which produces around 1020 kW and was also able to begin operating in 2012.

## SOUTH TYROLEAN DEMONSTRATES PIONEERING SPIRIT

For the next project, the developers had resolved to deliver a showpiece plant in Ukraine featuring state-of-the-art technology. In one of the zek HYDRO journals, they had come across the innovative system for water intakes, the Grizzly rake from the company Wild Metal. On a tour inspecting hydroelectric power plants in the Alpine region, they also got to know the company Wild Metal and the product and appreciated the superior turbine technology from the company Troyer AG.

In January 2013, the developers invited Markus Wild and Adolf Dengg to visit western Ukraine in order to visit the locations for the forthcoming projects and to assist them in deciding what should be given priority. The Shypot 2 project was the most advanced in terms of the permits that had been secured. It was agreed that Wild Metal would draw up the plant concept and the detailed plans. The definitive plans were drawn up in the in-house planning department to ensure that they conformed to the Ukrainian laws and standards. In a next stage, the company Wild Metal was again asked to supply all of the electromechanical plant technology along with the steel hydraulic engineering. This meant a considerable risk for the medium-sized company from South Tyrol, but this reflects the pioneering spirit of Markus Wild.

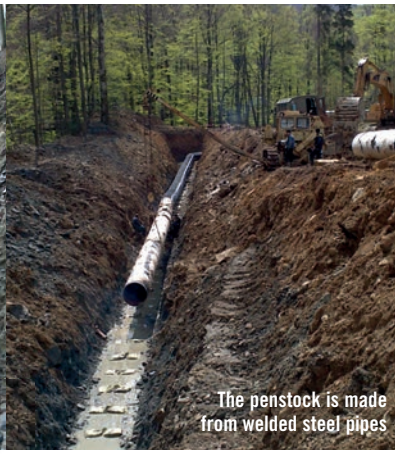
## DIFFICULT LAYING OF PIPES

At the end of the 2013/2014 winter season, the construction work commenced with the preparation of the route of the pipeline, which required the felling of trees. As soon as the temperatures allowed, the first metres of


photos: Wild Metal

Water catchment under construction


The route of the pipeline runs for around 3 km on the side of a mountain along the forest road.


The penstock is made from welded steel pipes

the DN 1000 steel pipeline were laid. The entire route of the pipeline runs on the side of a mountain along a forest road which runs next to the body of water over a distance of around 3 km from the catchment to the powerhouse. The amount of space available proved to be very constricted. In some places, the slope had to be worked up to a height of 20 m. Sections of loose rock alternated with craggy areas and crossings of small tributaries. In order to confine the cutting of the hillside to a reasonable limit, in large areas just a trough was dug out to produce a constant longitudinal gradient for the pipeline. In order to achieve the coverage of the pipeline required to ensure that it could be operated without any impact from frost, a partition was constructed between the road and the pipeline using gabions or wooden plank walls and this was backfilled with excavated material. This labour-intensive solution was implemented with the assistance of workers from the surrounding area.

## INNOVATIVE SLUICE DESIGN

For the construction of the water catchment, the body of water was routed past the side of the construction site using steel pipes. The feed water with a design discharge capacity of approx. 900 l/s is captured using 9 Grizzly 1000 modules and directed underneath the fish passageway through to the underground pressurised retaining basin. On the orographical left-hand side a sluice gate for the upstream basin was installed and, with a cylinder recessed in the double protective plate, this represents another innovative solution from the company Wild Metal. Apart from the opening in the concrete on the front of the new barrier, none of the sluice gate is visible.

For the base excavation of the construction pit for the pressurised retaining basin, it was necessary to dig down to a depth of more than 12 metres. The pressurised retaining basin with an outgoing pipe placed even deeper has a grated maintenance walkway fitted over the entire width above the level of the water. This means that the sluice and the hydraulic equipment are easily accessible.

The only thing that can still be seen today is the entrance door. Passers-by have no inkling of the construction volume below the ground. The catchment is configured to be accessible for living organisms in the body of water via an industrial fish ladder, with the concrete walls having been clad with natural stone in order to improve their appearance. As a general rule, the developer, Sergej Kovach, and his manager for the dedicated construction sector, Yuriy Korolychin, placed maximum importance on a clean finish and creative design with the minutest of detailed touches.

## TURBINE LIKEWISE FROM SOUTH TYROL

Operating in the powerhouse is a vertical 4-nozzle Pelton turbine from the company Troyer which delivers a maximum output of around 1 MW and was supplied by Markus Wild as part of his overall assignment. This also includes the Hitzinger synchronous generator, the transformer, the control equipment, the low-voltage installations and the medium-voltage installations as well as the pipelines leading to the catchment and the control panel for the catchment installed in the pressurised retaining basin together with a small transformer. The power supply for the catchment area was deliberately designed to be stronger because as a result it was also possible to simultaneously supply power to a nearby holiday home.

With regard to the previous experiences that the power plant operators gained with different models of turbine from a variety of different sources, for the Shypot II power plant they decided to place their trust in the reliably robust and powerful technology of one of the most inno-

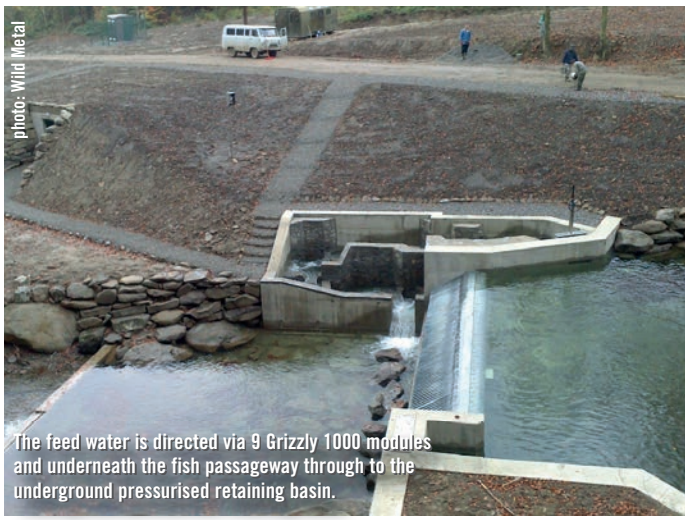


photo: Wild Metal

The feed water is directed via 9 Grizzly 1000 modules and underneath the fish passageway through to the underground pressurised retaining basin.


Nikolai leading assembler Ukraine, Ezio leading assembler Wild Metal, Yuriy director of the building sector, Sergiy Kovach Owner / Client

photo: Wild Metal


photo: Wild Metal

The vertical 4 nozzle Pelton turbine from Troyer is designed for 1 MW capacity.


photo: Wild Metal

Technical adviser DI Dengg Adolf (left) and Ezio Zandonella Maiucco inspecting the fish ladder

vative companies from the Alpine region – in the technology of Troyer AG from the town of Sterzing in South Tyrol. The high-quality runner is milled from a stainless steel monoblock, and the design of the turbine mirrors the state of the art in hydropower technology. It is a high performance turbine to ensure efficient and reliable operation for many decades.

The extremely smooth running coupled with strong efficiency data right across all operating points reinforced the operators' conviction that they had made the right choice. Ultimately, the reference installations that they had visited in the Alps before they made their decision offered an extremely persuasive argument. For the experienced hydro power specialists from South Tyrol, who also boast a great deal of experience in foreign markets, the assignment from the Ukraine also represented uncharted territory. However, with the turbine that was supplied, Troyer AG was able to impressively demonstrate that it can stand the test in North-East Europe very well.

## COMMITMENT WITH A SOCIAL BENEFIT

The facade of the new powerhouse has a unique character of its own thanks to the sensitive design incorporating traditional and modern elements. It stands comparison with the most modern plants in the Alps from both a technical and visual point of view.

The company Kommertsconsult is planning in the future to become involved with as broad a range of sources of renewable energy as possible. To this end, a kind of group structure with the name RENER is being created. One subsidiary will push ahead with projects in the area of providing energy from biomass. Another very important aspect for the company is implementing social compensatory measures alongside the projects. For example, a kindergarten has already been built in the community in which the next hydroelectric power plant will be constructed. Another primary concern for the developers is that, in addition to the workers from their own construction division, they should also strive to employ people from the local area surrounding the project and then subsequently get them involved in operating the plant. And not least in underdeveloped regions the people are able to enjoy a certain independence in respect of their power supply.