Record head at Garmisch-Partenkirchen's "Esterberg" hydroelectric power station

3600 metres of ductile cast iron pipes carry spring water to the power station

Once upon a time the Esterberg springs supplied the whole of Garmisch-Partenkirchen, but recently they have only been used as an emergency supply. Although this is a function they still perform today, an additional use has now been found for them. For a short time now the water has also served to generate electricity. The head of water available for this is 502 metres, the record head in Bavaria.

The construction firm that was given the contract built a new main collector duct for the Esterberg springs at 1193 metres above sea level and at 691 metres above sea level, within the city limits of the market town of Garmisch-Partenkirchen, it built a generator building that was built directly onto an existing transformer station. A pressure pipeline 3.6 kilometres long was laid between the two.

Rock made the laying work more difficult

Even when the work was being planned it was clear that severe demands would be made both on the material of the pipeline and on the skills of the laying team. The terrain is very rocky and about 1,600 cubic metres of rock needed to be dug out to allow the pipeline to follow its planned route. This was no small feat and it proved to be a real challenge for the firm doing the work. When selecting the material for the pipes, the representatives of the municipal authority wanted to be sure they were on the safe side. In view of the maximum operating pressure of 52 bars, of the variations in pressure that could be expected with the long turbine pipe and above all of the very difficult ground conditions, they opted for ductile cast iron pipes from TRM. There is no other pipe material that provides such large safety margins. To allow for the rocky terrain, pipes with a cement mortar coating were used for two-thirds of the pipeline. The part of the pipeline that was laid below roads and footways is protected by a polyurethane external coating bedded in gravel, to prevent the pipes from being damaged by the coarse material produced by the digging out of the rock. The entire pipeline is of DN 400 size. After the time-consuming laying work, the final results were very satisfying. "In the end everything went very well. There are no high spots at all along the pipeline so it is virtually self-draining", was the report that Josef Grasegger, Head of the Electricity Department at Garmisch-Partenkirchen's Municipal Utilities Authority, gave to the trade magazine zeK (Zukunftsenergie und Kommunaltechnik – Energy for the Future and Technology for Local Authorities) in its October issue.

The Esterberg springs

Laying work in rocky terrain

The run of pipeline just before the generator building

Successful entry into operation

A trial run of the system has been going on since January 2009 and there have been no faults. With the given head of 502 metres and a design flow of 154 l/s the nominal output is 636 kW. The electricity generated is fed onto the network that Garmisch-Partenkirchen's Municipal Utilities Authority itself operates. The power of the Esterberg springs is expected to generate around 3.1 gigawatt hours of clean electricity every year. The system at the foot of the Wank mountain thus looks to be a very economical proposition. The municipality, with its new power station able to generate enough electricity for roughly 700 households of four people, will eventually be able to take advantage of the new feed-in tariff of 12.67 cents/kWh which came into force on the 1st of January this year. This means that in less than 10 years the system should have paid back the entire investment cost of 1.73 million Euros.

The new power station also saves the atmosphere from some 2960 tonnes of carbon dioxide every year. And it can still do its job as an emergency supply of drinking water. There is a branch pipe installed in the pressure pipeline so that, if it comes to it, a switch can be made at any time from the supply of electricity back to the supply of drinking water.

For this ski-sports centre in the Werdenfelser Land, the power station is one more way of boosting its energy self-sufficiency. And the effort to be self-sufficient is continuing. The intention is that in ten years the municipality, which has 26,000 inhabitants, will itself be producing around 40% of the energy it uses.

The Estergebirge mountain range

Anyone who drives from Munich in the direction of Garmisch-Partenkirchen and has reasonable weather will see the Estergebirge mountain range in all its majesty. A steep, forbidding face which extends to heights of up to 1300 metres stretches from Eschenlohe to Partenkirchen. For many people however the range is just a blank spot on the map and is very much overshadowed by its famous neighboring range the Wettersteingebirge, which contains Germany's highest peak, the Zugspitze. The Estergebirge range is part of the Northern Limestone Alps and is one of the largest continuous regions of karst in the Bavarian Alps. In this region, rainwater and melt water disappear into cavities and fissures, collect below the ground and finally return to the surface as a karst spring. The best known of these is the Kuhflucht spring on the south-west face of the Hoher Fricken mountain, which has a catchment area of around five square kilometres and is situated in the middle of a vertical wall of rock. Water literally shoots out of the mountain there, particularly while the snow is melting or after heavy rain. After a long dry spell or in winter the water level drops in the system of caverns and then the unassuming massif, which has the Krottenkopf as its highest peak, becomes the stuff of dreams for speleologists and potholers. Some of the underground systems have still not been explored even today.