

A helicopter is shown in flight in a vast mountain valley, with a long cable extending from it down towards the ground. The background features rugged mountains under a blue sky with scattered clouds.

## *Putting water to work to generate electricity*



*Hydroelectric power stations powered by drinking water have a long tradition in the Alpine countries. Even before there was a public electricity system, hoteliers in the Engadin were putting turbines in water pipes to allow them to offer their guests electric light. Since then, this simple way of generating electricity has become more and more widely used. In Switzerland alone, around 100 new drinking water hydroelectric power stations have been built since 1990. Because the production of electricity does not affect the quality of the drinking water, it represents a welcome source of additional income for many water supply utilities. Also, hydroelectric power itself as a source of energy is becoming increasingly important as it offers many advantages from an environmental point of view. The energy generated in drinking water hydroelectric stations is one of the most environmentally compatible energies of all. It is 100% renewable, almost free of CO<sub>2</sub>, and does not require any additional interference with the natural hydrologic balance. When drinking water hydroelectric stations are built or set up there is generally minimal effect on the natural environment. Suitable locations for power stations of this kind can be found not only in high mountain ranges where there are large differences in altitude between the points at which spring water is extracted and those at which the drinking water is stored but also in more low-lying regions. Even a pressure head of 50 m and a volume of water of 500 l/min may be enough for the economical and environmentally friendly generation of electricity.*



## ***Ductile cast iron turbine pipe for the Niedergesteln drinking water hydroelectric power station in the Swiss canton of Wallis***

This trend – putting water to work to generate electricity – is one that has also been followed by the community authority of Niedergesteln in the Swiss canton of Wallis. In 2007 the company TWKW Trinkwasserkraftwerke Niedergesteln AG was founded with the aim of powering a turbine with its drinking water from the spring regions at high altitude and producing “green” electricity for the inhabitants of this village nestling idyllically at the foot of the mountain known as the Gestelnburg. Construction of the power station was planned in two stages and, when fully developed, it will generate about 4.1 million kilowatt hours of electrical energy. The investment costs were 8.6 million Swiss francs. Work on the first stage of development began in the late summer of 2007 and a ceremony was held to put the complete plant into operation on 23 November 2008.

The construction of the power station consists of a bottom stage (Tatz to Niedergesteln) and a top stage (Chiemattbodü to Tatz).

Because of the maximum operating pressure of around 80 bar in the first stage and the difficult terrain, there was really no question at Niedergesteln – or indeed at many other hydroelectric power station projects in the Alpine countries – of any other pipe material being considered. It had to be ductile cast iron pipes! Nor, to be on the safe side, could any other material, any other joint than the BLS® restrained joint or any other coating than the ZMU (which is called the FZM or fibre cement mortar coating in Switzerland) be contemplated in view of the variations in pressure which could be expected given the long turbine pipe. This is why BGW's Swiss sales partner, TMH Thomas Hagenbucher, was given the contract for the complete supply of the pressure pipe.

The laying work began in the spring of 2007. In stage one, a DN 200/250/300 pipe of a length of 2,157 metres was laid. This was followed by 3,061 metres of nominal sizes of DN 250/300 in stage two.

In the steep terrain, the installation work was a major challenge to both men and material. The only means of access to the majority of the region covered by the installation site was hiking tracks, so the pipes and equipment had to be flown in by helicopter. The helicopter shipments by Air Glacier and Air Zermatt carried on week after week and both the locals and tourists would stop to stare at the pipes suspended from the helicopters by heavy cables. Special excavators had to be used because of the confined spaces in which work had to be done. In addition, a 16 kV cable, a control cable and a cable protecting pipe had to be installed on the same route. The entire line followed by the pipe was selected to avoid any reverse gradients. This has advantages for draining and the prevention of built-up deposits but it did mean that the pipeline had to be run below the Jolibach stream and that there was no way of avoiding laying it along a wall of rock. However, at the end of the day, none of this was a problem, either for the experienced teams from Martig + Bürgi AG, Raron, Schmid Bautech AG, Brig-Glis, and Bregy Haustechnik AG of Steg, or for the ductile cast iron pipes, which are well known to take this sort of thing in their stride. Some 30 metres of pipe could be laid each working day. Even so, people did breathe a sigh of relief when the final testing of the pipe prior to commissioning went off well and no faults were found. As well as improving the energy supply of the Niedergesteln district, the drinking water hydroelectric power station has also increased its drinking water capacity by 60%.

