



100%

clean energy
equivalent to the
consumption of
16,000 households

ENGINEERING
TOMORROW

Danfoss

Case story | VACON® NXP Liquid Cooled

Maximum power for excavating uphill tunnels

The situation

FRANCE: Powerful VACON® NXP drives power the Tunnel Boring Machine (TBM) used in construction of a new hydroelectric power plant in the Alpe d'Huez region. The Italian contractor Cogeis operates this TBM to dig a tunnel with a 22% gradient. It's part of an innovative project which will deliver 100% renewable energy to the grid.

The hydroelectric power plant will integrate perfectly into the landscape, thanks to almost entirely underground systems. Tunnelling in this region requires the use of cutting-edge construction techniques, capable of overcoming the challenges posed by working in the difficult alpine environment, without disrupting the local tourism industry.

"La Sarenne" tunnel

An underground tunnel 2700 m long, with a gradient of 22%, climbs to the water source near the power plant intake.

The challenge

A refurbished TBM

For this project, Cogeis supplied a completely renovated TBM.

Paolo Bresciano, Technical Manager of the project, explains:

"There were many aspects to deal with:

- considerable slope that significantly impacts the distribution of the forces involved*
- the very limited space available at the access points to the construction site*
- 'electrical' factors*

All these challenges led to a total renewal of the equipment, which allowed us to obtain performance and flexibility far superior to those possible with the original configuration".

The TBM purchased by Cogeis used a configuration of **5 motors of 225 kW each**, connected to a gearbox through clutches, to drive the rotating head.

The solution

*"Because we wanted to keep the original motors designed specifically for this TBM, the solution proposed by Danfoss and Gatta Srl, DrivePro® Service Partner, is based on **VACON® NXP Liquid Cooled** drives, which have a very simple and effective load sharing management capability."* explains Paolo Bresciano.

*"**The drives control allows us to choose the rotation speed of the cutter with maximum flexibility, based on the expected conditions of the rock in the various stages of excavation progress.**"*

The motors were not originally designed for use with AC drives. Therefore, specially designed dU/dt filters were integrated to optimize motor control: Construction of the electrical panel was designed by the engineers from Danfoss Drives Italy, who delivered all equipment ready to be installed on the TBM.

In addition, Danfoss provided **DrivePro® Extended Warranty** services, giving a warranty extension of up to 6 years, the longest in the industry.

The outcome

Renewable energy at the end of the tunnel

The complex La Sarenne project is currently in full swing and excavation of the tunnel has started under the best conditions. The Cogeis TBM runs under the thrust of Danfoss drives. Upon completion of the tunnel, it will be extracted from the top and disassembled, ready to face new challenges. Thanks to the flexibility of the drive solution, it can be quickly prepared for transport to a new excavation site.

In 2024, the Compagnie Nationale du Rhone will be ready to feed 36 GWh 100% renewable energy into the grid annually, equivalent to the electricity consumption of 16,000 families.

36 GWh

estimated annual
hydroelectric
power
production

"It was a very satisfying job, because we were working together, each in our own role, 'speaking the same language', which also allowed us to respect the very stringent execution times for the realization of this project."

Paolo Bresciano Technical Manager, Cogeis Spa

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