



## Pumped Storage Plant Limberg/ Kaprun III (AT) Pressure Tunnel - Grouting

<b>Employer</b>	Verbund AG, Naglergasse 31, 1010 Vienna
<b>Client</b>	ARGE/ JV PSW Limberg III, Kesselfallstrasse, 5710 Kaprun
<b>Execution of the work</b>	Renesco GmbH, Department Marti Geotechnik
<b>Designer</b>	Verbund Hydro Power, Geoconsult ZT, Tractebel Engineering
<b>Construction Period</b>	January 2023 – December 2024
<b>Contract sum</b>	Approx. 6'000'000 EUR

## Project Description

The Limberg III pumped storage power plant in the municipality of Kaprun in Salzburg is part of a larger group of storage reservoirs and power plants. The new headrace will run underground from the Mooserboden reservoir over a length of 4.3km to the cavern, which is 450m lower.

## Key dimensions / special features

### Inlet Tunnel

- Consolidation & Contact Injections
- Length: approx. 750m

### Headrace/ Pressure Tunnel

- Consolidation & Contact Injections
- Hybrid injections in the fault zone (cement with polyurethane)
- Length: approx. 3,200m

### Pressure Shaft:

- Consolidation & Contact Injections
- Gradient: 90%
- Length: approx. 580m

### Tailrace Tunnel

- Consolidation & Contact Injections
- Length: approx. 500m

Number of boreholes: 14,000 pcs

Cement suspension: 700,000 l

Polyurethane (PUR) resin: 6,000 kg

## Hybrid Grouting

In the newly developed, hybrid grouting method, the cement suspension is mixed with PUR resin directly in front of the borehole. The proportion of PUR resin usually varies between 0 and 40% and can be continuously changed during the grouting. The resin pump is switched on and off automatically. The innovative injection control allows the positive properties of cement and PUR resin to be precisely tailored to the hydrogeological rock conditions. If the pressure in a borehole immediately increases when the pure cement suspension is grouted, PUR resin is not added because the small cracks are sealed by the cement suspension. However, if the grout material flows away without an increase in pressure or if there are leaks, PUR resin is added. In conclusion - the hybrid PUR supported cement suspension can seal even larger cracks with high water ingress. The small cracks are penetrated with pure cement suspension in the same operation.



1. Panorama view, Mooserboden reservoir/ dam
2. Grouting System in the Pressure Tunnel during transition of the concrete transport for the inner shell
3. Gout Pump Container including monitoring equipment