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REPRESS

Tunnel project in Slovakia opts for complete GIA line-up

To speed development of a new talc mine in Slovakia, main contractor Skanska BS AS used a complete line-up of GIA tunnelling equipment in drill and blast operations for a 4.2 km access tunnel featuring a cross sectional area of just 11.5 m².

A complete 'line-up' of GIA tunnelling equipment comprising two locomotives, four shuttle cars, and a crawler-mounted 9HR/B Haggloader, were used by Skanska BS AB for excavation of a 4.2 km-long Slovakian tunnel with a cross section area of just 11.5 m².

The tunnel will provide access to the mineral in a new talc mine in Gemerska Polona, Slovakia for VSK Mining.

Located in the foothills of the Low Tatra mountain range with heights of up to 2,043 m and some 70 km east of Košice, the mine is expected to produce 600t /day once production gets underway: with estimated reserves for 30 years.

Following initial explorative investigations Skanska had anticipated good rock conditions, but quickly encountered very poor class B2 and B3 rock which caused a two month delay in the 24 month tunnelling contract.

Throughout the 4.2 km-long tunnel Skanska met five classes of rock ranging from A1 and A2 magnetite, with a Pascal factor of 150, and granite plus badly fragmented B1, B2

and B3 rock containing muds, voids and water.

It was, in fact, progress through an unexpected 150 m-long section of B3 classification which caused the delay, and resulted in redesign of the support system comprising steel arches, mesh and dry shotcreting.

When experiencing B3 conditions, the contractor has since been able to achieve advance rates of up to 8 m/day compared with the specified 6 m/day.

“We are therefore almost 40 days ahead of the original schedule” said Project Manager Mariân Oravec confirming that this was “due to the highly efficient combination of the GIA Haggloader feeding three shuttlecars in the confined 11.5 m² tunnel.”

“It is a highly cost effective system for a tunnel with this small cross section area,” he added.

The GIA system was specified by VSK Mining following experience and recommendation by the project consultant Werner Steck following its use on a tunnelling project in Austria where he achieved an advance rate of 621 m in 26 working days.

Skanska also has considerable experience of the tunnelling system.

The tunnel features a finished size of 3.2 m width and a maximum 3.6 m height throughout the A1 and A2 class rock with Skanska drilling up to 3.5 m x 3.8 m in the B class conditions; using an Atlas Copco 282 Raildrill with two boomers.

Complying with local mining regulations, 6 m-deep passing bays for twin rail tracks and switching facilities, are located at 300 m, 1.5 km, 2.5 km and 3.5 km along the 4.2 km tunnel.

To date, Skanska has completed 3.6 m including a dry shotcrete applied manually – which in the worse cases including two net meshes - can be 30 cm thick. The contractor is also shortly expecting to encounter A1 class granite which underlies the talc ore body.

A four cycle/day operation including drill, blast, removal, cleaning, and 'making good' is being met by Skanska.

Following the drill and blast operations, the GIA 9HR-B backhoe Haggloader is brought in to remove the blasted 'spoil' feeding it onto the units overhead conveyor system to load the three 11.5m³ capacity shuttlecars.

Haggloader

The GIA Haggloader was considered to be the ideal loading machine for the 11.5m² 'face' area according to the Project Manager, Mariân Oravec. The crawler - mounted 9 HR-B option was also chosen by the contractor to allow access up the ramp when reaching the ore body.

At the start of the tunnel excavation Skanska had relied on a rental 8HR Haggloader with a dual digging arm system until delivery of its purpose ordered 9HR-B featuring an 85 litre backhoe bucket late last year.

For work in the drift and tunnel, the rail system, in combination with the shuttlecars and locomotive, is preferred - but once operations in the ramp leading to the ore begin, the slope will be too steep for the trackbound equipment, and the Haggloader will revert to crawler mode.

Use of the preferred bucket attachment by Skanska, instead of the two digger arms, allows excavation of a narrow drainage ditch along one side of the tunnel for water 'run off'; at times up to 50 litres per second. A gradient of 3 mm/m along the tunnel length ensures efficient water 'run off.'

The backhoe digging bucket is also particularly useful when handling soft rock and cleaning the tunnel floor and walls.

When used in conjunction with its built-in conveyor the Haggloader is able to continuously load the blasted 'spoil' from the face into the GIA shuttle cars in an uninterrupted, spill-free loading operation; offering loading capacities of up to 3 m³/h.

Shuttle car operation

Utilizing three GIA 115 CE shuttle cars allows loading from car to car using internal conveyors to ensure the fastest loading system possible

With each 1700 mm car featuring an 11.5 m³ (22,000 kg) capacity along its 11.2 m length, use of the three cars connected together allows Skanska to transport up to 34.5 m³ (66,000 kg) of 'spoil' in a single trip without time consuming car switching.

Up to eight cars can be coupled to suit different size construction sites and, by matching the number of cars to the volume of blasted rock, it is possible to transport up to 100 m³ of spoil in a single trip.

The shuttle car floor is lined with Hardox 500 wearparts to ensure long life and low service requirements.

Remote controls allow up to eight shuttle cars to be operated by a single operator.

At the discharge pier outside the tunnel all three shuttle cars, utilizing the internal conveyor system, discharge the 'spoil' from the front car in an operation taking less than five minutes.

The shuttle cars feature specially designed bogies with centre suspension and rubber springs which contribute to a smooth and safe running of each car.

This results in minimising the risk of derailing even when running on uneven tracks.

The centre suspension features a well-protected Teflon bearing which requires virtually no maintenance.

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The 'cars' are 'hitched' to a GIA DHD20 hydrodynamic diesel locomotive which offers high productivity and easy operation and service. It has a maximum speed of up to 30 km/h but the system allows 12 km/h.

The 20,000 kg class locomotive is powered by a 144kW engine. Skanska are also using a GIA DHD15 shunting locomotive.

VSK Mining

VSK Mining is a joint venture operation with partners in Slovakia, Cyprus and Austria. Its activities include 23 aggregate quarries and an underground gypsum operation across Slovakia.

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