Gotthard Basis Tunnel
Sedrun Lot 360, Switzerland

Logistics System: Heading Installation Gotthard South – VGS
Continuous Conveyor Facility; South-East and South-West

Editorial

Dear Readers

With this issue we will introduce you to the Project Sedrun Gotthard Basis Tunnel, Lot 360. The current and long-term goal of Rowa, to consistently mechanise conventional headings, is especially clear in the case of Sedrun. In this issue you can read how Rowa has developed and implemented two highly mechanised heading installations with continuous conveyor facilities for the advance in a southerly direction into the Gotthard massif.

Your Rowa Team

Project

The segment Sedrun, Lot 360, comprises the construction of a multi-function station and 2 tunnel tubes with a length of 7.8 km of the 57 km long Gotthard Basis Tunnel. The contract section includes the geotechnically most demanding conventional excavation segments in the whole of the Gotthard Basis Tunnel. Made accessible over a 1 km long access gallery and two 800 meter vertical shafts, the multi-function station Sedrun is being constructed. In this, all necessary technical installations, emergency stopping points and crossover facilities for railway operations are to be established. From the multi-function station both tunnel tubes, direction north to Faido and direction south to Amsteg, are being excavated conventionally. Supply and disposal for the underground construction site is provided for over the vertical shafts.

Assessment of the Client

Christian Krauer, Construction Site Manager Arge Transco-Sedrun
Dipl. Ing. Dipl. Builder / KMU HSG

Thanks to intensive cooperation and joint development, based on the hitherto good experiences made with multi-function heading installations in the north headings, a modern and highly mechanised heading and logistics facility emerged despite high time pressure.

The combination of advance and concurrent follow through with base invert concreting, the high level of mechanisation and the division of material flows onto continuous conveyor and rail systems has had productivity raising consequences and brings clear improvements in regard to work safety and health protection.
Assignment to Rowa

On 9th December 2004 Rowa received from ARGE TRANSCO-Sedrun (Batigroup AG, Frutiger AG, Bilfinger Berger AG, Pizzarotti SA) an assignment for two heading facilities for the drill and blast heading in the direction south. During the design and development phase for the heading facilities Arge Transco decided to carry out the disposal of excavation material with continuous conveyor belts instead of with dump trucks. On 15th June 2005 Rowa received an order for the delivery of a continuous conveyor belt system South-East and South-West. These heading facilities with conveyor belts represent, due to the mechanisation in the drill and blast heading, a decisive factor for the success of the headings.

Civil Engineering Requirements

- Consistent mechanisation of supply and disposal with a thought-out logistics concept from the driving face into the multifunction heading installation.
- High daily headway
- Follow through of concrete floor in the heading
- Crushing of excavation material in the heading
- Efficient waste disposal system
- Ventilation and cooling
- Dust elimination
- Work safety and health protection
Heading Installation Gotthard South – VGS

Disposal – Excavation Material
The excavation material is crushed in the heading by means of an installed on site impact roll crusher and disposed of onto the towing conveyor. The towing conveyor bridges the base invert construction site and delivers the material onto the conveyor belt. The overlap of the towing conveyor to the conveyor belt amounts to 150 meters. The conveyor belt is therefore extended for every 150 meters advance. The preconstruction of the conveyor belt takes place during the advance, parallel to the work of railtrack extension.

Provision & Supply
The provision of shotcrete, rock securement material and building materials takes place by rail operation from the multi-function installation to the heading installation. From the rail track the Rowa heavy duty crane, with 20 tonnes bearing capacity, supplies the base invert construction site and the heading. Through the high bearing capacity of the crane all necessary material transportation can be carried out.

Ventilation / Cooling
On account of the high demands on ventilation and cooling in the heading a telescopicable suction ventilation has been developed and installed. The innovation lies in the combination of fresh air provision and suction with a telescopicable air ducting system. The main benefits of suction ventilation lie with:
• Immediate removal of detonation smoke
• Fresh air at the construction site base invert concreting
• Dust removal when clearing debris
• Fresh air provision in the free cross section area by the suspended platform in direction of the heading
• Heat disposal through the suction ducting
• Cooling machines in the free cross section (high flexibility: in location and number)

To prevent the telescopic tube being damaged during detonation it is pulled back ca. 36 meters. The outer and inner tubes are suspended on a proven suspension track system.

There are thus two main positions for the telescopic ventilation:
• Telescopic tube extended: ca. 10 meters before the rock face (work location)
• Telescopic tube withdrawn: ca. 46 meters before the rock face (by detonations)
Continuous Conveyor Facility SBA South-East / South-West

The material from heading east is transported over the conveyor belt east directly to the loading facility in the multi-function station. The material from heading west is disposed of onto conveyor belt west to the construction logistics cross passage, from there over a cross belt in the construction logistics cross passage onto conveyor belt east.

The drive and tensioning unit of conveyor belt east is installed in the multi-function station, the drive and tensioning unit of conveyor belt west by the construction logistics cross passage Nr. 5.

Loading Facility

The loading facility in the multi-function station can load material directly into the dumper wagons. The reversible belt is fitted with a flap in the drop funnel which permits the loading of two dumper trains made up of 6 wagons standing parallel to each other.

If required the material can also, using the reversible belt, be dumped into the bunker. The loading of material from the bunker into dumper wagons takes place with plant equipment.

Advantages of Conveyor Belts

With a conveyor belt operation the heading performance lies considerably higher. The reasons lie in higher availability, less waiting time for trains, higher productivity and a reduced personnel requirement.

The consequences for the remaining tasks from a conveyor belt operation have positive effects not only on the performance but also on the higher productivity. Considerably less obstructions are caused. The capacities of the transport routes and the means of transport must not be subordinated to the heading.

The reasons for the still comparatively large number of serious accidents in tunnel construction lie to a large extent in the transport systems. Tight space conditions and large transport volumes for supply and disposal have, as a consequence of rail and/or pneumatic operations, a high frequency and a tunnel cross section filled to the limits.

Dependant on the situation, the air burdening and thus the consequences on the «tunnel climate» are substantial. The results are a reduced work performance and an increased danger of accidents.