

## THE LONG MARCH THROUGH THE MOUNTAIN

### CASE STUDY: GOTTHARD-BASIS-TUNNEL, SWITZERLAND

It will be the world's longest railway tunnel: the Gotthard base tunnel has been driven through 57 km of mountain mass in Switzerland, to connect Erstfeld in the Canton of Uri with Bodio in the Canton Ticino. Its goal is to speed up passenger transport and to ease freight transport. The first blasting of the tunnel was executed in 1999, the commissioning is at present planned for the end of 2016. To ensure as much safety as possible with the intended high capacity of utilization, alkitronic<sup>®</sup>'s electric torque multiplier EFCip was used for the construction of the tracks.

#### COMPANY PROFILE

Building contractor of the Gotthard base tunnel is the AlpTransit Gotthard AG, a subsidiary of the Schweizerische Bundesbahnen (SBB). In May 2007 they assigned the Arbeitsgemeinschaft (ARGE) Transtec Gotthard with the order to equip the two one track tunnel tubes as well as the following sections north and south up to the existing railway system. 200 employees were occupied to install the railway technology, and in October 2014 the last bolts were tightened on the track bed. Already for the end of 2015 and the beginning of 2016 the first test service runs are scheduled to go through the complete tunnel, and the wagons will go as fast as 220 km/h.

#### INITIAL SITUATION

Especially freight transport shall benefit from the new Gotthard base tunnel after the completion in 2016. According to plan, the new section will be used daily used by 220 to 260 trains, of which the major part will transport freight. This way transport

capacity on the route can be increased from 20 to nearly 50 million tons each year.

**260 trains daily and 50 million tons freight yearly shall pass from 2016 through the Alps, instead of until now over them**

Passenger trains will cross the 57 km at a max. speed of 250 km/h, reducing time of travel between Zurich and Milan by nearly an hour to 160 min.



Figure 1: Track construction work in the Gotthard base tunnel – Photo: © Alp Transit Gotthard AG

So far as many as 180 trains have to struggle on the route over the mountain every day, which is only accomplishable with less weight and with the help of a second engine. The new tunnel is nearly ground-levelled – its highest point is at 550 m above sea level, which is not much higher than the city of Munich. However, precise planning and execution of work are necessary in order to ensure high capacity of utilization.

Quality and accuracy during installation of the railway technology are a top priority to ensure the safety of trains and passengers in the tunnel tubes.

## SOLUTION

“Quality and accuracy – these are our cues”, explains Bruno Stoll, employee at alki TECHNIK GmbH. For more than 30 years the Bavarian company has been producing bolting systems with electric, hydraulic, pneumatic and manual drive. At the track-laying construction in the Gotthard base tunnel, three electric torque multipliers alkitronic<sup>®</sup> EFCip have proven in continuous operation since May 2012: “The high robustness, ensured by compact design and cast aluminium housing of the EFC motor, makes the EFCip an ideal tool on the vast building site in the Gotthard base tunnel,” says Stoll.



Figure 2: Der alkitronic<sup>®</sup> EFCip in operation - Photo: © Alp Transit Gotthard AG

Further advantages are the high repeat accuracy of  $\pm 3\%$  and the low-noise operation. In both tunnel tubes with each 57 km there was a total of 114 km of track work, where approx. 1.000 000 boltings were carried out. In the first step the track sleepers on the track system were automatically raised and affixed to the rails from below.

The two bolts on the side were loosened and the two clamps placed over the rail base. Finally bolting was made on both sides. In the past a standard impact wrench was used for tightening and a torque wrench for retightening.

**“With the alkitronic EFCip we could work three work steps in one, and with 1.000.000 joints have saved much time and energy” – Georg Jaffke, ARGE Transtec Gotthard**

“With the alkitronic EFCip the three work steps of tightening, retightening and examination were carried out in one single work step due to the pre-adjustable torque of 160 Nm and automatic shut-off” – Georg Jaffke, construction manager at ARGE Transtec Gotthard tunnel, was most satisfied with the torque multipliers: “We were very impressed with the saved work-time, and also the accuracy of the alkitronic torque multipliers. We can only recommend the tools.” In this way 31 m of track per hour were laid through the Swiss mountains – almost with Swiss clockwork precision.



Figure 3: The alkitronic<sup>®</sup> EFCip

### TECHNICAL DATA OF THE EFCip

- ✓ Operation possible in any weather
- ✓ automatic shut-off ensures torque accuracy
- ✓ brushless synchronous motor with minimal risk of failure
- ✓ ergonomic, stress-free working: no transmission of reaction forces to the user