

Tunnelling towards a superconnected Europe

The LTF, or Lyon Turin Ferroviare, is the first high-speed rail link in a series of EU-backed projects that will eventually see a complete hi-speed rail network connecting major European cities (from London to Milan on the North-South axis and Lisbon to Budapest, and eventually Kiev, on the West-East axis). The main portion of the Lyon-Turin rail link, which lies at the very heart of the proposed new network, will pass through a 53.1km tunnel through the Alps connecting Saint-Jean-de-Maurienne (France) to Venaus (Italy).

Penetrating deep into the mountains

Although work hasn't started on the main tunnel yet, it is progressing well in the access tunnels on the French side of the border. The two main access tunnels at La Praz and Modane, along with a smaller tunnel sited at St-Martin-La-Porte, have been constructed in spiral formation to minimise the incline on descent. During the exploration phase the access tunnels provide vital geological information and allow access to the level of the future main tunnel. During construction they will provide a route for evacuating waste materials from the excavation process, and when the tunnel is in use (completion date scheduled for 2018) they will offer ventilation and access for maintenance and emergency teams.

Pumping problems call for innovative solution

Despite the spiral formation keeping the slope to a 12% incline, the length of the access tunnels and the composition of the terrain posed particular problems for the companies that pitched for the pumping contracts. The longest access tunnel at Modane will be 4000m long and will descend to the LTF site from an altitude of 1085m, creating an overall height differential of 360m that the water must be pumped up. Not only that but the nature of the terrain means that the water in question is very heavily saturated with clay and sand particles, which creates a difficult and abrasive liquid. The proposed pumping solution would have to meet these unique challenges.

The operating companies for the project are Razel, Bilfinger&Berger, Pizzarotti at the Modane tunnel and Spie Batignolles TPCI, Ghella S.p.a., Cogeis S.p.a in La Praz. After a lively pitch process, the pumping contracts for the two access tunnels was awarded to a French specialist pumping company, who proposed an ingenious solution using Tsurumi submersible pumps. To deal with the problem of high levels of particles in the water, mobile clarification stations have been installed every 1000m with centrifugal machine to filter the water. In response to the massive vertical pumping distance at the La Praz site, the proposed solution involved connecting six Tsurumi KRS822 pumps in parallel, each capable of pumping 33l/sec at 25m head. The operating companies opted for the Tsurumi solution because the KRS822 pumps are ideally suited for applications involving muddy or sand-drenched water. They come with 4-pole motors and turn at 1450 revolutions per minute – much slower than similar pumps with 2-pole motors – meaning that abrasion damage is kept to a minimum. Like all Tsurumi pumps they are also incredibly reliable.

Overall, 24 Tsurumi KRS series pumps have been ordered (12 at each site) and were installed in the two main access tunnels in January 2006. They will remain in the Modane access tunnel until August 2007 and in La Praz for a further three years. Once complete, the LTF high-speed rail link will cut passenger journey times between Lyon and Turin from 4 hours to 1 hour 45 minutes. Additionally, the LTF will handle the anticipated rise of up to 75% in trans-Alpine freight over the next 15 years. Currently 130 million tonnes of freight cross the Alps every year, the majority on trucks which cause extensive pollution problems in the Alpine region – it is hoped that the new Lyon-Turin rail link will carry over a million trucks every year, making a significant contribution to sustainable development.



KRS822



KRS-Pump in a cage, protected against rockslide



Water amount in the tunnel clearly visible, KRS in the background



Mud from the tunnel water in the sedimentation basin



Dewatering using a Tsurumi-Boosterpump

Za dodatne informacije kontaktirajte:

Mr. Birger Schmidt, Marketing
Tsurumi (Europe) GmbH
Wahlerstr. 10
40472 Düsseldorf

Nemačka

Tel.: +49 211 417 9373

Faks: +49 211 479 1429

E-pošta: sales@tsurumi.eu

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