

Site report

11 BSA concrete pumps in operation at 3 ICE tunnel construction sites

Putzmeister



One of the 11 BSA's placing concrete in a cross tunnel in the Irlahüll Tunnel

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Work is progressing well on the “Road Project German Unity No. 8” between Nuremberg and Munich. The project involves an extension of the express rail connection (ABS) from Munich to Ingolstadt (82 km) as well as the 89 km Intercity express route (NBS) from Nuremberg to Ingolstadt. On the 15.6 km long contract section Centre, up to 11 stationary Putzmeister BSA concrete pumps are simultaneously in operation.

The new high-speed section will connect Berlin with the Bavarian capital via Halle/Leipzig and Erfurt from 2006. The 171 km rail track between Nuremberg and Munich around the NBS section is designed for speeds up to 300 km the hour

and will reduce travelling time between the two cities from 102 to just 64 minutes.

In order to avoid carving up the landscape any further, the new 89 km ICE track from Nuremberg to Ingolstadt will for the most part run parallel to the A9 motorway.

Of all the contract sections, the Los Mitte especially features many tunnel construction sites. This section is approximately 18 kilometers long and is being built by the HOCHTIEF company. It consists of three long tunnels totalling 15.6 kilometers in length: the Irlahüll Tunnel (7,260 m), the Schellenberg Tunnel (650 m) and the Eulerwang Tunnel (7,700 m) plus the construction of 13 emergency exits with around 8,000 access galleries, some of which are trafficable. The tunnel



Graphic showing the route of the new Intercity express link between Nuremberg and Munich (Graphics: DB Projektbau)

construction works are being carried out by the ARGE Tunnel Los Mitte HOCHTIEF/ALPINEBAU (Deutschland).

The NBS Nuremberg-Ingolstadt tunnels have an excavated cross-section of around 140 m² and were driven with crown and bench using the drill and blast method. The tunnel tubes are built to accommodate dual tracks and a direct or indirect emergency exit is accessible every 1000 m along the distance of the tunnel. The special geological conditions (including cavities in the karst rock being tunnelled) of the Irlahüll Tunnel required in some sections additional drift walls with follow-up crown and bench as well as tube protection measures during driving work under A9 Motorway where the overlying ground was just 10 meters thick.

Complex concrete internal shell

The tunnel is a double-walled construction consisting of a 25 to 35 cm thick shotcrete outer shell reinforced with concrete steel mesh and a 35 to 50 cm thick interior shell of cast-in-place concrete. In between the two shells is a sealing foil. The vault of the tunnel is divided up into 12 m long blocks in each of which approximately 200 m³ concrete is placed.

The concrete for the Los Mitte section is made in three mixer units, using concrete formulations for the mixes based on a combination of Portland cement and fly ash. ARGE decided to use an additive combination of polycarboxylatether (a new generation of plasticizing admixtures) and an air-entraining agent to obtain and maintain the targeted workability. Depending on the application, the cement contents are between 320 and 240 kg/m³.

The Putzmeister Group

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The German Federal Bureau of Railways approved each single case for all of the concrete formulations.

The tunnel vault in the Los Mitte section is constructed using formwork transport wagons each equipped with two attached wagons for secondary re-working.

The humidity in a standing layer of air in these secondary wagons can be kept at a high level. This guarantees optimal hydration in the concrete layer near to the surface. Furthermore, the layer of air acts as heat insulation and thus protects the concrete from temperature shock which could lead to cracking.

Enormous quantities of concrete required

ARGE Tunnel Los Mitte deployed up to ten stationary PM BSA 1408 E concrete pumps and one BSA 1005 D for concreting the different sections of formwork. The machines are needed to pump enormous quantities of concrete for the inverts (totalling approx. 262,000 m³) and vaults (totalling approx. 231,000 m³) at the same time into several places at once in the three tunnels, including the emergency and connecting galleries. In addition, around 157,000 m³ concrete have to be transported for other filling in work. The concrete is pumped through type 125 delivery lines, some of which are 400 m long and handle uphill grades of up to 10 %.

Directly on site if necessary: PM Services and wear parts

Roland Ebner, machine foreman at ARGE Tunnel Los Mitte is obviously more than satisfied with the reliability of the BSA pumps and the customer service which is on call whenever needed. "The con-



Some of the BSA concrete pumps are 400 meters away from the placement site

crete pumps are not being spared even when we do take care to see that the machines are regularly serviced. We take on the lubricating service of course ourselves – for other tasks, we are helped on request by the Putzmeister branch in Munich (Eching). That holds good too for all the usual customer service intervals as well as for prompt delivery of spares such as spectacle wear plates and wear rings. When we order today, the parts are guaranteed to be on the construction site the following day!"

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