

KEMROC planer EX 45 HD

# TUNNEL RENOVATION REDEFINED

During renovation of the Hasselborner Tunnel in central Hesse, Germany, the contractor Baresel used a method they hadn't tried before. Parts of the tunnel lining had to be removed and those areas were subsequently to be shotcreted in preparation for a new tunnel lining including a plastic membrane. Using a KEMROC patch planer, Baresel were able to grind away the required sections quickly while achieving precisely the required surface profile.

The 1,300 m long Hasselborner tunnel in central Hesse, Germany has a long history. Constructed between 1910 and 1912, the lower section of the tunnel was natural stone while the tunnel crown, from 9 to 3 o'clock, was constructed with masonry bricks. Today the single track, non-electrified railway tunnel is located on the Taunus line connecting the towns of Grävenwiesbach and Hasselborn, to the west of Frankfurt am Main. After about 100 years in operation, renovation of the tunnel lining was necessary to prevent water seeping into the tunnel, to maintain safety standards and to ensure a working life of another 50 years. The contract for this work was granted by the client, HLB Basis AG (Frankfurt am Main), to the contractor Baresel GmbH (Leinfelden-Echterdingen), who have earned an extremely good reputation for their tunnelling and renovation projects carried out all over the German speaking region.

In addition to demolition, drilling, shotcreting and anchoring, the specialists at Baresel had to have a plan to grind sections of the tunnel crown in preparation for installation of new tunnel lining including a plastic geomembrane at those locations. As early as the calculation phase, it had been decided to include a KEMROC milling machine as the most suitable type of grinder in budgeting a cost for the project. After the contract was awarded by the tunnel operator, HLB Basis AG, the Baresel Maschinentechnik Tunnelbau Team (MTT), led by Josef Galster and the KEMROC Team, led by Managing Director Klaus Ertmer had detailed technical discussions to determine the correct milling attachment for the excavator to be used. In conclusion it was decided to go with the KEMROC patch planer type EX 45 HD. This increased the number of KEMROC attachments in the BARESEL equipment park. The main factors influencing the decision was the expected high production rates and minimal wear or potential damage to the excavator or the surrounding brick lining due to the low vibration characteristics of the milling attachment.

## Precision over a large area

Among other things, KEMROC patch planers were designed to repair asphalt surfaces or to remove layers of concrete or screed. With eight models, there is a planer to fit all carriers in the 1 to 23 ton operating weight range. Depending on the material to be ground, different designs of drum and tooling can be fitted. Whether mechanical or hydraulic depth control is chosen, the



At the Hasselborner tunnel renovation project in central Hessen, Baresel used a KEMROC patch planer mounted on a railway excavator.



Where required, the KEMROC EX 45 HD was used to remove a 25 – 30 cm deep layer from the brick tunnel lining in the crown of the tunnel.



Productivity meets accuracy: the mechanical or hydraulic depth control assures a constant cutting depth while working with the KEMROC attachment.

cutting depth is accurate to the nearest millimetre with maximum depth of 190 mm, depending on the model. At the Hasselborner Tunnel, the brickwork layer to be removed was expected to be constant at between 25 and 30 cm, so the version with mechanical depth control was chosen.

In principle, EX planers can work at any inclination, horizontally, vertically and any inclination in between, even overhead as can be found in some tunnelling applications. However, the limited space in the single track Hasselborner Tunnel was a challenge. In the narrow tunnel, only 5 m wide and 5.2 m high, the railway excavator cannot rotate and there was no room to manoeuvre the patch planer into position at the top of the tunnel. For this reason, the patch planer was mounted on a tilt-rotator. With the minimum amount of joystick movement, the excavator operator was able to get the planer into the correct position along the tunnel lining. In practice, the operator placed the patch planer in the starting position, pressed the planer to the required depth into the brickwork and then drove 5 m along the length of the tunnel. The cut material fell onto a wagon that had been strategically placed in the tunnel. In this way, the contractor completed the grinding work in conjunction with the transportation of spoil material in one operation, leaving the work place clean. According to Baresel MTT, only in those areas where the bricks were made of hard natural stone, located at the very top of the tunnel crown, did they have to resort to using a hydraulic hammer.

## The new method prevails

According to their own conclusions, working with the EX 45 HD patch planer, Baresel MTT completed the project within a very tight, contractually binding time deadline set by Betra, the rules regarding operations and working. While the project in the Hasselborner tunnel was still underway and showing positive results, Baresel MTT took the decision to add a second KEMROC patch planer to the machine park for identical tunnel renovation projects in the Kalmut (124 m) and Talberg (144 m) tunnels near Boppard am Rhein. In these tunnels a similar amount of material had to be removed from the brick internal tunnel lining. In comparison with conventional methods such as cutting or hammering and the use of rotary drum cutters, Baresel MTT have concluded that from their experience with patch planers, they consider them to be economical, effective and non-destructive. ■

### Publisher

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EX planers can be used to work overhead. But to orientate the patch planer correctly in the narrow Hasselborner Tunnel, a tiltrotator had to be used.



In comparatively soft brick, there was very little wear of the tungsten carbide tipped teeth on the cutter drum, resulting in very low operating costs.