

An overnight OPA job – Wirtgen Group technologies pump up the speed

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During rehabilitation of the A1, Wirtgen Group machines worked hand in hand, paving thin layers and carrying out fine milling work. The new high-quality surface course was paved economically in just 42 nights, as opposed to the scheduled 55.

Around 15 years ago, Straßen.NRW had the first section of federal highway paved with noise-reducing open-pore asphalt on the A1 between the Westhofen interchange and the Dortmund/Unna junction in the Ruhr region – by far the most densely populated area in Germany. By 2016, the surface course was worn and the three-lane highway including the hard shoulder needed rehabilitation. On the right-hand lane and the hard shoulder, the binder course also needed replacing.

Project planners wanted to prevent full closure, as this 7.2-km highway section is one of the main arteries of the German federal highway system and is used daily by an average of 100,000 vehicles in each direction, with heavy goods vehicles accounting for around 17% of this total. In the end, the starring roles in the project fell to Wirtgen milling machines and Vögele pavers, which took to the road each night and rehabilitated the asphalt pavement section by section and lane by lane. Some of the mix was supplied by a Benninghoven mixing plant. They all did an excellent job – so excellent, in fact, that the project was completed after just 42 nights.

Innovative rehabilitation concept

To minimize traffic obstructions during rehabilitation, Straßen.NRW developed an innovative concept: Every night a 700 to 900-m section of each of the 3.75 m-wide lanes was rehabilitated when the traffic frequency was at its lowest in the hours between 8 p.m. and 5 a.m. Heike Gerlach, Head of Road Construction at the highway subsidiary of Straßen.NRW in Hamm, summarized the project as follows: “If you don’t notice during the day that there was a construction site here at night, then we have done our job properly.”

For the left and center lanes, this meant blocking the respective section, removing the surface course with fine milling drums, cleaning the milled surface, placing a SAMI layer (Stress Absorbing Membrane Interlayer), paving a new surface course, applying the road markings and cooling. There was slightly more to do on the right-hand lane, where cold milling machines removed the surface and binder courses in two passes. The

binder course material was then paved to a thickness of 12 cm. In another night shift, the right-hand lane and the hard shoulder of the highway were milled to a depth of 4 cm and replaced with a new OPA surface course of the same thickness. Next came the final step: creating 2 cm-deep joints at the seams. These ensure that the individual paved lanes are permanently bonded without impairing the drainage of water in the open-pore asphalt.

Hand in hand for high quality: Fine milling and thin overlay paving

GEHRKEN Straßen- und Tiefbau GmbH & Co. KG from Dortmund carried out the work as the general contractor and project coordinator. The company used Wirtgen Group machines for the key jobs. For example, the milling contractor GMS Fahrbahnsanierungen GmbH exclusively worked with Wirtgen cold milling machines – two large milling machines of type W 210i and the new compact milling machines W 100 CFi and W 150 CFi. After cleaning the milled surface, a Vögele SUPER 1800-3i SprayJet spray paver carried out two jobs at the same time: With the integrated spray module, it placed the new SAMI layer and immediately overlaid the new surface course "hot on hot" (thin overlay). Some of the asphalt for the job site was supplied by a Benninghoven BA 3000 mixing plant belonging to KEMNA BAU Andreae GmbH & Co. KG in nearby Kamen-Heeren.

The customer was thoroughly thrilled with the machine performance across the board. Engineer Udo Mattigkeit, Project Manager at Straßen.NRW, reported; "In the end, the machines proved even more efficient than previous calculations had led us to expect. This prompted our decision to extend the length of the sections after the first few nights, enabling us to rehabilitate up to 1,300 m per night. We ultimately finished the job 13 nights ahead of our original schedule. And the quality of the new surface course is absolutely superb."

Fine milling: Wirtgen large and compact milling machines create basis for thin overlay

One of the machines used was the W 150 CFi, the most powerful cold milling machine in the Wirtgen Compact Class. With its low transport weight, it can be conveyed on most roads without a special transport permit – a great advantage when it comes to providing flexible and fast milling services.

With a capacity of 283 kW and a milling width of 1.50 m, this front loader is ideal for larger job sites with limited space. In such conditions, the sophisticated vision concept combined with the camera systems help the machine operator to maneuver the milling machine. The many cameras around the milling machines were

particularly helpful to the operators when working on the A1 at night. "I can see exactly where the milled material lands in the truck. I can also recognize what is happening immediately in front of and behind the milling drum," explains Milling Machine Operator Jens General. The brilliant illumination of the entire working area of the milling machines by bright LED lamps is a further boon. The excellent visibility not only enhances safety, but also helps the operators achieve the required precision. A large front axle steering angle also ensures very small turning circles and the large conveyor slewing angles of 60° to the right and left make it possible to load material under difficult job-site conditions.

This model also features ISC (Intelligent Speed Control) to optimally deliver the power of the W 150 CFi to the road. Just like a traction control system on a car, the ISC prevents crawler track slip and guarantees maximum traction of all crawler units for the highest possible milling output.

Also on the job: two Wirtgen large milling machines of the type W 210i. With their excellent performance and precise milling and leveling processes, they are ideal for the economical execution of a wide range of milling jobs – such as fine milling on the A1.

Maximum surface accuracy with the Multiplex leveling system

Fine milling drums were specified for milling the 4 cm-thick surface course. GMS therefore opted to use type LA6 fine milling drums with two cutters per cutter row for this project. In contrast to a standard milling drum, it has 672 cutters instead of the customary 168. The 6-mm tool spacing creates a very finely structured roadway surface with a low peak-to-valley depth that ensures optimum interlocking of the milled surface with the newly paved layer. GMS also elected to use the Multiplex leveling system, which is particularly suitable for smoothing irregularities in a lengthwise direction during fine milling jobs. The system comprises several sensors which are mounted on either one or both machine sides (e. g. cable, ultrasonic and cylinder sensors) that measure the actual level of the roadway. The automated leveling system then calculates the average value from the results. The control system then automatically adjusts the milling depth on the basis of this value. This compensates longitudinal undulations highly effectively, delivering maximum surface evenness.

The milled surface was meticulously cleaned after milling with a suction and sweeping machine so that the Vögele SUPER 1800-3i SprayJet paver was able to spring into action a short time later. The spray paver was designed specifically for paving thin overlay on spray seal, "hot on hot" and for conventional paving with pre-spraying. It can, however, also pave surface and binder courses without activating the spraying module. In the space of two to three hours, the GEHRKEN team paved around 5,000 m² per night with an advance rate of 7 - 8 m/min. This left enough time for the pavement to cool and the markings to be applied, so that the newly

completed section was punctually reopened again for traffic every day at 5 a.m.

Paving thin overlay: Vögele SprayJet technology best choice for OPA surface course

A spray paver is particularly essential when paving OPA, as a SAMI layer (Stress Absorbing Membrane Interlayer) is required underneath the open-pored asphalt to prevent the base becoming wet. This layer channels the surface water out of the OPA surface course and routes it to the edges. The preferred materials are impermeable emulsions made of polymer-modified or rubber-modified bitumen. These layers only do their job when they are undamaged. For this reason, trucks are not permitted to drive over the sprayed-on film. Vögele SprayJet technology solves this problem by paving asphalt directly over the freshly applied bitumen film.

The SprayJet principle

To apply the bitumen emulsion evenly over the surface, the SprayJet paver is equipped with five spray bars. Three of the bars are fixed in place. They are located directly behind the push-roller between the two crawlers or behind the undercarriage on the right and left. A movable spray bar with seven nozzles is additionally mounted on each side. It ensures seamless emulsion application, even with varying pave widths. The rate of spread can be selected accurately within the range of 0.3 and 1.6 kg/m² – on the A1 it was 0.5 kg/ m². The color display supplies all vital information to the paver operator. The desired rate of spread can be entered very easily. The SprayJet nozzles operate in pulsed mode and the frequency of the spray pulses is adjusted automatically as a function of the selected rate of spread, pave speed and pave width. This guarantees a regular film that covers the entire surface.

The entire spraying equipment is designed as a completely self-contained functional unit. As a result, the new SUPER 1800-3i SprayJet can be used both as a spray paver and as a standard paver. Its maximum spray width is 6.00 m. As a standard paver without spray function, it can even pave widths of up to 9.00 m.

The pre-sprayed bitumen emulsion must “break” for it to fulfill its intended function. This means that the water it contains must escape. This process is aided by the use of special, fast-breaking, cationic, polymer-modified emulsions. It is sprayed from the SprayJet tank at a temperature of 70 to 80°C. When it makes contact with the mix, which is much hotter than 100°C, most of the water evaporates – the emulsion “breaks”. Any water still remaining in the bitumen emulsion can evaporate later through the pores in the asphalt layer.

SUPER 1800-3i SprayJet: Simple operation – High quality

In addition to the SprayJet technology, the SUPER 1800-3i SprayJet has everything that hallmarks a Vögele paver. For example, the sprung push-rollers reliably absorb all jolts from the feed vehicles, ensuring a high-quality, even asphalt surface.

Operation is also impressive: After just a few nights on the job, Paver Operator Dietmar Langer already perfectly mastered the machine that GEHRKEN had purchased expressly for this project. This is partly due to his experience as a road constructor, but also a result of the extensively self-explanatory, well-conceived operating logic. "Except for two buttons, operation is the same as on a normal Vögele paver – this is really great," he enthuses. Langer was also very satisfied with machine induction by the service technician from Wirtgen Windhagen, the Wirtgen Group subsidiary responsible. He also "supported the team for several nights so that we could work through all typical operations – that was super," the paver operator explains.

New asphalt: Benninghoven mix from the neighborhood

A product from the Wirtgen Group was also involved in producing the mix for several nights: the Benninghoven mixing plant belonging to KEMNA BAU Andreae GmbH & Co. KG. First set up in 1999 in Kamen-Heeren, the type BA 3000 stationary asphalt mixing plant has been impressing its owners with its high quality and easy maintenance ever since. "This lady is extremely reliable," comments Master Mixer Christoph Schauf. One reason for the quality is the conservative design of the maintenance-friendly, high-quality components. They can be run in regular operation at temperatures of over 400°C. In addition, all drives are intelligently located on the outside to protect them against excessive heat.

As the plant in Kamen is located near a residential area, its operator KEMNA is keen to keep noise and dust emissions as low as possible. Benninghoven solves this problem by enclosing all components. Furthermore, this housing prevents heat radiation and therefore optimizes the energy balance. In addition to the low energy consumption, the heat insulation of the hot areas is also exemplary. This helps to conserve resources, boosting cost-efficiency in the process.

Burner technology turns up the heat

The powerful Benninghoven burner also enhances economic operation. A triple burner that can process pulverized lignite, gas and oil is installed in Kamen-Heeren. The fuel can be switched at the touch of a button – without any mechanical modifications. This safeguards the plant operators against any plant downtimes caused by lack of resources or delivery problems. What is more, the fuel type can be quickly switched in

response to price fluctuations.

6-fold screening enhances flexibility

With this plant, KEMNA mainly supplies the densely populated eastern part of the Ruhr region. Several construction sites are handled regularly at the same time in this area. "We can guarantee flexible supply of different mixes to our customers as the plant features 6-fold screening. The frequency-controlled conveyor systems also ensure accurate composition according to the formula," explains Christian Scherff, Project Coordinator at KEMNA.

Sustainable concept with state-of-the-art control

Benninghoven mixing plants are designed for a long service life. However, as it is clear that several components will require renewal over decades of operation or will be succeeded as more advanced solutions emerge, they can be easily replaced thanks to the modular concept. This also applies to the complex control system. For example, since 2014, the KEMNA plant has been running with a new control system, which can, incidentally, also be installed on systems from other manufacturers. Since the retrofit, "I have mixing operation even more firmly under control and can adjust and monitor all parameters," explains Industrial Foreman Christoph Schauf. He likes the simple operation, the clear graphic display and the very realistic process visualization. This is not surprising, as all functions and operating elements of the process management system are controlled with a mouse or the keyboard, but can also be manually operated.

Any number of formulas can be entered and managed on the intelligent control system. The parameters can also be modified during mixing. The selection and creation of formulas, balances and parameter settings are managed on the user interface. It is also possible to enter any number of orders and split them into sub-orders, interrupt customer orders and move others forward. All this ensures transparency and quality – as was the case when producing the new asphalt for the A1 between the Westhofen interchange and the Dortmund/Unna junction.

Source: Wirtgen GmbH

Vögele Super 1800-3i On LECTURA Specs