WIRTGEN GROUP

Wirtgen

Job Report Hot Recycling

Remixer 4500: Rehabilitation of the B 9 using the Remix-Plus process, Germany

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Remixer 4500: Rehabilitation of the federal road B 9 using the Remix-Plus process, Germany

Martin Diekmann, September 2004

The rehabilitation of the pavement on the B 9 between Mettenheim and Alsheim using the Remix process will be described below. The 12.20-m-wide roadway is being recycled in several sections. The right lane, which was rehabilitated on the previous day (Fig. 1), has already been opened to traffic. One lane is also continually available in the working direction, as is one in the opposite direction, to enable traffic to pass.

Fig. 1: Rehabilitation section 2.

The rehabilitation work became necessary as cracks had formed in the surface course, as can be seen in Fig. 2. Cracks are caused by structural physical processes as well as the stress of traffic and weather influences. Crazing results, for example, from the excessive deformation of the roadway pavement due to over-stressing and/or the increased brittleness of the binder as a result of aging. Consequently, surface water and solid material can penetrate into the roadway structure and cause consequential damage, particularly in the winter months. The economical, fast and environmentally compatible Remix-Plus process was selected during the planning of the rehabilitation project.

Fig. 2: Cracks in the surface course.

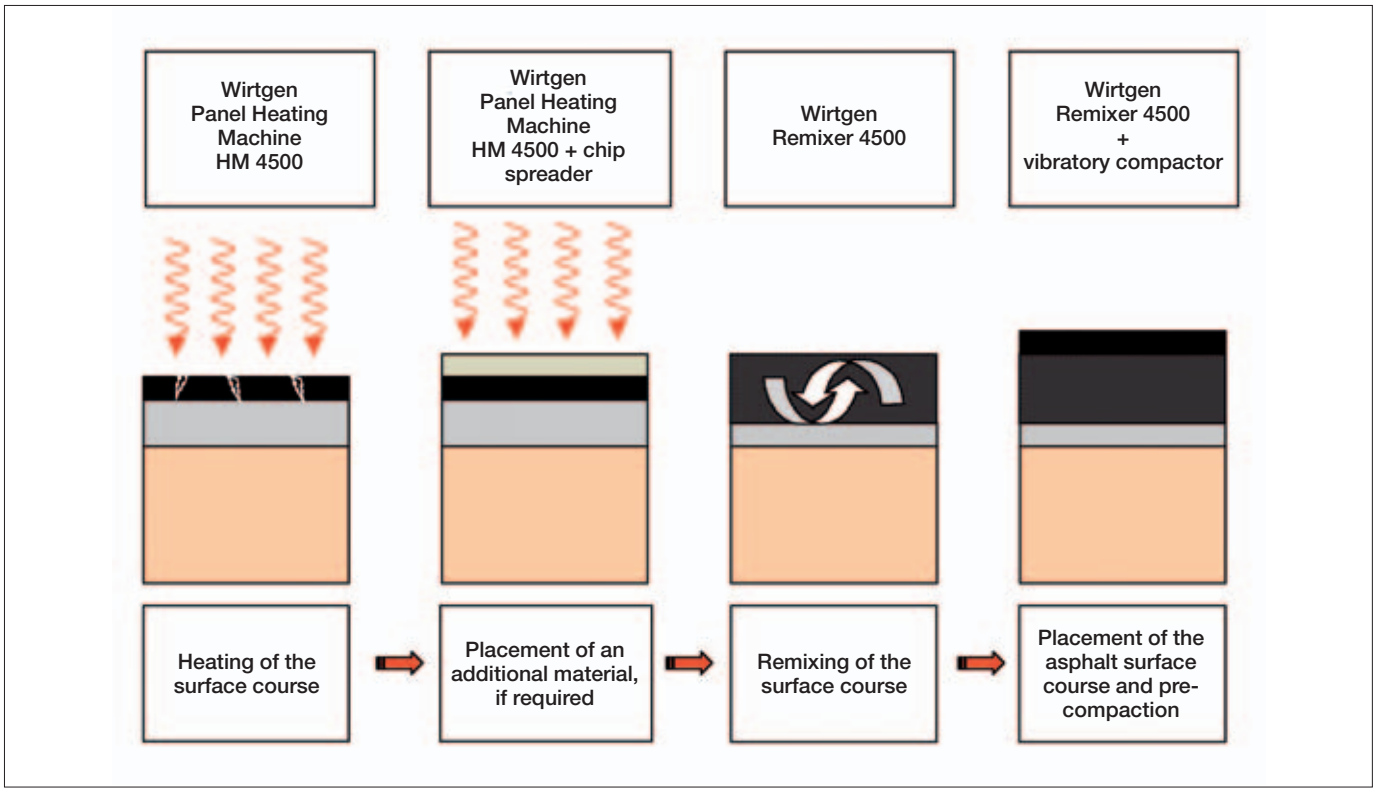

Fig. 3: Process sequence of the rehabilitation project carried out.

The procedural sequence described in Fig. 3 is illustrated step by step in the following photographs.

Fig. 4: Heating of the surface course. The first of the three panel heating machines is in the front area of the recycling set. The panel heating machines heat the old pavement to a temperature of 120 – 150°C.

Fig. 5: The overlapping heating of the roadway ensures a seamless joint.

Fig. 6: Placement of an additional material.

Directly behind the front panel heating machine, a chip spreader adds additional 11/16 chippings in order to attain the required gradation after remixing. In Fig. 7, the red curve shows the resultant aggregate grading. The area between the two grey curves is the desired status for 0/16 asphalt binder.

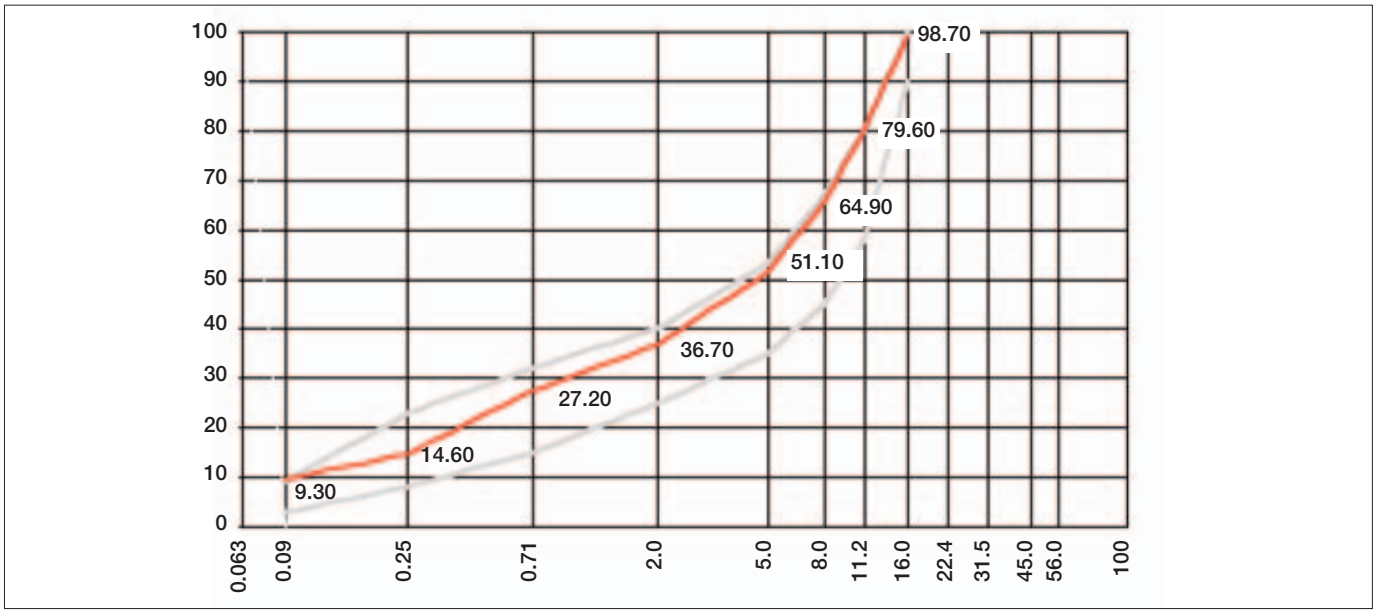

Fig. 7: Grading curve of the 0/16 asphalt binder.

Directly behind the panel heating machines and the chip spreader, a truck feeds the Wirtgen Remixer with 0/8 S asphalt containing polymer modified binder at a temperature of 180°C, mix batch: 28 t. The subsequent material flow is shown in Fig. 10.

Fig. 8: Feeding of the Wirtgen Remixer 4500 with asphalt mix.

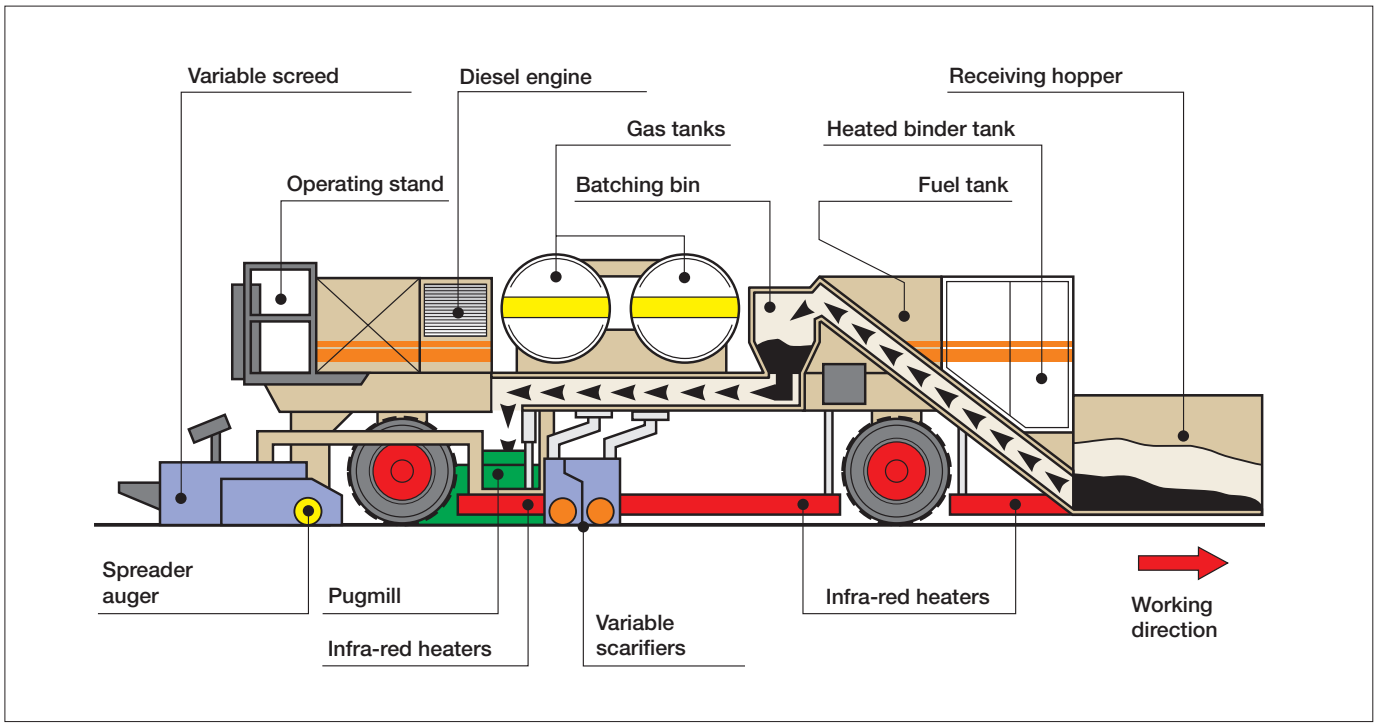

Fig. 9: Schematic diagram of the modules of a Remixer 4500.

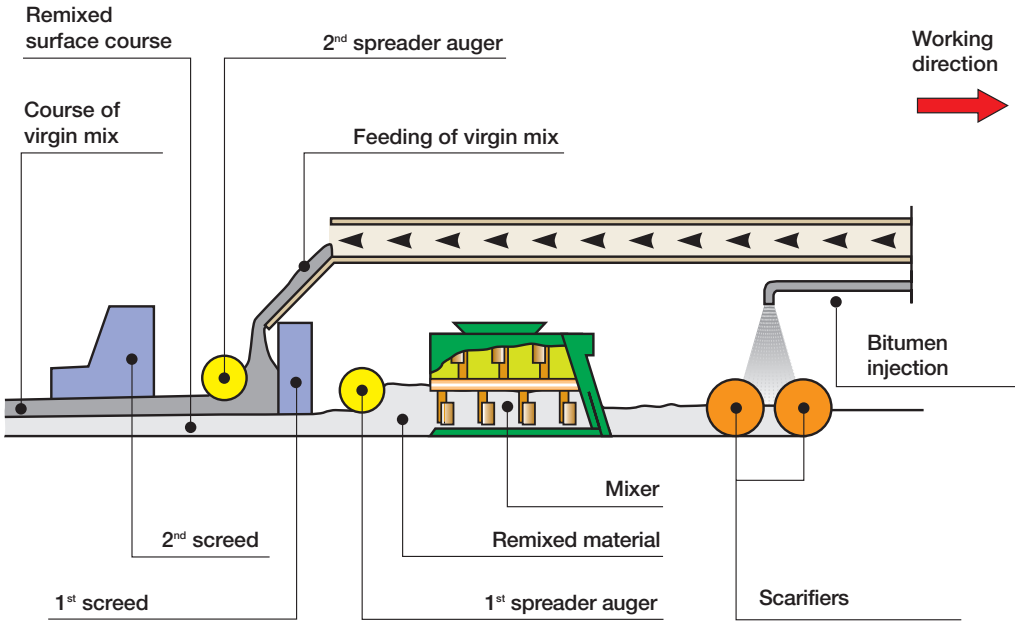

Fig 10: Placement and final compaction of the mix.

The admixture of small quantities of bitumen (visible after mix design test) of 0.1%, balances out the properties of the bitumen, which may have hardened due to the long period in situ or the reheating.

The Remix-Plus process used here is similar to the Remix process, except that an additional course of virgin mix is laid. A second spreader auger located downstream of the first one lays a course of asphalt containing polymer modified binder over the binder course (remixed surface course).

Fig. 11: "Hot-in-hot" placement: Virgin mix is laid on top of the remixed surface course.

The layers are placed and precompacted true to cross-section line and level with an infinitely variable high-compaction tamping screed. The subsequent final compaction work is performed with a vibratory roller.

Fig. 12: Placement and final compaction of the mix.

The remixing of the existing surface course with 0/16 asphalt binder and the addition of 20 kg/m of 11/16 additional chippings, and the simultaneous placement (“hot-in-hot”) of a new surface course results in the following course thicknesses:

- 3 cm 0/8 S asphalt containing polymer modified binder as an asphalt surface course (virgin mix)
- 5 cm binder course 0/16 as a remixed surface course.

Fig. 13: Course structure: asphalt surface course on a binder course.

The asphalt surface is gritted while it is still around 100°C, to improve the grip. One of the positive side effects of this is that the colour of the new roadway is lighter.

Fig. 14: Gritting of the asphalt surface.

Fig. 15: When the asphalt layers have cooled down sufficiently, this section can then also be opened to traffic.

Fig. 16: Completed sections 1 and 2.

Mix design test:

Tables 1 and 2 show the results of test mixes 1-3. The compositions and properties of the three test mixes in the Marshall test specimen correspond with the "additional technical contractual terms" and the guidelines for the construction of asphalt roadway pavements (ZTV Asphalt -StB 01) for 0/16 asphalt binder. Mix number 1 with 4.9% by weight of binder was used for the project.

Binders/additional materials						
Mix: 0/16 asphalt binder		Test mix			Required values	
		1	2	3	min	max
Binder from granulated material	% by weight	4.8	4.8	4.8		
Binder from additional materials	% by weight	0.1	0.2	0.3		
Total binder content	% by weight	4.9	5	5.1	4.00	6.00

Table 1: Determination of the total binder quantity for test mixes 1-3.

Mix properties						
Mix: 0/16 asphalt binder		Test mix			Required values	
		1	2	3	min	max
Bulk weight of mix	g/cm³	2.593	2.588	2.584		
Bulk density in Marshall test specimen	g/cm³	2.451	2.444	2.436		
Air voids	Vol-%	5.5	5.6	5.7	3.0	7.0
Mineral fraction	Vol-%	82.5	82.2	81.9		
Binder fraction	Vol-%	12	12,2	12,4		
Air voids in mineral structure	Vol-%	17.5	17.8	18.1		
Filled with binder	%	68.6	68.6	68.5		
Marshall stability	kN	15.5	15	14.5		
Marshall flow	mm	2	1.9	1.8		
Compaction temperature	°C	135.0				
Bulk density of the mineral mix	g/cm³	2.824				

Table 2: Properties of test mixes 1-3.

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