

Road Recycling

Mix-In-Place recycling used on the SP 11 of the „Colline per Legoli“



A flexible method designed for actual road conditions

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Commissioned by Pisa Province, F.Ili Lepri is currently carrying out work on the SP 11 lane of the „Colline per Legoli“, which connects the SS 67 „Tosco-Romagnola“ near Pontedera with the south-east region of Pisa Province, up to the borders of Florence Province.

The section under reconstruction is located in an area governed by the Peccoli and Palaia (PI) communities between PK 11+050 and PK 25+320. It covers a length of approx. 14 km.

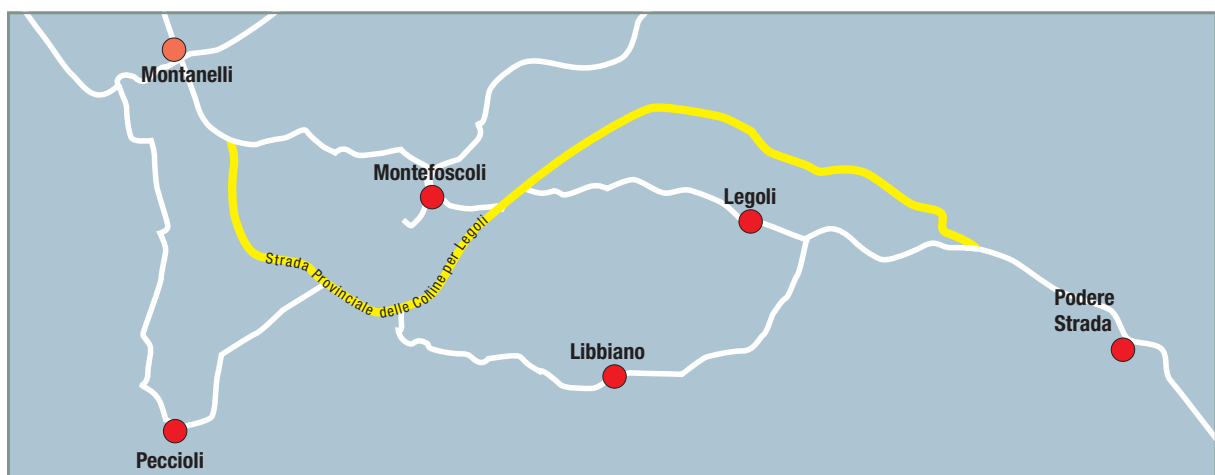
Description of the method

F.Ili Lepri Srl developed a project version based on former Item 11 of the Italian DM 145/00. This version was authorised by the office inviting tenders with the aim of amending the „uniform“ approach originally planned by the project into an approach based on the degree of damage to the existing road.

Cold recycling was used with added binder (foamed bitumen) on those sections with clearly identifiable damage and cracks in the surface, to produce a road surface 20 cm thick (8 cm asphalt binder layer and 4 cm asphalt cover layer with bitumen product). Cold recycling was limited to a layer thickness of 10 cm on those sections with less damage.

On-site cold-recycling

Recyclers are used to pulverize asphalt and are capable of treating thick road layers in a single pass. The heart of such recycling equipment is the milling and mixing rotor which is equipped with a wide range of special cutting tools. The rotor works in upcut mode to pulverise the existing asphalt layer. In one pass the existing material is pulverized, additional material mixed in and additives such as bitumen and water are injected into the mixing drum. The process is controlled by a micro-processor which guarantees precise metering. To aid distribution of the bitumen in the mix, bitumen is foamed by contact between hot bitumen and water.





BOMAG MPH 125 – designed for maximum efficiency.

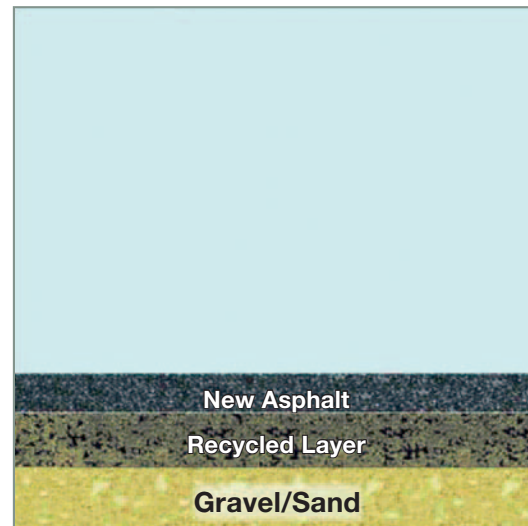
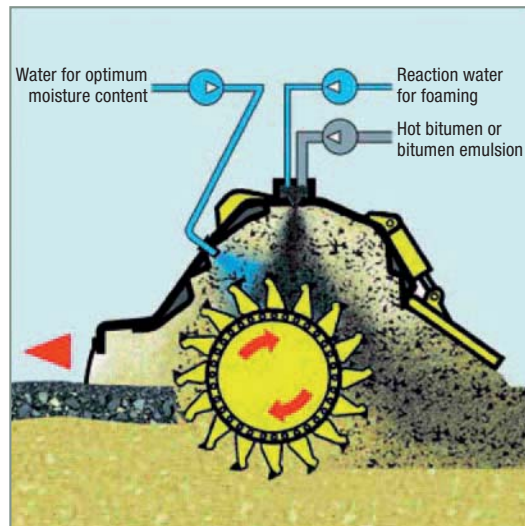
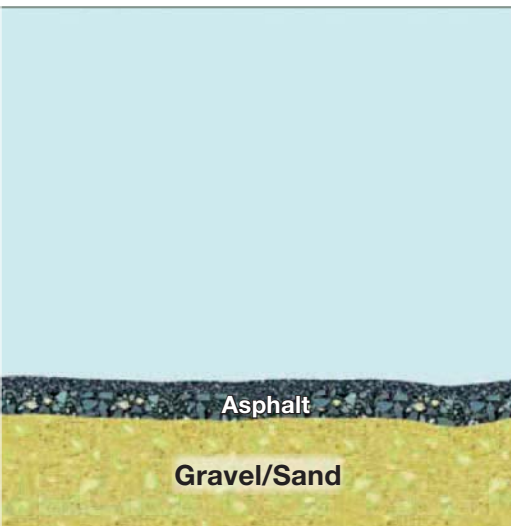


A perfect mixture.

Recycling trains change configuration depending on the application and type of binder used.

In every case, the recycling unit is used as a towing vehicle for front-end or towed equipment. The processed material laid behind the machine is pre-leveled by a level bar at the rear of the mixing chamber to guarantee uniform compaction with a single drum roller. This is followed by high quality shaping with a grader and final compaction by heavy single drum rollers and rubber tyred rollers.

A range of mixes can be produced using mineral additives. By adding foamed bitumen, mixed material made from widely different natural additives or asphalt granulates can be turned into high-quality roads.



Mix-in-place Recycling on a secondary road.

The BOMAG MPH 125 recycler

BOMAG has developed the MPH 125 recycling unit for material improvement under tough site conditions. In collaboration with contractors and drawing on extensive experience gathered from decades of construction applicational work, BOMAG has developed a unit for maximum efficiency, reliably and performance. The MPH 125 recycling unit is ideal for mixing lime, fly ash and cement for soil stabilization. For cold recycling, this unit can be used in multiple applications to pulverize old and damaged roads or to stabilize the base course.

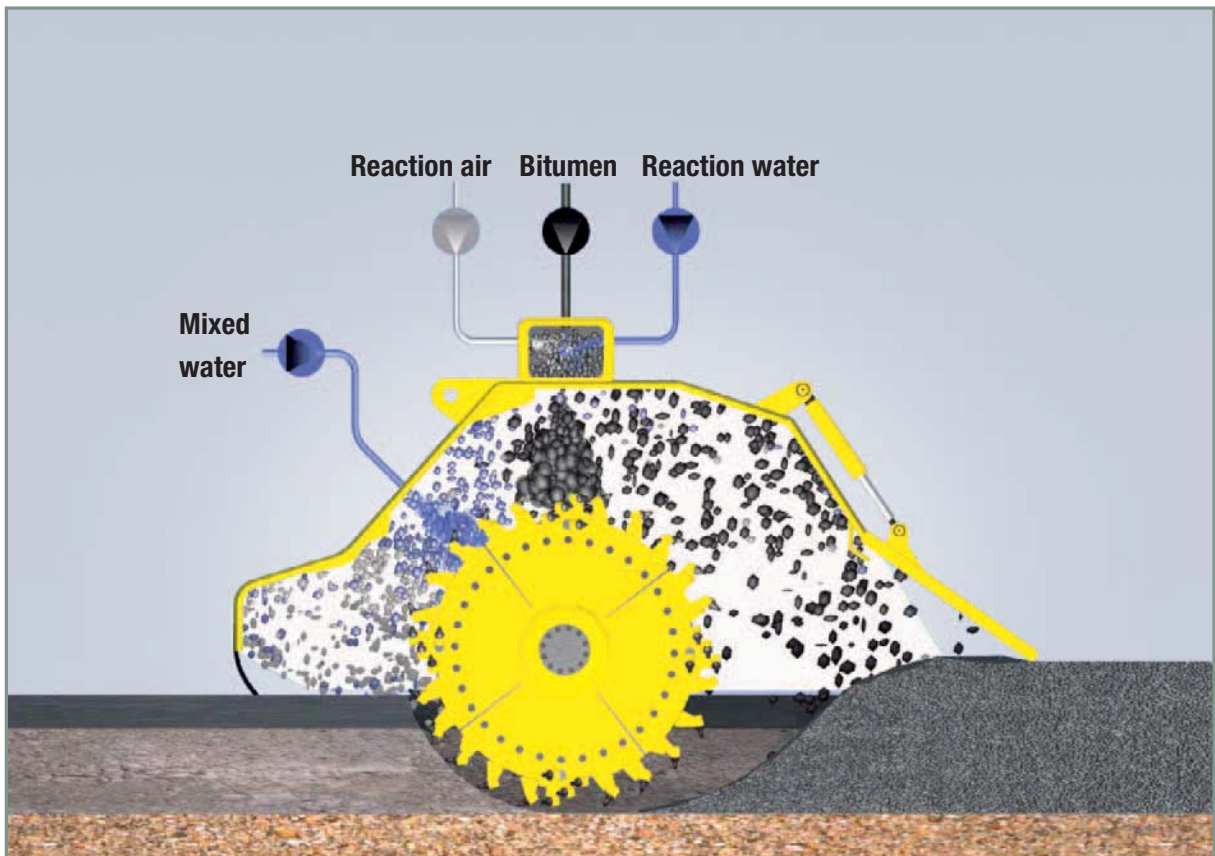
Designed for tough on-site conditions

The MPH 125 recycler features optimum visibility over the full working area, outstanding manoeuvrability, rear axle steering and proven hydrostatic rotor drive with over load protection, for outstanding mixing performance and maximum productivity.

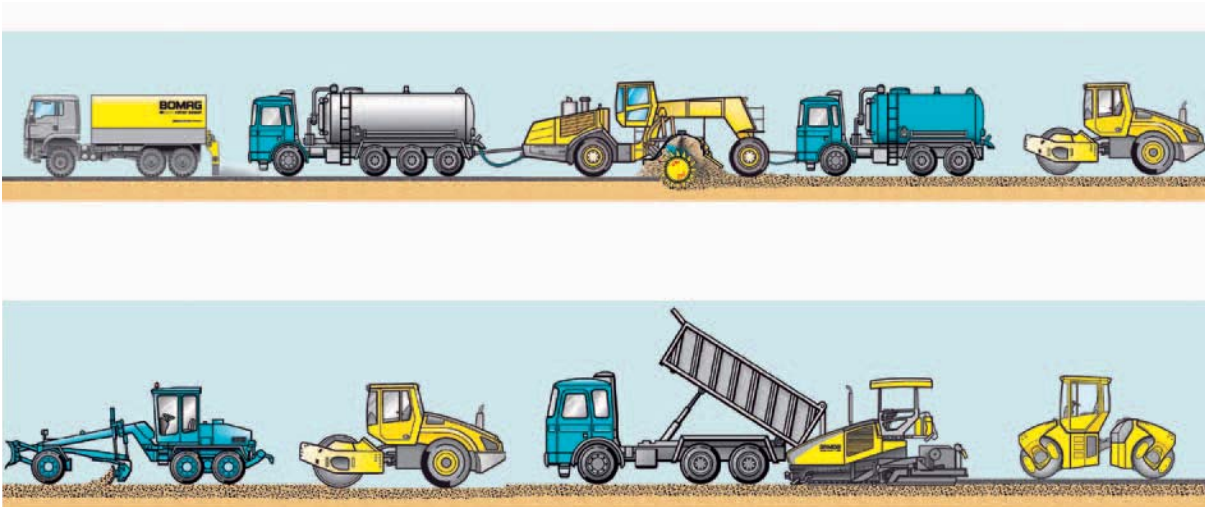
The universal rotor with freely adjustable speed under load can be precisely adapted to the jobsite conditions. The variable mixing chamber adapts automatically to each milling depth, taking into account the type of soil and material used. Binder and soil can be processed to form a uniform mix with minimal tooth wear and optimized energy consumption.

Optional equipment for more flexibility

An extensive range of options widens the application range of the MPH 125. Versions with special rotors, computer controlled water injection and bitumen injection system guarantee high quality and high flexibility in application.



Foamed bitumen production and metering into the mixing chamber.



A example for a cold recycling train.

The advantages of Mix-In-Place Cold Recycling

The use of the cold recycling method for road reconstruction offers the following advantages:

- **Environmental:** All material from the existing road is recycled and used in place, so transport to landfill is not required. The volume of newly added, granular material is minimal or zero. The creation of new quarries is slowed and the method significantly reduces transport costs. This has a clear effect on overall energy consumption and CO output, which is significantly reduced. Likewise recycling reduces collateral damage to roads caused by transporting heavy loads.
- **Quality:** A high-quality mix is created from the materials recovered on-site when combined with water and binding agents. The pumps, which are controlled by micro processor, allow precise metering of the additives. A cold recycled asphalt binder layer is created with outstanding mechanical properties on which the surface layer is placed. There is consequently no need to use reinforced structures. The procedure also improves the load bearing capacity of the road

 - as shown by testing,
 - and subsequently in the performance of the road in terms of mechanical stability and fatigue resistance.

- **Stability:** Cold recycling creates uniform single-layer binder courses that contain no weak points as with thinner layers.
- **Sub-base stress:** Stress on the substructure is minimal when compared to the loadings produced when renewing asphalt using conventional methods, where high stresses potentially lead to deformation of the surface. Cold recycling can often be carried out in one pass. With a recycling unit with rubber tyres, contact between the tyres and the cleared sub-surface is avoided.
- **Construction time:** Recyclers have a higher daily output in comparison with other reconstruction methods. This therefore considerably reduces construction time. At the same time, thanks to lower construction times, project costs and inconvenience to road users is reduced. Disruptions between construction work and road traffic is limited.
- **Safety:** One of the most important advantages of cold recycling is the higher level of road traffic safety. The entire recycling train can work in one lane of four-lane roads. Reconstruction can be carried out on half the carriageway during the day and the entire road can be opened up again for traffic at the end of the working day.



Process control by dosing computer.



Jobsite, only one lane closed.



Recycled lane can be used after compaction.



Dynamic plate test.

Tests and checks on the roads

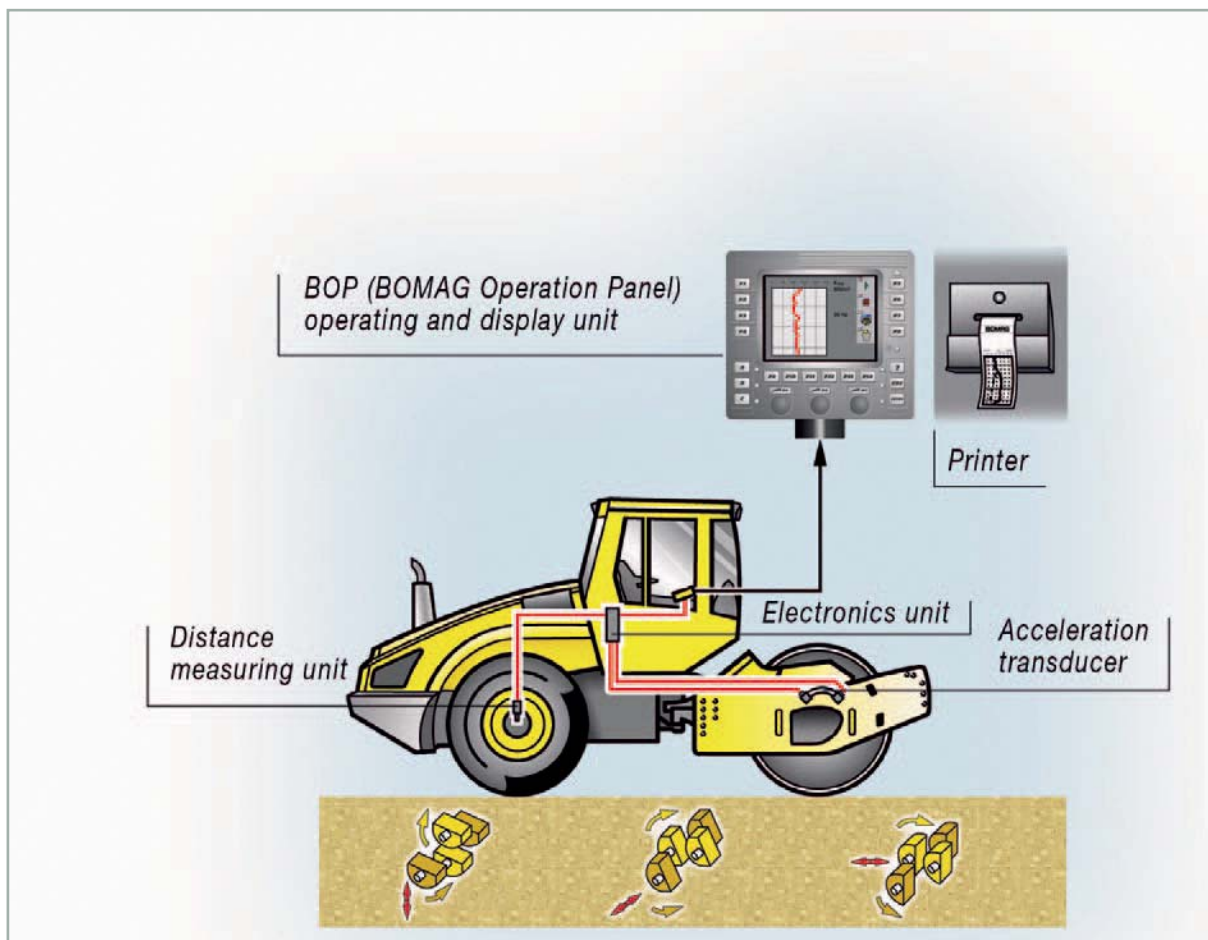
Tests are carried out during cold recycling while the process continues using the BOMAG Variocontrol roller. This unit continuously checks that work is carried out to specification by testing the load bearing capacity of the recycled layer. These tests run automatically during compaction, after which dynamic plate tests are applied.

Results show the optimum mechanical properties produced with cold recycling; these properties are clearly above targets set by the CSA.

Conclusion

Mix-In-Place cold recycling, in conjunction with targeted testing of results, is superior to conventional methods in terms of the time required, the mechanical properties of the road and future maintenance requirements.

Tests and analysis have clearly proven the benefits of the process.



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