Cold Recycling – a method of road construction with low CO$_2$

Martin Diekmann

Developments in Asphalt Plant and Equipment
London, October 24, 2013
Conventional road construction

- Transport
- Excavating
- Crushing
- CO$_2$
- Transport
- Loading
- Asphalt plant
Cold Recycling in situ

Asphalt course with granular base + Milled material

Binding Agent

- cement
- emulsion
- foamed bitumen
- water

Bound granular base course
Cold Recycling in situ
Foamed Bitumen

The larger surface area allows the mixing of bitumen with cold and damp aggregate.
WR 4200 + WM 1000
Cold Recycling of a main traffic road

High performance recycling by using cement suspension and foam bitumen
Cold recycler WR 4200
A cold recycler with twin shaft pugmill mixer

Microprocessor-controlled pump for injecting water to produce foamed bitumen

Hose connection at bitumen tanker

Microprocessor-controlled pump for the addition of hot bitumen

Hose connection at slurry mixer WM 1000

Microprocessor-controlled pump of WM 1000 for injecting the cement-water slurry

Working direction

Recycled construction material mix

Twin-shaft compulsory mixer

Fixed milling drum

Variable milling drums

Distressed asphalt layer
Recycling by using the WR4200 cement suspension and foam bitumen
Steps of conventional structural rehabilitation

Milling out
CO₂ - Emission conventional

kgCO₂/m²

Milling, Transport, Aggregate, Bitumen, Asphalt, Paving
WR 4200
Cold Recycling Highway I 80 in California
Steps of cold recycling
Material comparison for 75,000 m²

<table>
<thead>
<tr>
<th>Material</th>
<th>Conventional</th>
<th>Cold recycling</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milled Asphalt</td>
<td>42.900 t</td>
<td>6.600 t</td>
<td>-85%</td>
</tr>
<tr>
<td>Bitumen</td>
<td>1.855 t</td>
<td>1.337 t</td>
<td>-28%</td>
</tr>
<tr>
<td>Additional material</td>
<td>42.900 t</td>
<td>10.725 t</td>
<td>-75%</td>
</tr>
<tr>
<td>Transport (18 t LKW)</td>
<td>166.833 Km</td>
<td>25.667 Km</td>
<td>-85%</td>
</tr>
<tr>
<td>(35 km round trip)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CO₂ comparision

Kg CO₂ /m²

Recycling  Conventional

Milling  Transport  Recycler  Raw Material  Bitumen  Asphalt  Paving
16

9,7

5

10

15

20

25

30

kg CO₂/100km

kg CO₂/ m² Cold recycling total

kg CO₂/ m² Conventional Total

30,2

- 68%

BMW

0
WR 4200
Production of a CTB in cold recycling method

Milling and paving of the material up to the guide rail
WR 4200
Production of a CTB in cold recycling method

Paving with the Vögele screed “AB 500 TV”
WR 4200
Production of a CTB in cold recycling method

Uppermost accuracy during paving
WR 4200
Coldrecycling – B52 in Germany

Coldrecycling train in operation, B52 near Trier
Cold mixture leaves the WR 4200 pre-compacted and pre-paved
Recycling of a highway in USA

WR 4200 + WM 1000

Coldrecycling of a highway I 80 in California
WR 4200 + WM 1000

Coldrecycling of a highway I 80 in California

Paving screed equipped with ultra sonic levelling sensor
WR 4200 + WM 1000
Coldrecycling of a highway I 80 in California

Milling and paving of the material up to the guide rail
WR 4200 + WM 1000

Coldrecycling of a highway I 80 in California

Closed surface after compaction
WR 4200 + WM 1000
Coldrecycling of a highway I 80 in California

Road lanes without any further overlay released for traffic
Main advantages of the cold recycling in situ

- Very efficiency in comparison with conventional methods
- Protection of resources e.g. additives and binding agents
- Considerable reduction of CO₂ emission
- Reduction of transport volume
- Less exposure of the existing road network
- Reduction of dumpsite volume
- Fast construction progress – shorter construction time, less obstruction of traffic

According to the waste act the recycling is definitely prioritise compared to the disposal