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Sustainable road construction due to the use of temperature-reduced asphalts

Roller-compacted asphalt used for road construction is produced and paved at temperatures between 130℃ and 195℃. For work safety reasons, an occupational exposure limit (OEL) was set in Germany in 2019 for vapors and aerosols from bitumen during hot processing. A reduction in emissions can be achieved by using temperature-reduced asphalt. The mixing and paving temperatures are lowered by at least 20K compared to conventional asphalt. This results in fewer emissions, which leads to better working conditions. Moreover, energy consumption during asphalt production, and consequently CO2-emissions, can be significantly reduced.

Organic, mineral and chemical additives are used to ensure workability at reduced paving temperatures. Depending on their mode of action, they lower the viscosity of the binder or reduce the surface tension between the aggregate and the bitumen. This improves the processing properties of the asphalt and enables it to be compacted at lower temperatures. This is essential to ensure the functionality of temperature-reduced asphalts and to achieve the same performance properties as asphalts without temperature reduction.

For temperature-reduced asphalts to become the standard for sustainable road construction, their performance properties must be determined and proven comparable to non-temperature-reduced asphalts. As part of a research project, extensive tests were carried out on temperature-reduced and as a reference non-temperature-reduced asphalts at both the asphalt and binder levels. The test specimens produced were tested in the laboratory for their resistance to low-temperature cracking, fatigue cracking and permanent deformation at high, medium and low temperatures. Different additives were considered and both laboratory-produced and on-site mixes were used. The results demonstrate a high degree of comparability between temperature-reduced asphalts and reference asphalts. Depending on the additive used, certain properties were identified in which the temperature-reduced asphalts performed better than the reference asphalts. These results were also confirmed in the in-situ test fields.

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