

Collaboration in asphalt APplications with Lignin in the Netherlands

Publieke samenvatting / Public summary

Aanleiding

The Netherlands is producing and maintaining high quality roads. To maintain this road network, asphalt and its asphalt binder quality (bitumen) should keep its high performance level and should meet strong environmental criteria. In that respect bitumen as residue of an oil refinery is of fossil origin and this by-product is facing decreasing production volumes, due to the closure of bitumen producing refineries and variable qualities as a higher share of light products is extracted from the bitumen fraction. Also the insecure situation in the Gulf region will have a strong impact on the availability and fluctuation of prices of oil and bitumen. To address these recent changes in bitumen quality and to prepare for the future, there is a need for renewable binder suited for asphalt applications. Lignin, a binder in lignocellulosic biomass, and extracted in high volumes as a by-product of pulp and cellulosic ethanol production, may serve as bio-based alternative to bitumen. Lignin has been researched for some years, but detailed analyses on its production, binder behavior, outdoor performance in the user phase, recycling options, techno-economic and life cycle assessment is limited.

Doelstelling

The aim of this project CHAPLIN is to evaluate lignin, which is produced in The Netherlands, in asphalt applications and monitor current and novel test roads of selected lignins. CHAPLIN will generate data on the availability of locally and Internationally

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sourced lignins and study its suitability as binder in hot mixed asphalt. The partners in CHAPLIN cover the full value chain including lignin production, processing of lignin in asphalt, test road construction, and integral knowledge of lignin, bitumen and asphalt. This combination of partners will ensure project success and assure short-time market deployment as soon as competitive business cases are developed. The program line of TKI-BBEG 'Thermochemical and Catalytic conversion technologies' has the potential to contribute substantially to the goal of CO2 reduction. The use of biomass in large scale industrial applications, such as asphalt, do support such an effort. CHAPLIN perfectly suits this goal since its using lignin as a partial binder in asphalt and this application creates a carbon sink for decades and the used lignin will not be burned as is the case today. This offers sustainable solutions for the future.

Korte omschrijving

CHAPLIN is structured in work packages headed by different work package leaders. In WP1 the lignin availability and sourcing in the Netherlands and outside will be assessed. In WP2 the blending and modification of lignin and bitumen is tested on lab scale. Suitable lignins will be tested in asphalt construction on lab scale and detailed analyses of the binder including aging will be performed in WP3. Selected lignins will be tested in the lignin asphalt production at larger scale (pug mill) and the overall process will be monitored on health & safety aspects, processing and recycling in WP4. Construction and monitoring of test sections will be performed in the municipalities participating in CHAPLIN in WP5. The technical performance of lignin asphalt will be supported by a full techno-economic and LCA assessment. CHAPLIN will generate a road map how to come to full implementation of lignin based asphalt in the future infra world.

Resultaat

CHAPLIN will deliver results on the technical, including recycling, economic and environmental performance of lignin based asphalt from existing demonstration roads and novel demonstration

roads. The influence of the Dutch climate (e.g. UV radiation, water/dryness cycles, and frost-dew cycles) on the top layers of demonstration roads, in which several types of lignin have been used, will be monitored by a sufficient monitoring plan. This project will deliver the feasibility results in a well written report. Next to that, CHAPLIN will generate knowledge on the use of lignins, which are produced in the Netherlands, in this asphalt application. Performance results over a longer monitoring period will be essential to validate the use of lignin in the asphalt binder to continue the full scale upscaling towards commercial application of lignin based asphalt in the near future. After finalising this project the monitoring will be continued within the larger OVERALL CHAPLIN program. Results of CHAPLIN will form the basis for implementation of lignin as a binder for asphalt application at the asphalt mills in the Netherlands and other countries.

De data in deze applicatie is afkomstig van de Rijksdienst voor Ondernemend Nederland (RVO) en wordt in samenwerking met de Topsector Energie ontsloten.

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