



From Roof to Road - From Roof to Road - Innovative recycling of bitumen felt roofing material

LIFE07 ENV/DK/000102

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Project description:

Background

Bitumen is a sticky, black mixture of hydrocarbons and other substances, occurring naturally or obtained by distillation from coal or petroleum. It is commonly used in road construction as a component of asphalt, together with small stones and sand etc. Bitumen is also used in felt roofing material, where it delivers important qualities as a durable, flexible and waterproof material. The bitumen content in felt roofing material is between 40-50 % compared with 5-7 % in road asphalt.

Bitumen is durable and inert at ambient temperatures – leaching of aromatic hydrocarbons and heavy metals is not considered an important environmental problem. However, at end of life, waste bitumen is commonly landfilled or incinerated, which can release heavy metals, CO₂ and volatile organic compounds into the air. Such practices are inefficient and unnecessary given that bitumen is 100% reusable/recyclable.

Annual generation of waste bitumen from roofing materials is currently estimated at 1.8 million tonnes across the EU as a whole. Denmark generates some 40 000 tonnes annually. At the same time, Europe annually produces over 300 million tonnes of new hot mix asphalt and around five million tonnes of cold mixtures for use in roads, new roofs as well as other uses including industrial floorings and pipe coatings.

Objectives

The objective of the From Roof to Road project was to demonstrate that recycling of bitumen felt roofing material (bituminous membranes) is an

economical and environmentally viable alternative to the existing European practice of landfilling or incineration of this waste stream.

It also sought to demonstrate that the recycled material was a viable replacement for virgin bitumen used for road construction, avoiding the higher environmental and economic costs of its production. It hoped to show that it will ultimately be feasible to replace 5-10 % of virgin bitumen used for road construction in Denmark with recycled roof bitumen.

Re-use of bitumen from end-of-life roofing materials aimed to avoid the landfilling of waste bitumen. In this way, the project sought to anticipate an EU ban on the landfilling of organic waste. It also sought to prevent the incineration of bitumen at end-of-life, with consequent avoidance of CO₂ and VOC emissions.

Results

The Roof to Road project succeeded in demonstrating that the bitumen in waste roofing felt can be effectively reused in asphalt for road construction and repair. It was able to establish a collection system for roof-felt waste, process and grind the waste into grades suitable for re-use and to apply this in asphalt for road and infrastructure constructions.

After conducting an updated overview of the technological and legislative state-of-play with regards bitumen recycling, the project created a basic network of material collection sites. These were run by third parties and combined collection and recycling also of other waste streams. The project saw the collection of 1 000 tonnes of roof felt waste during its lifetime.

All the waste collected during the project was recycled, using an innovative mobile recycling machine designed by the project. An important lesson was that the success of the process was highly weather/temperature dependent. Too cold temperatures in winter resulted in stiff or frozen roof felt which could not easily be processed, whilst too much heat in the summer caused some of the bitumen to become increasingly liquid and sticky in the shredding process.

Approximately 60% of the total weight of felt roofing waste collected during the project was extracted as a reusable bitumen aggregate containing small uniform grain (grit) of up to 8 mm. The project partner NCC Roads tested the product in its laboratories and applied it in ten on-site test mixes. This work demonstrated that the recycled bitumen can be successfully used for most grades of asphalt and passed all necessary certifications except for use on airport runways.

Following the successful experiences and learning, the project designed and ordered a 'second generation' stationary version of the machinery for a fixed indoor site in Herning. This machine was complemented by a post-sorting device and sufficient storage capacity for collected waste and extracted materials. It should have an annual capacity of 10 000 tonnes per year, equating to 25% of annual Danish roofing waste generation.

The beneficiary worked to ensure the long-term viability of the new process. It obtained all the necessary approvals and certifications for ensuring the recycling process complies with national and EU standards. It worked to expand the collection network across the whole country and signed agreements with 150

waste producers to deliver future roof felt waste, including production and sub-standard waste.

To encourage transfer of the new technology, the project produced a good practice handbook and a brochure with guidance material for operators covering the major issues in practical operation of a collection and recycling system, including waste handling, the technical procedure for grinding roof felt into grades, transport and logistics. From an economic point of view, the recycling of roof felt as an asphalt ingredient will reduce the need of virgin hydrocarbons and this, in turn, reduces the price of the asphalt, while establishing a basis for a commercial operation. Furthermore, the developed process offers additional job opportunities compared to the current practice of burning and landfilling this waste fraction.

The beneficiary has also foreseen moving the mobile machine developed in the project to new markets in neighbouring countries.

Further information on the project can be found in the project's layman report and After-LIFE Communication Plan (see "Read more" section).

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Environmental issues addressed:

Themes

Industry-Production - Building
Waste - Waste recycling

Keywords

waste recycling, building material, demolition waste

Natura 2000 sites

Not applicable

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Beneficiaries:

Coordinator
Type of organisation

Karsten Rasmussen Holding Thisted A/S
Large enterprise

Description	The beneficiary is a large nationwide enterprise that has operated in the construction and infrastructure material recycling business for 25 years.
Partners	I/S FASAN, Denmark Tarpaper Recycling ApS, Denmark NKR Demolition Group A/S, Denmark NCC Roads A/S, Denmark

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Administrative data:

Project reference	LIFE07 ENV/DK/000102
Duration	01-JAN-2009 to 31-DEC -2011
Total budget	2,068,442.00 €
EU contribution	1,002,547.00 €
Project location	København Og Frederiksberg Kommuner(Danmark) Københavns amt(Danmark) Frederiksborg amt(Danmark) Roskilde amt(Danmark) Vestjællands amt(Danmark) Storstrøms amt(Danmark) Bornholms amt(Danmark) Fyns amt(Danmark) Sønderjyllands amt(Danmark) Ribe amt(Danmark) Vejle amt(Danmark) Ringkøbing amt(Danmark) Århus amt(Danmark) Viborg amt(Danmark) Nordjyllands amt(Danmark) Hovedstaden(Danmark) Sjælland(Danmark) Syddanmark(Danmark) Midtjylland(Danmark) Nordjylland(Danmark)

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Read more:

Project web site	Project's website (DK)
Publication: After-LIFE Communication Plan	Title: After-LIFE Communication Plan Year: 2011 No of pages: 3
Publication: Layman report	Title: Layman report Year: 2011 No of pages: 8
Publication: Technical report	Title: Project's Final technical report Year: 2012 No of pages: 46

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