

Shell Bitumen

Greater performance ready for launch

Research and development by Shell Bitumen has produced a new specialist polymer modified binder with enhanced characteristics, designed to help the UK match developments overseas.

The UK has been lagging behind the rest of Europe and other parts of the world in its use of polymer modified binders (PMB). France and Germany in particular invest significantly more in the value for money offered by pavements containing PMBs. But Shell Bitumen has been working to help the UK catch up.

Shell is launching a new polymer modified binder for the UK market after a research and development process drawing on Shell's worldwide resources. The product has been developed to further

performance of asphalt layers by focusing on specific challenges, such as increasing water resistance and enhancing the bond between aggregate and binder.

Shell Bitumen's Technical Development Manager Dr Richard Taylor explains: "PMBs are well established in the UK but are mainly used in the surface course only. In order to get the full benefit of using polymers in asphalt, PMBs should be used in all layers as they are in other countries, such as Germany. We have decided to take on the task of educating the market in the

long term, highlighting the value for money benefits that are being missed."

There has been a lot of interest from major UK asphalt producers, Taylor says: "The market definitely wants products that can offer longer life. We just have to increase awareness and prove that our products will do the job."

Sophisticated technology has been used to develop the new products. "There is a growing interest in this, as a fundamental understanding of the nature of bonding between bitumen and aggregates (in the presence of water) will lead to longer lasting asphalt mixtures.

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"For developing a high performance binder for bases we were able to use surface energy measuring equipment developed in the United States and acquired by the University of Nottingham. A lot was learned previously while we were working on self-adhesive formulations for the roofing industry, allowing bitumens to adhere to cold and damp substrates. During the development process we made use of

More use of polymer modified binders is made in Europe and other parts of the world for value benefits, but Shell is helping the UK to catch up





Shell Bitumen has drawn on its expertise and resources in Europe and North America to develop a polymer modified binder with enhanced characteristics

several novel additives and surface energy measurements," Taylor says.

Shell has a pavement research and development venture with The University of Nottingham, which has built network links with a Texan University on the application of surface engineering measurement for asphalt mixtures and ingredients. This has been applied to bitumens to quantify adhesion – to express the magnitude of the bond between aggregate and bitumen.

The outcome is what Taylor calls a "tenacious bond". Stripping and boiling tests were carried out which showed stone coated with conventional material almost completely stripped after boiling, with only 5% coverage left. Stone coated with the new binder lost only 5% of its coverage.

"It was only a simple test so we cannot make any specific claims about longevity based on just that, but it is clearly a marked improvement. We are confident that we have produced a major improvement in moisture resistance."

The new base layer product involves a blend of special polymers and additives being used to help compaction and to resist fatigue and water. "Most people would accept that using more polymers in a base layer will produce a better result than a penetration grade of bitumen, but the specifications in use by highway authorities might have to be changed to allow for that."

Increased maintenance intervals from longer life are likely to sell the product, due to the superior compaction and better

resistance to cracking and moisture achieved from its use. Research outlined in the North American Asphalt Institute's Engineering Report 215 shows that PMBs deliver benefits for the top 40mm of a pavement, but give a more substantial benefit when used in layers of the upper 100mm.

"Modern roads should definitely use more polymer modified products," Taylor says. "Recent research from Delft University suggests that using thinner layers of polymer modified layers can lead to massive improvements in pavement performance. We aim to validate that with further research. We may be able to show that bases made using PMBs can be substantially thinner."

Taylor points out that Shell has 20 bitumen research projects underway across the group. "We aim to make better binders and are devoting substantial resources to that worldwide. The new base layers are just one major part of the overall initiative.

"Chemists were modifying bitumen with fillers, fibres and natural rubbers until 40 years ago, when invention of synthetic polymers made modern levels of performance possible."



Stripping and boiling tests on stone coated with conventional bitumen showed 5% coverage remaining (left), while only 5% of Shell's new binder was lost from the same type of stone and tests