

**Nynas Bitumen**

# EME2 introduction creates new technical challenges

Nynas UK's Asphalt Engineering Laboratory at Eastham is fully prepared to meet the technical demands of the complex design methodology behind EME2 asphalt mixtures.

**E**ME2 (or Enrobé à Module Élevé) is the generic title for high strength, long life asphalt base and binder courses whose technology – developed in France – is now being taken up in the UK. The mixture has proven to be extremely durable in France provided essential material selection and design criteria are met.

Now in Britain, one company in particular is helping the asphalt supply sector get to grips with EME2 and the special needs that come with it. That company is bitumen specialist Nynas UK which has developed

binders specifically for EME2 and whose Asphalt Engineering Laboratory has the knowledge and equipment to assist in proving EME2 mixture design.

Nynas feels that EME2 represents a positive development for the asphalt industry and has invested heavily in the new (to the UK) technology.

“One result of our investment is standing here beside me,” says Nynas Senior Chemist Mike Lancaster, pointing to a new Duriez machine recently installed in the company's laboratory at Eastham. A Duriez has the capability of assessing water sensitivity, one of a number of stringent tests required during the EME2 mix design process (see below); and Nynas' machine is one of only a handful resident in the UK.

“We have the capability here of carrying out virtually all the testing that is required to prove EME2 mixes, even though the tests are comparatively time-consuming,” Lancaster says.

“For a contract where EME2 is specified, there is a good deal of pre-tender mix design work to do. We have the equipment to contribute substantially to that work and have already been extensively involved in proving EME2 on two major contracts, in England and in Scotland. As use of the technology picks up, we are looking forward to facilitating contractors in proving their mixtures for EME2 asphalt.”

The philosophy behind EME2 mixture design is to produce stiff, flexible, fatigue resisting asphalt mixtures which provide durable structural layers.

Nynas has all of the equipment for performing thorough testing regimes essential for developing EME2 mixes – including a new Duriez machine

There is a great deal of emphasis on material selection and laboratory design methodology. The French have determined that the long term performance of EME2 can be assessed and predicted by the selection and design procedures they have developed.

French practices are now being adopted in the UK. The Highways Agency and Transport Scotland require high levels of proof that EME2 mixes being proposed for individual contracts are likely to meet long term performance requirements.

**“We have the capability here of carrying out effectively all the testing that is required to prove EME2 mixes.”**

**Mike Lancaster**

This means, in real terms, that separate mix designs have to be carried out for each nominal stone size and for each proposed grading, for mix materials supplied from each quarry, for each road contract being pursued.

Hence Mike Lancaster's comment above about the amount of pre-tender mix design work that needs to be done, for EME2 contracts.

The UK evaluation procedure for each EME2 mixture involves a number of stages. The composition of the asphalt mixture is optimised by evaluating its compactibility and properties at final compaction stage.

“Binder content is a calculated value, producing a 'richness modulus' which is an





Nynas has had opportunity to prove its worth developing EME2 mixes in England and in Scotland close to the Forth Road bridge

estimation of binder film thickness. The minimum richness modulus to comply with fatigue requirements is 3.6," Lancaster says.

Void content is determined with the use of a gyratory compactor. This simulates the forces that are applied to asphalt during compaction on site. "The height of the specimen under gyration reduces, and this reduction is plotted to give an indication of typical air voids content and the mixture's likely behaviour during compaction."

The French have developed the Duriez test for measuring water sensitivity.

Samples of asphalt mix that have been immersed in water for seven days are compared with samples kept in the dry, in terms of strength determined by crushing. The ratio of wet over dry has to achieve a result of 0.75 or higher.

"Rut resistance is obtained through use of a wheel tracking machine. The UK uses the now established Indirect Tensile Stiffness Modulus (ITSM) test to evaluate the stiffness modulus. The French evaluate fatigue resistance by bending a series of trapezoidal specimens: in the UK the need for this testing is obviated, providing the

minimum richness factor is achieved," Mike Lancaster says.

A typical mix design takes up to four weeks depending on laboratory equipment availability, or longer if the trapezoidal French fatigue test is called for, to more closely define fatigue resistance.

EME2 technology requires a special, low PEN binder specially manufactured to meet the specifications. "We are known for our capabilities in the development of specialist binders, and our EME2 binders are among the very best," says Nynas Bitumen's UK Sales Manager Roger Dennison.

## EME2 FORMALLY SANCTIONED FOR SPECIFICATION

EME2 constitutes for Britain the latest generation of high performance asphalts. Its adoption in the UK was prompted by durability problems encountered with high modular base course materials; and prefaced two years ago by a comprehensive TRL document: 'TRL Report 636 - The application of Enrobé à Module Élevé in flexible pavements'. A draft specification contained in this is included in the 'Specification for Highway Works' to be published next month (October 2007).

February 2006 saw publication of the UK

'Design Manual for Roads & Bridges' volume seven, which introduced EME2 as a permissible base material for flexible and flexible composite design; through the use of HD 26/06 - 'Pavement design and construction'. Transport Scotland has formally sanctioned the use of EME2 on trunk roads.

The European standard BS EN 13924: 'Bitumen and bituminous binders - Specification for hard paving grade bitumens' provides the base specification for binders used in EME applications.



Transport Scotland has formally sanctioned use of EME2 on its trunk roads and a draft specification is expected from the Highways Agency in October

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