First European Symposium on Bituminous Materials Rheology and Pavement Performance

London, U.K.
November 15th, 2000

This symposium was held on 15 November 2000 at the prestigious headquarters of the Institute of Materials in London. Dr Geoffrey Rowe (Abatech) welcomed the 70 strong audience and introduced the proceedings and purpose of the seminar which was to provide a forum to present and discuss proposed test methods, especially for binders and asphalt mixes, but also for clients, producers and contractors, to learn of innovations from experts in rheology. Nine short papers were presented during the day, allowing ample time for questions, plus a workshop session.

Session 1 was chaired by Derek Pearson (Leeds / Abatech): Dr John Read (Shell) spoke on "The impact of rheology on pavement performance". He gave a concise overview of rheology and its history in bitumen testing, describing its development from chewing bitumen, from the 1900s, to present-day developments in dynamic shear rheometers. He concluded with a warning that we should all ensure that we used the correct terminology when discussing rheology; this was a minefield of misunderstanding. Andrew Walton (Bohlin Instruments) presented a paper on "Developments in dynamic shear rheometers", describing the development of DSRs over recent years due to their importance within the UJS SHRP programme. He stressed the need for careful preparation of tests and maintenance of accurate temperature control; without this, the results were meaningless. New test machines reduced the likelihood of operator error, as well as providing methods of depicting data with more advanced software packages, tailored to meet the requirements of national standards. Derek Bell (T A Instruments), whose subject was "A novel low-cost dynamic rheometer", described the development of this robust apparatus, the CP20, which might find favour in the routine testing of bitumens, rather than just in research laboratories. He had found that the CP20 could produce results comparable with traditionally de-signed DSRs at lower cost, due to the elimination of air bearings and the external temperature co-troller. "The use of servo-pneumatic equipment to de-termine time-dependent properties of asphalt" was the paper presented by Keith Cooper (Cooper Re-search Technology). The author, who is the major contributor to the development of the NAT, dis-cussed the importance of testing the whole mix, due to the characteristics of the aggregate as well as those of the binder. He described the develop-ment of the original NAT with loading times set at 124 milliseconds due to the limitations of early PCs. He had now been able to take advantage of ultrafast PC capability and had developed servo-pneumatic equipment which can apply continuous cyclic loading at varying rates to simulate traffic loading conditions, thus allowing the examination of existing pavements and the design of new pavements in the laboratory under more realistic loading conditions.

Session 2 was chaired by Tony Harrison (Refined Bitumen Association): Dr Geoffrey Rowe (Abatech) spoke on "Develop-ments of binder performance specifications in the USA after SHRP". He outlined the use of DSR and the vital importance of temperature control, as stressed by previous speakers. Because of improved temperature control, the coefficient of variability had been reduced from 44 to 22%. The new procedures were being reviewed by AASHTO. Improved methods and equipment also gave improved tension testing. The author also reported on modifications to the RTFO test which increase the ageing effect by three to four times of that of the standard method. Because it is difficult to test modified binders, a new test is being developed which combines the direct tension test with the bending beam rheometer; a new low-temperature specification is being devel-oped as it has been found that the current speci-fication does not distinguish between modified and unmodified. Andre Stawiarski (Eurobitume) spoke on the "Development of performance-related standards – an overview of CEN and Eurobitume projects". He described the progress of the harmonisation of paving grade bitumens and the commencement of the development of performance standards during the year 2000. This was a four-stage process, in-volving identification, selection, collection and re-view of data and specifications. He stressed that the process relied on stakeholder involvement by all parties, ensuring the acceptance of appropriate test methods and standards which are relevant to market requirements. "Rheology, measurement, accuracy, precision and prediction" was the paper presented by Jim Cars-well (BP). He gave detailed test data on the effect on the accuracy of DSR of test geometry, temper-ature and thermal history. For example, stiff binders at low temperatures may give inaccurate results due to equipment

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distortions. He reviewed test data from various studies carried out by AASHTO and RILEM on DSR, including the comparison of DSR and dry wheel tracking rates. He concluded that mixture testing can measure complex behaviour and that predicting performance from DSR may not always be appropriate. Standardisation was required for rheometer testing with improved precision, but mix testing will be required for the prediction of performance.

Session 3 was chaired by Dr Hassan Al Nageim (Liverpool John Moores University): Martin Heslop (Acland) spoke on "SHW Clause 928 and type approval", outlining the require-ments for the proposed Clause 928 type approval of binders and how there will be a transition from empirical to fundamental testing using DSR data, but recognising that for polymer-modified binders additional data will be needed. He covered sample preparation, definitions such as high equi-stiffness temperature (G = 2 kPa at 0.41 Hz) and low equi-stiffness (at 2 MPa). He also showed how results are to be presented, e.g. phase angle vs. temperature and Black diagram. This data will be required byy SHW Clause 942 (Thins Surfacing) in addition to Clause 922 and 918 (Surface Dressing and Micro-Surfacing). Bernard Eckmann (Jean Lefebvre) spoke on "Desirable developments in binder and mix testing". He raised key issues relating to performance testing, such as how to validate performance tests for binder and what are performance re-quirements. Is there a binder test for each performance requirement on the mix? He covered the pros and cons of in-situ and laboratory testing, recognising the potential shortcomings of both. Importantly, he defined the functional require-ments which depend on factors such as mix type, place in the pavement structure and traffic/environmental conditions; going on to discuss in detail binder properties relating to handling, mixing and performance. Permanent deformation, for example, could be related to zero-shear viscosity (viscous flow) and stiffness at short loading times (plastic flow), but these were related to phase angle, temperature and viscosity. He suggested that the Vialit pendulum test may be too severe for brittle conditions and adaptations may be necessary. However, he confirmed that G* was strongly linked to mix and binder stiffness but no good binder test had been identified (yet) which relates to fatigue, although ageing tests such as RTFOT and PAV were simulative. Further work was required to validate tests and define their sensitivity to performance equally for mix and binder testing.

The Workshop Session was jointly chaired by John Williams (Highways Agency) and Bill Heather (Associated Asphalt): This open-forum workshop session, with some of the speakers on the platform, concluded the day. It proved to be a lively forum, with the issues presented earlier debated and further questions put to the speakers. Many questions related to test procedure accuracy and repeatability and the difficulty of predicting in the laboratory the mix performance in situ. All questions were answered well and it was generally felt by all that the symposium had achieved its mission of broadening the debate on a very important subject.

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