Book review

The Shell Bitumen Handbook

R. N. Hunter, A. Self and J. Read (eds). Sixth Edition, ICE Publishing, London, UK, 2015, ISBN 978-0-7277-5837-8, £110.00, 788 pp.

Even in our internet age, there are some essential hard copy references that have a place on the diminishing bookshelves of most practising engineers and materials scientists. The distinctively yellow-bound Shell Bitumen Handbook, first published in 1949 and now issued in its sixth edition, is certainly one such valued book. It replaces the fifth edition of 2003 and is completely reorganised, thoroughly updated and expanded by around 50%. Three principal authors, led by civil engineer and expert asphalt consultant, Dr Robert Hunter, are supported by a panel of specialist authors, many of whom are with Shell Bitumen.

Those familiar with the fifth edition will find the chapters rearranged somewhat, with a net increase in chapters from 20 to 24 and a doubling of appendices from 4 to 8. The new chapter sequence approximately follows the 'life' of bitumen, from its origins and manufacture, through its properties and use in asphalts, then design, installation and performance of asphalt pavements, to durability and other applications for bitumen and asphalt. Two of the new appendices indicate an objective to make the handbook more international: Appendices 5 and 6, respectively, list bitumen and asphalt product standards across the world. In the former, different principles are used in various regions, with performance graded (PG) specification being used in North America and partly in China, whereas empirical testing is used elsewhere, such as 'penetration/softening' in Europe, Africa and much of Asia, and 'viscosity' in Australasia, the Indian subcontinent, Mexico and parts of South America (and for soft grades in Europe); unfortunately, there is some minor inconsistency between the text and the map in Appendix 5.

A surprising omission from the previous edition was guidance on the design of asphalt mixtures. This gap is well and thoroughly addressed in the new edition, with a completely new, 50-page Chapter 12. In common with all the chapters in this book, Chapter 12 is clearly written and beautifully presented, being both easy and a pleasure to read, supported by full-colour diagrams of impressive clarity; there are no photographs in this particular chapter, but elsewhere there are plenty of good-quality images, as appropriate. This new chapter provides a grounding in the principles that underpin asphalt mix design, notably 'mixture volumetrics'

and 'aggregate grading', then explains the four most widely implemented design methods, all of which were developed in the USA: 'Hubbard Field', 'Hveem' (or 'California'), 'Marshall' (or 'Corps of Engineers', perhaps the best known) and 'Superpave' (the most recent, resulting from a research programme initiated in response to increasing premature pavement failures).

As well as reorganisation and the new chapter on asphalt mix design, existing users will be pleased to know that this new edition sets out to update the whole opus, and two splendid examples are the completely new Chapter 7 on rheology of bitumens and the extended Chapter 8 (formerly Chapter 5) on polymer-modified bitumens and other modified binders. The former is a most valuable 30-page addition on a critical property, especially with the growth in the use of polymer-modified bitumens, authored jointly by specialists from Shell (Dr Richard Taylor) and the University of Nottingham (Professor Gordon Airey). A potentially complex account of the science of rheology is handled with skill and clarity, then the rheological behaviour of bitumen is considered first in terms of 'a low-temperature linear elastic region', then 'a high-temperature viscous region' and finally 'an intermediate temperature visco-elastic region'.

In common with all technical books, this handbook includes many established or new terms that will not be immediately familiar to all readers, but the presentation style includes careful and digestible explanation of such terminology as it arises. It might be argued that a glossary would have been a useful additional facility, but this reviewer found it to be unnecessary, as the in-text explanations can easily be accessed from the admirably detailed index.

Overall, this greatly enlarged and thoroughly revised new edition of a well-respected specialist handbook is a magnificent achievement; a veritable *tour de force* by Dr Robert Hunter and his fellow principal and chapter authors. It is a book that will reward a wide range of readers, from those pursuing a general interest in this long-standing and vitally important, yet unglamorous, construction material, through those dipping into the work in search of answers to specific and perhaps urgent questions, to those who will make full and frequent use of it as a genuine and doubtlessly well-thumbed handbook. I have absolutely no hesitation in recommending this new edition to readers.

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