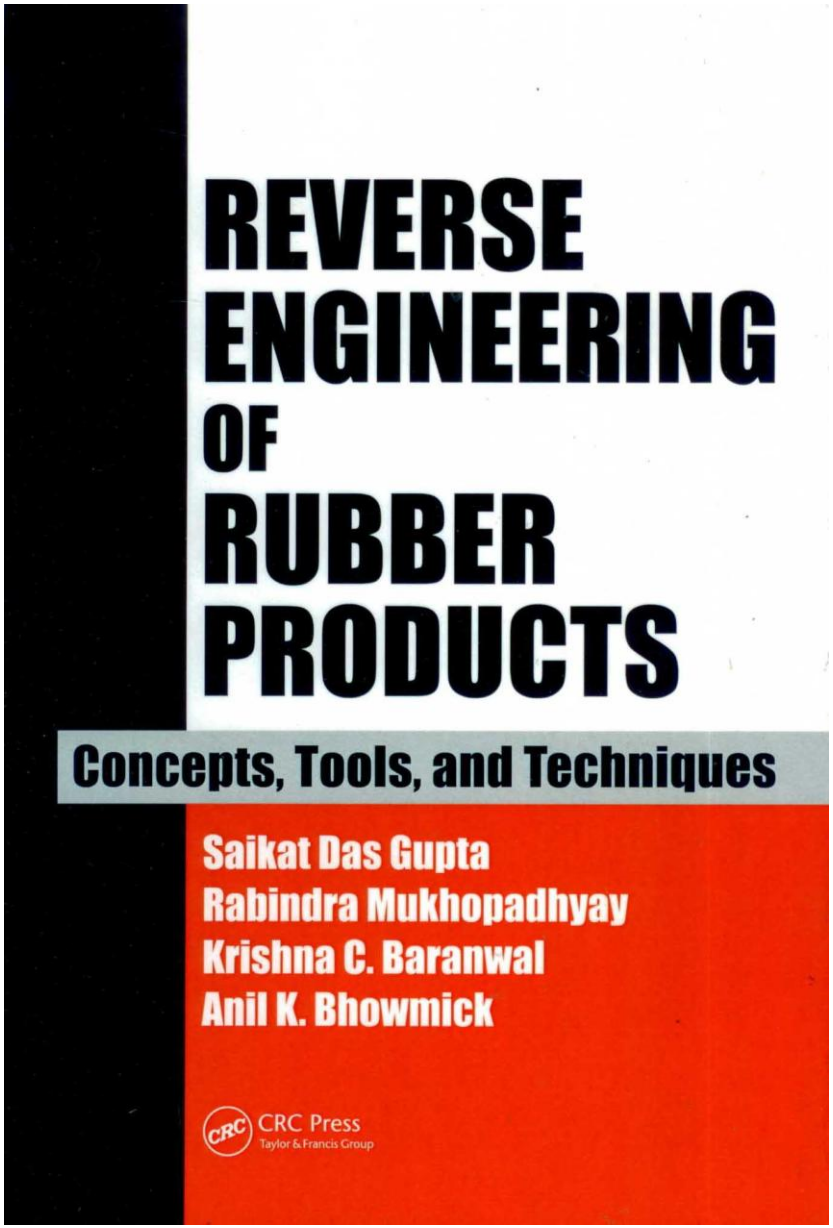

About the book

Reverse engineering is widely practiced in the rubber industry, with companies routinely analyzing competitors' products to gather information about specifications or compositions. The rubber compounds contain a large number of additives including elastomers, plasticizers, inorganic fillers, carbon black, antidegradants, cure systems, fire retardants. Some of the additives are present at very low levels. Vulcanization reactions change the nature of the components in a rubber and make the product more complex. In a competitive market, introducing new products with better features and at a faster pace is critical for any manufacturer. Reverse Engineering of Rubber Products: Concept, Tools and Techniques explains the principles and science behind rubber formulation development by reverse engineering methods.

The book describes the tools and analytical techniques used to discover which materials and processes were used to produce a particular vulcanized rubber compound from a combination of rubbers, fillers and numerous different additives. Quite a good numbers of case studies, from tires and belts to seals and hoses, were discussed in detail for reconstruction.

Combining scientific principles and practical advice, this book brings together important insights on reverse engineering in the rubber industry. It is a valuable reference for scientists, engineers, and researchers who want to produce comparative benchmark information, discover formulations used throughout the industry, improve product performance and shorten the product development cycle.

Many spectroscopic techniques are employed in reverse engineering of rubber products including thermogravimetric analysis (TGA), differential scanning calorimetry (DSC), dynamic mechanical thermal analysis (DMTA), infrared spectroscopy, ultraviolet light spectroscopy, NMR spectroscopy, atomic absorption spectroscopy, energy dispersive analysis, gas chromatography-mass spectrometry (GC-MS), high performance liquid chromatography (HPLC), thin layer chromatography (TLC) etc. This book explains each technique used in reverse engineering and then also illustrates the methods that are applied to determine ingredients.

This book is a good introduction to a very complex subject area: reverse engineering of rubber products and will help the reader to understand the subject in a better way.

Contents

Review

"The authors of this book are authorities on the subject, and they have done a great service by bringing together this collection of valuable techniques. Readers will appreciate the convenience of having this information in a topic-focused volume, and they will benefit from the decades of experience that the authors bring to the subject" – Will Mars, CEO, Endurica LLC; editor, Rubber Chemistry and Technology

"Reverse engineering is very important. This is the first text addressing this area and will therefore be of considerable value" – Bredan Rodgers, ExxonMobil.

Bio data of authors

Saikat Das Gupta is Chief Scientist in research and development at HASETRI. He earned a BTech in Polymer Science and Rubber Technology from Calcutta University, India, in 1987 and completed the MTech in Rubber Technology from the Indian Institute of Technology (IIT), Kharagpur, India, in 1992. Das Gupta then joined the research and development section of JK Tyre and Industries Limited. He pursued his PhD degree while working, and earned that degree in 2009. He completed a postgraduate diploma in business management in 2001.

Rabindra Mukhopadhyay is Director and Chief Executive, Hari Shankar Singhania Elastomer and Tyre Research Institute (HASETRI); Director (R&D), JK Tyre and Industries Limited; and chairman of Indian Rubber Institute. He did graduation in Chemistry from University of Calcutta, Masters in Chemistry & Doctorate in Rubber Technology from IIT Kharagpur. He is a fellow member of Indian National Academy of Engineers, Indian Rubber Institute, The Institution of Engineers (I), ACS Rubber Division, Indian Institute of Quality etc. He is associated with several institutes and universities in India as a visiting faculty in the Department of Polymer Science and Rubber Technology. His fields of interest are reverse engineering, environmentally friendly technology, sustainable development, and nanotechnology with special reference to the Rubber and Allied industry including various business excellence models on quality.

Krishna C. Baranwal earned his BS and MS degrees from the University of Allahabad, and his M Tech degree from the Indian Institute of Technology, Kharagpur, India. After receiving his PhD in polymer science from the University of Akron, Ohio, he joined BF Goodrich Research Center, where he later became director of tire research and tire testing. After about 30 years with Goodrich, he joined the Akron Rubber Development Laboratory, Ohio, as executive vice president-technical. He has a distinguished professional career of 43 years in the rubber industry, which includes 38 publications, four patents, and two books. Baranwal was previously active in the Rubber Division, American Chemical Society (ACS). He has been chairman of the Program Planning Committee and also chaired the Science and Technology Awards Committee. He has been the editor of Rubber Chemistry alld Technology, an internationally recognized rubber journal, and has edited textbooks used in the correspondence courses by the Rubber Division, ACS. In addition to his activities in technical groups, he is involved in community volunteer work for several nonprofit organizations

Anil K. Bhowmick is a Professor of Eminence and former head of Rubber Technology Centre and Dean of Postgraduate Studies and Dean (Sponsored Research and Industrial Consultancy), IIT Kharagpur. He was previously associated with the University of Akron, Ohio; London School of Polymer Technology, London; and Tokyo Institute of Technology, Japan. His main research interests are thermoplastic elastomers and polymer blends, nanocomposites, polymer modification, rubber technology, failure and degradation of polymers, adhesion and adhesives. He has more than 500 publications in peer-reviewed journals, 35 book chapters, and 7 co-edited books. He was also coeditor of the special issue of Polymer and Composite Characterization of the Journal of Macromolecular Science. He was the 2002 winner of the Chemistry of Thermoplastic Elastomers Award and 1997 winner of the George Stafford Whitby Award of the Rubber Division, American Chemical Society, for innovative research, and the 2001 K.M. Philip Award of the All India Rubber Industries Association for outstanding contribution to the growth and development of rubber industries in India. He was also awarded the NOCIL Award (1991), the JSPS Award (1990), the Commonwealth Award (1990), the MRF Award (1989), and the Stanton Redcroft ITAS Award (1989). He is on the editorial board of the Journal of Adhesion Science & Technology, Journal of Applied Polymer Science, Journal of Materials Science, Polymers and Polymer Composites, Rubber Chemistry and Technology, Polymers for Advanced Technology, and Natural Rubber Research. He holds 12 patents including one U.S. and one German patent. He guided 40 PhD students. He is a Fellow of the National Academy of Engineering, Indian National Science Academy, and W.B. Academy of Science and Technology. He is currently the director of the Indian Institute of Technology, Patna.