



Chemical Product Design (Cambridge Series in Chemical Engineering)

By E. L. Cussler, G. D. Moggridge

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The chemical industry is changing, going beyond commodity chemicals to a palette of higher value added products. This groundbreaking book, now revised and expanded, documents this change and shows how to meet the challenges implied. Presenting a four-step design process - needs, ideas, selection, manufacture - the authors supply readers with a simple design template that can be applied to a wide variety of products. Four new chapters on commodities, devices, molecules/drugs and microstructures show how this template can be applied to products including oxygen for emphysema patients, pharmaceuticals like taxol, dietary supplements like lutein, and beverages which are more satisfying. For different groups of products the authors supply both strategies for design and summaries of relevant science. Economic analysis is expanded, emphasizing the importance of speed-to-market, selling ideas to investors and an expectation of limited time in the market. Extra examples, homework problems and a solutions manual are available.

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Editorial Review

Review

"I have been anticipating the launch of this book since Dr. Moggridge told me back in 2009 that he had been working on the second edition. This is the long-awaited update of the book which was the first of its kind in the chemical engineering literature. The book had served as the foundation of my chemical product design course. Cussler and Moggridge's clear writing style and abundance of real-world examples in the book make it a must-have for any faculty interested in this fast emerging field of product design in chemical engineering." Sin-Moh Cheah, Singapore Polytechnic

"Nowadays, Chemical Process Industries mostly produce products with target end use properties, and not simply molecules. This textbook offers the opportunity, for students, chemists, engineers or professors, to discover the framework, methodology and building concepts of the emerging 'chemical product design' discipline. The 2nd edition proposes an increased number of relevant and novel examples, treated thanks to a unique common approach. This reference textbook should be strongly recommended to anyone who wants to take into account the evolution of the chemical industry, and its incidence on teaching applied chemistry or chemical engineering." Eric Favre, ENSIC, Nancy, France

"After their pioneering first edition on 'Chemical Product Design', Cussler and Moggridge have produced a second edition in which they have adopted a more systematic approach to this topic, which should make it easier to teach at the undergraduate level in chemical engineering courses, and more readable by industrial practitioners. The authors describe a four-step design strategy, involving a template composed of needs, ideas, selection, and manufacture that can be applied in principle to any product, from commodities to novel devices to molecular products to microstructures. The authors have also expanded the economic analysis to emphasize the importance of speed-to-market. Any instructor teaching a course on product design will find this book to be a very useful textbook. Industrial practitioners should find this book to be an excellent reference for promoting innovation in their organizations." Ignacio E. Grossmann, Carnegie Mellon University

"There is a difficult transition from asking 'How do we make this commodity more cheaply?' to asking 'What should we be making in the first place?', but Cussler & Moggridge clearly guide the way. This is the seminal textbook on Chemical Product Design, demonstrating how chemical engineering fundamentals can be effectively applied to product design. The new and expanded material in the second edition greatly improves the text, illustrating how to apply their design template with industrially relevant problems. I highly recommend this book to everyone in the field of chemical product design and development." Michael Hill, Columbia University

"Back in 2001 Cussler and Moggridge pioneered Chemical Product Design and introduced its first ever textbook. Now, one decade later, they do it again, through a substantially revised new edition that covers a broader range of topics (chapters for different product categories, coverage of business idea evaluation/presentation tools, defining future trends and establishing sets of final commandments for chemical product development), and will for sure become the book of reference in this field for the forthcoming years, a mandatory presence in many many shelves, including mine!" Pedro Saraiva, University of Coimbra

"This second edition of a pioneering and well-received book has been carefully updated and enlarged by the

addition of four new exemplifying chapters. Appearing 10 years ago as the first text on chemical product design, the book has been an important source of inspiration for chemists and chemical engineers. The systematic treatment of this diverse discipline and the many practical examples make the book very useful as an introductory text for both a university course and for practicing engineers." Søren Kiil, DTU-Chemical Engineering

"The book builds on the well established four-step design process presented in the ground-breaking first edition. New additions emphasize the differences in design and manufacturing characteristics of molecules, micro-structured products and devices as opposed to chemical commodities. Students and practitioners may find this an invaluable introduction into the methodology of chemical product design and the use of engineering principles to support the screening and selection of product options." Ton Broekhuis, University of Groningen

"Revisions to the second half of this excellent text by Cussler and Moggridge have made the book even more relevant and valuable to the challenge of contemporary chemical product design." Keith Alexander, University of California, Berkeley

"Beyond its value as a text, the book will be useful to a variety of readers, including those trained in commodity chemicals but now involved with other types of chemicals with higher added value. It should also serve as inspiration for industrial practitioners seeking to promote innovation in their organizations." - CEP, September 2011

About the Author

E. L. Cussler is Distinguished Institute Professor at the University of Minnesota. The author of the text Diffusion, he has received the Colburn and Lewis Awards from the American Institute of Chemical Engineers and is a member of the National Academy of Engineering.

G. D. Moggridge is a Senior Lecturer at the University of Cambridge. He has taught chemical product design since 1998, receiving the Entec Medal and Frank Morton Prize from the Institution of Chemical Engineers and a Pilkington Teaching Prize.

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