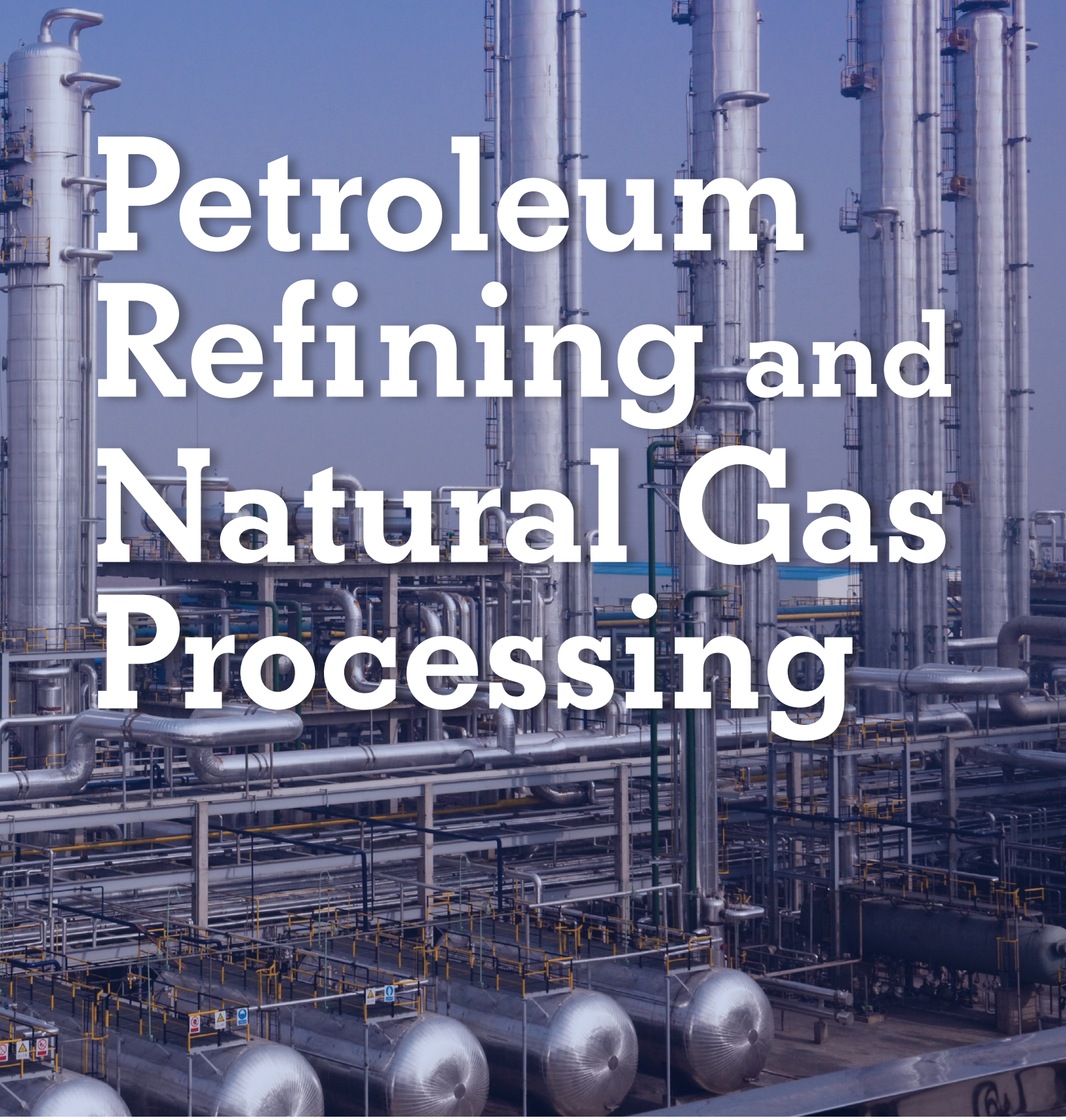

Petroleum Refining and Natural Gas Processing

M.R. Riazi, S. Eser, S.S. Agrawal, J.L. Peña Díez, editors

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Petroleum Refining and Natural Gas Processing

M.R. Riazi, Semih Eser, Suresh S. Agrawal, and José Luis Peña Díez, Editors

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Foreword

THIS PUBLICATION, *Petroleum Refining and Natural Gas Processing,* was sponsored by Committee D02 on Petroleum Products and Lubricants. This is Manual 58 in ASTM International's manual series.

To
Our families

Preface

Oil and gas have been the main sources of energy the world over for the past century and will remain important sources of energy for the first half of this century, and possibly beyond. Currently, more than 60 % of the world's energy is produced from oil and gas, and energy needs are increasing. In addition, oil and gas provide the main feedstocks for the petrochemical industry. World population is expected to increase to eight billion by 2030, which will demand an increase in energy of 40 % in the next two decades. With these increases in energy consumption it is becoming necessary to consider unconventional types of oils. Such oils, which are heavier, require more rigorous processing and treatment. The evolution of petroleum refining began with the birth of modern oil production in Pennsylvania in the nineteenth century. Current refineries are much more complex than those of a few decades ago and there is significant research concerning the development of more economical uses of available hydrocarbon resources.

In the past few decades there has been an increase in the number of publications that report advancements in the petroleum industry. *Petroleum Refining and Natural Gas Processing* is a continuation of those efforts and attempts to bring together the most recent advances in various areas of petroleum downstream activities, with an emphasis on economic and environmental considerations, heavy-oil processing, and new developments in oil and gas processing.

The primary goal of this book is to provide a comprehensive reference that covers the latest developments in all aspects of petroleum and natural gas processing in the downstream sector of the petroleum industry. It includes topics on economy and marketing, scheduling and planning, modeling and simulation, design and operation, inspection and maintenance, corrosion, environment, safety, storage and transportation, quality and process control, products specifications, management, biofuel processing and production, as well as other issues related to these topics. Every attempt has been made to avoid overlap between chapters, however, there are some topics that have been included in more than one chapter when relevant to both chapters. Another objective of this book is to describe the latest technology available to those working in the petroleum industry, especially designers, researchers, operators, managers, decision-makers, business people, and government officials. The petroleum industry is a diverse and complex industry and it is almost impossible to include all aspects of it in a single book. However, we tried to cover the most vital issues and we believe this is the most comprehensive resource published to date for use by people involved in this worldwide industry. We hope this contribution will be useful to them. In writing this book we benefited from the published works of many researchers, which are cited at the end of each chapter. We welcome comments and suggestions from readers.

More than 40 scientists, experts, and professionals from both academia and industry have cooperated and contributed to the 33 chapters in this book. Authors with years of experience made unique contributions not available in any similar publications. We are grateful to all of them for their efforts in bringing this book to fruition.

We also thank the large number of anonymous reviewers who went through lengthy manuscripts and provided us with their constructive comments and suggestions, which greatly enhanced the quality of the manual. Many publishers, organizations, and companies provided us with permission to use their published data, graphs, and figures and we thank them for their cooperation in supporting this publication effort.

We are also thankful to ASTM International for sponsoring publication of this book, especially to Kathy Dernoga, Monica Siperko, Marsha Firman, and other ASTM staff involved in this project. Kathy Dernoga's review and encouragement were essential to the completion of this work. The support and encouragement of Dr. George E. Totten, ASTM's Committee on Publications representative for this manual, is also appreciated. The reviewing process was managed and conducted by Christine Urso of the American Institute of Physics (AIP) and she was extremely cooperative in uploading the manuscripts to the online reviewing site, inviting reviewers, and handling of all manuscripts submitted for this manual. Also, many thanks to Rebecca L. Edwards, senior project manager at Cenveo Publisher Services for copyediting and production.

Finally, and most importantly, we thank our families for their patience, understanding, cooperation, and moral support, which were essential throughout this process.

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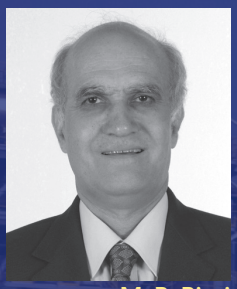

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Dr. M. R. Riazi is currently a Professor of Chemical Engineering at Kuwait University. He was previously an Assistant Professor at Pennsylvania State University (USA), where he also received his MS and PhD. He was also a visiting professor at various universities in the U.S., Canada, Europe and the Middle East. He has been consultant and invited speaker to more than 50 oil companies and research institutions in Canada, the U.S., Europe, India, China, Malaysia, Australia, the Middle East and North Africa, including invited speaker to the World Economic Forum. He is the author/co-author of more than 100 publications, including three books mainly in the areas of petroleum and chemical technology. He is the founding and Editor-in-Chief of IJOGC and an associate editor of some other international journals. He was awarded a Diploma of Honor from the National (American) Petroleum Engineering Society, as well as teaching and research awards from various universities. He is a member of AIChE and the Research Society of North America. (www.RiaziM.com)

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Peña Díez is the author of forty technical articles and presentations at international conferences in the fields of petroleum fluids characterization, process engineering and control, and process simulation, areas in which his expertise contributed to this book.

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