GUIDELINES FOR

INHERENTLY SAFER CHEMICAL PROCESSES

A LIFE CYCLE APPROACH

with website

3

THIRD EDITION

An AIChE Technology Alliance
CCPS Center for Chemical Process Safety

WILEY

Guidelines for Inherently Safer Chemical Processes: A Life Cycle Approach 3rd Edition

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CENTER FOR CHEMICAL PROCESS SAFETY
of the
AMERICAN INSTITUTE OF CHEMICAL ENGINEERS
New York, NY

WILEY

This edition first published 2020

A Joint Publication of the American Institute of Chemical Engineers and John Wiley & Sons, Inc.

Registered Office
John Wiley & Sons, Inc., 111 River Street, Hoboken, NJ 07030, USA

Editorial Office
111 River Street, Hoboken, NJ 07030, USA

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Library of Congress Cataloging-in-Publication Data is available

Hardback ISBN: 9781119529163

Cover Design: Wiley
Cover Images: Silhouette, oil refinery © manyx31/iStock.com; Stainless steel © Creativ Studio Heinemann/Getty Images; Dow Chemical Operations, Stade, Germany/Courtesy of The Dow Chemical Company

Printed in the United States of America.

10 9 8 7 6 5 4 3 2 1

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Preface

The American Institute of Chemical Engineers (AIChE) has been involved with process safety and loss prevention issues in the chemical, petrochemical, hydrocarbon process and related industries and facilities for more than 50 years. AIChE publications and symposia are information resources for chemical engineers and other professionals on the causes of process incidents and the means of preventing their occurrences and mitigating their consequences.

In 1985, the Center for Chemical Process Safety (CCPS), a Technology Alliance of the AIChE, was established specifically to develop and disseminate technical information for use in the prevention of major chemical process incidents. With the support and direction of the CCPS Advisory and Managing Boards, a multifaceted program was initiated to address the need for Process Safety and Risk Management systems capable of reducing potential exposures to the public, the environment, personnel, and facilities. This program includes:

- developing and publishing Guidelines and Concept Books relating to specific areas of Process Safety and Risk Management
- publishing a monthly newsletter, Process Safety Beacon
- organizing, convening and conducting seminars, symposia, training programs, and meetings on process safety-related matters
- cooperation with other organizations, both internationally and domestically, to promote process safety.

CCPS activities are supported by more than 200 corporations that provide funding and professional expertise. Several government agencies and academic institutions also participate in CCPS endeavors.

In 1989, CCPS published Guidelines for Technical Management of Chemical Process Safety, which presented a model for process safety management characterized by twelve distinct, essential and interrelated elements. These Guidelines were refined over the ensuing years and updated in the Guidelines for Risk Based Process Safety (2007), which

expanded the definition of process safety and risk management into twenty distinct elements.

The previous editions of this book, which were part of the "Concept Series," supported many of those twenty key elements of process safety, as identified in the Guidelines for Risk Based Process Safety, including process safety competency, workforce involvement, hazard identification and risk analysis, auditing, and management review and continuous improvement. The purpose of this guideline series book is to update the previous 2nd edition concept book in order to demonstrate the on-going and improved application of inherently safer strategies throughout all the stages of the chemical process life cycle, including additional case studies and examples of inherently safer design (ISD) implementation.

Inherently safer (IS) concepts continue to be well-received by industry and there has been significant advancement in the concept since the original version of this book was published in 1996. Both the original 1996 concept book and the 2009 update are frequently cited as authoritative sources on inherent safety, and, as such, it is important that an updated edition be published. The Third Edition will reflect not only the most current knowledge on the subject but will harness the concepts introduced in the first two editions, provide additional examples of IS and provide a guideline for the practical application of inherent safety techniques.

This book encourages engineers, process safety experts, and others involved in analyzing and reducing the risks from chemical processes to make conservative choices that apply the principles and spirit of inherent safety to the extent feasible. The discussion and examples range from the basic process chemistry through the details of the design of hardware and procedures. Inherently safer thinking can be applied at all levels of the process design, from the overall concept through the detailed equipment design and procedure development.

Acknowledgements

The American Institute of Chemical Engineers (AIChE) and its Center for Chemical Process Safety (CCPS) thank the subcommittee members and their CCPS member companies for their generous efforts and technical contributions to this book. CCPS also thanks the members of the CCPS Technical Steering Committee for their advice and support.

Guidelines for Inherently Safer Chemical Processes
A Life Cycle Approach, 3rd edition

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Before publication, all CCPS books receive a thorough peer review. CCPS gratefully acknowledges the thoughtful comments and suggestions of the following peer reviewers. Their work enhanced the accuracy and clarity of these guidelines.

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