

“Practical Guidelines for the Chemical Industry: Operation, Processes, and Sustainability in Modern Facilities”

By **Kiran R. Golwalker (Consulting Chemical Engineer, India) and Rashmi Kumar (Dwarkadas J. Sanghvi College of Engineering, India), Springer Nature Switzerland AG, 2022, 297 pp, ISBN: 978-3-030-96580-8, £109.99, €126.72, US\$137.27**

Reviewed by Mahmud Juned

Johnson Matthey, Pimlico Industrial Area, West Bradford Road, Clitheroe, BB7 4QB, UK

Email: mahmud.juned1@matthey.com

NON-PEER REVIEWED FEATURE

Received 17th April 2023; Online 14th June 2023

Introduction

This book is a body of work to give insight to designers, technicians and production-based engineers working in the chemical industry as well as some general guidelines for safe and efficient running of chemical plants. There are specific guidelines on operational equipment including the use of pressure vessels, appropriate materials of construction and efficient handling of process fluids.

The authors are both located in India. Golwalker is a consultant chemical engineer working in private practice and has had much experience commissioning chemical plant in India, Kenya, Thailand and Indonesia. Kumar has experience from a long teaching career of around 25 years and is now an Assistant Professor of Chemical

Engineering at the D. J. Sanghvi College of Engineering in Mumbai, India.

Overview of Chapters

The book is split into nine chapters. The structure of the book is convenient for those with little knowledge and for non-specialists in chemical engineering. The order of the subjects suggests that safety is understood to be a high priority as it shows up early in the guidelines. Furthermore, the order of the chapters would generally be the direction and format one would use when designing equipment or sections of a chemical plant.

Each chapter has an introduction and some examples to give the reader a good insight into best practice. A brief description on what each category involves is provided below. It is to note that there are references for further reading if one would like to find out more around certain sections which is especially useful.

Chapter 1: Management Functions

Management functions cover a wide set of roles and activities in the chemical industry. The range of functions include how to be successful in management, marketing, surveying, procurement, planning, commissioning, delivery and maintenance.

The chapter covers general steps that one would look to take to be able to manage a chemical plant or commission a new one, such as process selections and how to utilise research and development.

Chapter 2: HAZID, HAZOP and Ensuring Safety

This could easily be one of the most important sections of the book and is quite concise in its explanations of each safety point. The chapter considers steps when carrying out hazard identification (HAZID) or hazard and operability (HAZOP) studies, discusses operational safety and suggests procedures to take. The case studies in this chapter go a long way towards understanding safety and its application on a practical level.

Chapter 3: Materials of Construction

This chapter aids in teaching the reader the importance of proper material selection. The correct choice of material for the application will minimise risk, process failure under work and potentially unsafe conditions. It also covers the basics of properties that need to be considered when going over material selections, such as physical, volumetric, mechanical and thermal properties.

This section also encompasses common materials such as the various carbon steel alloys and stainless steel alloys with different compositions. Common causes of failure in relation to material construction are also addressed in this section as well as methods to control those failures.

Chapter 4: Pressure Vessels

Due to pressure vessels being so abundant in the chemical industry for applications such as carrying out reactions, storage of fluids and heat recovery, they have been given their own chapter in this book. The chapter describes the different classifications of pressure vessels, addresses important considerations when designing pressure vessels and presents the relevant codes and standards.

Chapter 5: Piping Design and Pumping Systems

Similar to pressure vessels, this book has a section specifically for this topic covering their high abundance in the chemical industry as well as the various different pipes and pumps. This chapter outlines a guide on piping, important considerations

when designing vessels as well as the codes and standards surrounding pipes and pumps.

Interestingly, in comparison to other chapters in this book, this chapter also describes simple formulations to assist with designing pipes. This has not been seen elsewhere prior to this chapter.

In terms of pump systems, there are many examples of where to use specific types of pumps and the issues and failures that can occur with them. This gives a great insight into types of pumps and their application.

Chapter 6: Cooling and Heating Systems

Controlling temperature is a vital part of chemical plants and this chapter discusses the types of systems for cooling and heating that are available and appropriate. The chapter also talks about practical considerations, expected observations during operation, maintenance and specific safety procedures for this type of unit operation.

Chapter 7: Cogeneration of Steam and Power, Steam Traps, and Heat Exchangers

A substantial number of chemical plants utilise steam for heating. This chapter covers efficient ways of creating steam, the drainage of condensate and the potential for recycling condensate.

There are some notes to take away in terms of safety when it comes to steam due to the amount of pressure required on certain equipment. Different steam traps and types of floats are considered and discussed and the design considerations required when commissioning steam heated equipment are described.

Chapter 8: Process Control and Instrumentation

Proper control of operations is a vital part of creating a safe, efficient and sustainable working chemical plant. Proper implementation of control allows minimal breakdown, optimal product quality, effective troubleshooting and prevents damage to the organisation's reputation. This chapter addresses the process parameters that should be considered when selecting those which need monitoring. It mentions advantages of implementing process control as well as some problems with hardware.

It is important to understand the sampling systems that are required for the chemical plant and what is critical for the plant to work. Process control can

be used as a preventative measure. However, there are still limitations to process control. These are mentioned in this chapter as well as some examples.

Chapter 9: Practical Considerations and Guidelines for Project Managers, Plant Managers and Plant Engineers

The book mentioned a lot of detail in individual chapters. This final chapter discusses scope, conditions for performance, precautions to take when considering future capacity and such things as location. These guidelines can be used by project managers, plant managers and maintenance engineers to commission instruments, equipment or process units into a plant.

This chapter although not specific to an area (Europe, Asia or the Americas) reminds the reader that there will still be regulatory requirements that each plant must adhere to depending on the permissions required for the chemical plant to run in the area where it is commissioned. In addition to statutory permissions, the chapter compiles a list of things to consider when sending out purchase orders for new equipment and what to include in the scope during the initial project management stage.

It is to note that capacity expansions need to be considered to allow the chemical plant to have a certain degree of reasonable expansion. In addition, a guide to modernising any legacy equipment is also mentioned here.

This final chapter encompasses a lot of the smaller roles such as introducing changes into a system, managing resources as well as subjects like guidelines for certain job roles in the workplace. It also includes what to look for in employees when hiring for a chemical plant.

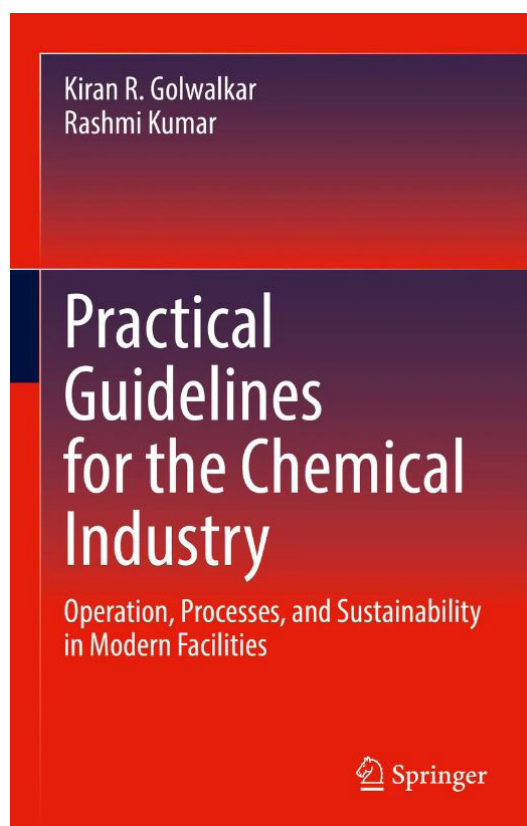
Discussion

Most chapters give a general overview of the respective chapters with further reading as an optional extra at the end of each chapter. Although the book is labelled as practical guidelines for the chemical industry, it also includes a lot of the work required in the preparation and design steps of commissioning a plant. In my opinion, the chapters are well formatted to follow the standard order when designing a plant. However, I believe that these chapters can be further simplified into three categories: preparation (Chapters 1 and 2); specification(s) (Chapters 3, 4, 5, 6 and 7) and application (Chapters 8 and 9). This would make it a little easier to find specific information.

This book is a great resource for those who have studied chemical engineering and have just started to work in the chemical industry (early career). This is also a great read for those already in the industry who would like to understand a little more about the reasoning as to why certain things are designed the way they are (experienced employees without necessarily a chemical engineering background, but active in the chemical industry).

Conclusion

This book is a well-structured approach to the chemical industry. It incorporates all the relevant information required to use as a guide towards preparing, commissioning and maintaining a chemical plant. As stated in the discussion, those who would benefit from this book are those who have a technical background in the chemical industry and would like to close the gap between theoretical and practical application. This is definitely a useful book to have on your shelf as a chemical engineer to reference from time to time. It will also help those who are new to the industry. I believe this is a great foundation book although additional books may still be needed to aid with actual design calculations when it comes down to the direct design work.



“Practical Guidelines for the Chemical Industry: Operation, Processes, and Sustainability in Modern Facilities”

The Reviewer



Mahmud Juned is currently a Process Engineer at Johnson Matthey, UK. He has a BEng in Chemical Engineering from the University of Hull, UK, following which he completed his MSc in Advanced Chemical Engineering at the University of Leeds, UK. He is an associate member of the Institution of Chemical Engineers with the title AMIChemE working towards his chartership. Juned's professional career started in a technical role at Johnson Matthey before pursuing a role as a process engineer and process development engineer in the aerospace and aviation industry. He gained around three and a half years' experience in aerospace, specialising in platinum plating and ceramic vibro-polishing, before returning to Johnson Matthey.
