

The Pilot Plant Real Book: A Unique Handbook for the Chemical Process Industry

by Francis X. McConville

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The pilot plant is indispensable in the development of chemical processes. Yet it is seldom covered in a typical chemical engineering curriculum, leaving it as one of the subjects that the graduate is supposed to learn “on the job.” The author suggests that this omission is a failure of today’s educational system. Given the importance of pilot plant, which can be viewed as one of the four elements of process development,[1] there is some truth in this assertion. At least this omission forgoes an opportunity to show the students how basic principles, experiments, know-how, experience, simulations, literature data, workflow, etc., come together in the development of products and processes.

If you are an educator, a process development chemist, or engineer, who shares McConville’s view that there is a gap in pilot plant education and practice, this book may be just what you want. It provides a lucid account of how chemical processes are transferred from the lab to the plant. The information often needed for pilot plant personnel is organized in a logical and readily accessible manner. This book is named a “Real Book”—McConville explains that just as young jazz musicians had to master the “Real Book,” a bootleg, photocopied collection of the great jazz standards with all the songs anyone needed to know in one place, this book has admirably achieved a similar objective for pilot plants, particularly those for the pharmaceutical industry.

Chapter 1 sets the tone by describing the role of a pilot plant. It contains a wealth of hints on factors to consider and things to do and not to do in scale-up, which is one of primary functions of a pilot plant. Some of the terms and jargon commonly used in pilot plant such as work-up, batch record, campaign report, equipment qualification, cGMP, and others are explained. Chapter 2 describes the key pieces of equipment and their operations in a typical pharmaceutical pilot plant. Consider the discussion on the reactor. It complements a chemical reaction engineering textbook in which reactor theory and kinetics is covered by focusing on the practical issues such as reactor types and configurations, selection criteria, raw material charging, sampling methods, reac-

tor cleaning, etc.

Chapters 3, 4 and 5 are concerned with liquid handling, heat transfer, and electrical instrumentation, respectively, all basic issues in a pilot plant. Solvents are covered in Chapter 6. It identifies the solvents useful for crystallization, and those limited for pharmaceutical use, as well as their physical and chemical properties. Binary azeotropes for some common solvents are also listed. These data are important for pilot plants because it is often possible to take advantage of them to improve the efficiency of drying and solvent exchange operations by distillation.

Compressed gases are covered in Chapter 7. Proper procedures for handling compressed gases, metering gases, using gas pressure regulators, installing a vacuum pump, etc., are described. Chapter 8 provides data on the properties of commercial acids and bases, and buffers. The aqueous solubility of various inorganics and organics are also given.

Chapters 9 and 10 are concerned with chemical hygiene and safety, and materials selection, respectively. Chapter 11 contains miscellaneous topics such as unit conversion tables, sieve sizes, etc., that might come in handy in daily pilot plant operations.

There are many books on process development, equipment and chemical data,^[2-6] but this book is unique. Capturing the experience of a seasoned pilot plant practitioner, it delivers what is wanted and needed in a compact package, particularly for pharmaceutical pilot plant projects. The topics selected are highly relevant, the extent of coverage is to the point, the data chosen are consistent with what a chemist and engineer might need, and the style of writing is direct and concise. There is also an extensive bibliography in case additional information is required on the various topics.

This beautiful book is highly recommended for pilot plant personnel as well as people engaging in chemical processing and research. Its contribution to the education of process development is still limited, however. My suggestion is to include pilot plant case studies to illustrate how the information and tools are used to complete a process development project, thereby taking it one step closer to a truly “Real Book.”

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