

Preface

You need only 10 % of the things you learn at the university.

The problem is: You don't know which 10 %!

(University Sapience)

There are so many good textbooks on process engineering. When you start writing a new one, you must wonder what might be its identifying feature, making it different from other textbooks. In fact, I think I have got one.

After having worked in industry for twenty years in process simulation, design, and development, the author is by no means in a position to give proper answers to any problem. On the contrary, any new process has its own characteristic problems, and more or less you start from scratch. But experience and a good network help to develop an appropriate strategy to get a solution, and to be able to distinguish between important and less important knowledge in process engineering. In the academic world, there is a tendency for over-emphasizing theoretical concepts without integration of the application aspects. For instance, many phase equilibrium and physical property data specialists have never simulated a distillation column, which would give a certain feeling for the importance of an activity coefficient at infinite dilution. On the other hand, practitioners have a tendency to believe in a solution which worked once, disregarding that this might have been related to conditions which are not always available. The corresponding pieces of software are simply trusted in any case, while nobody can explain what they are based on and what their limitations are.

Bridging the gap between university and industry is the utmost concern of this book. The intention is not to write a textbook for beginners in process engineering, but to help the reader to be prepared with the most essential pieces of knowledge in practical applications. It tries to answer the so-called silly questions, things that many students have learned at the university without understanding their implications.

The target of this book is not to generate specialists but to make the reader do something reasonable and keep the overview. It is not a textbook which gives thorough explanations for any topic listed in the book; for this purpose, some 400 pages are by far not enough. In fact, long mathematical and scientific derivations are avoided, and other existing textbooks are referred to where the reader can acquire an in-depth knowledge if needed. Instead, we try to explain the meaning of the topics and formulas so that the reader gets a feeling for the relationship and the interpretation. It should enable the reader to take part in discussions and to know where it is worth increasing his knowledge with further literature, and to distinguish between important and less important topics.

To give an example: the author has often been asked to explain what an activity coefficient is. People always expect at most two sentences, in the usual manner of engineers. This is simply not possible. Good textbooks need several pages to explain phase equilibria of pure substances, the difference between mixtures and pure sub-

stances, the meaning of the Gibbs energy, and the concepts of excess and partial molar properties. Certainly, this explanation is a requirement for thermodynamists, but it is not the way for application engineers to understand why he must use activity coefficients (or an equivalent concept) for nonideal mixtures and how to get them. Instead, a “recipe” for the usage of a model is required, and in many projects it is important to explain the necessity of a proper evaluation of the model parameters, and to avoid that the project manager gets the impression that it is just an accuracy fad.

The author is fully aware that the text reflects his own opinion. For example, equations of state are currently favored by most scientific authors. Nevertheless, the author wants the reader to be capable, not perfect and at state of the art in each area. For this purpose, activity coefficients are the more pragmatic approach and taken as the standard in this book.

The author is grateful to Jürgen Gmehling, Michael Benje, and Hans-Heinrich Hogrefe, who eliminated many errors and misprints in my draft. Thanks also to Hristina and Olaf Stegmann, who helped me a lot to write reasonable texts in Chapters 1 and 11.

I would like the reader, probably a process engineer in his startup phase, to have a better idea about the 10 % knowledge which will help him in his professional life. And of course: always have fun in your job!

And remember:

There is always much more to learn than can ever be taught!
(Peter Ustinov)

A fool with a tool is still a fool.
(Grady Booch)