

Preface

This volume presents an overview of fluid flow and heat exchange.

In the broad sense, fluids are materials that are able to flow under the right conditions. These include all sorts of things: pipeline gases, coal slurries, toothpaste, gases in high-vacuum systems, metallic gold, soups and paints, and, of course, air and water. These materials are very different types of fluids, and so it is important to know the different classifications of fluids, how each is to be analyzed (and these methods can be quite different), and where a particular fluid fits into this broad picture.

This book treats fluids in this broad sense, including flows in *packed beds* and *fluidized beds*. Naturally, in so small a volume, we do not go deeply into the study of any particular type of flow; however, we do show how to make a start with each. We avoid supersonic flow and the complex subject of multiphase flow, where each of the phases must be treated separately.

The approach here differs from most introductory books on fluids, which focus on the Newtonian fluid and treat it thoroughly, to the exclusion of all else. I feel that the student engineer or technologist preparing for the real world should be introduced to these other topics.

Introductory heat transfer books are devoted primarily to the study of the basic rate phenomena of conduction, convection, and radiation, showing how to evaluate “ h ,” “ U ,” and “ k ” for this and that geometry and situation. Again, this book’s approach is different. We rapidly summarize the basic equations of heat transfer, including the numerous correlations for h . Then we go straight to the problem of how to get heat from here to there and from one stream to another.

The recuperator (or through-the-wall exchanger), the direct contact exchanger, the heat-storing accumulator (or regenerator), and the exchanger, which uses a third go-between stream—these are distinctly different ways of transferring heat from one stream to another, and this is what we concentrate on. It is surprising how much creativity may be needed to develop a good design for the transfer of heat from a stream of hot solid particles to a stream of cold solid particles. The flavor of this

presentation of heat exchange is that of Kern's unique book; certainly simpler, but at the same time broader in approach.

Wrestling with problems is the key to learning, and each of the chapters has illustrative examples and a number of practice problems. Teaching and learning should be interesting, so I have included a wide variety of problems, some whimsical, others directly from industrial applications. Usually the information given in these practice problems has been designed so as to fall on unique points on the design charts, making it easy for the student and also for the instructor who is checking the details of a student's solution.

I think that this book will interest the practicing engineer or technologist who wants a broad picture of the subject or, on having a particular problem to solve, wants to know what approach to take.

In the university it could well form the basis for an undergraduate course in engineering or applied fluids and heat transfer, after the principles have been introduced in a basic engineering course such as transport phenomena. At present, such a course is rarely taught; however, I feel it should be an integral part of the curriculum, at least for the chemical engineer and the food technologist.

My thanks to Richard Turton, who coaxed our idiot computer into drawing charts for this book, and to Eric Swenson, who so kindly consented to put his skilled hand to the creation of drawing and sketch to enliven and complement the text. Finally, many thanks to Bekki and Keith Levien, who without their help this new revision would never have made it to print.

Corvallis, OR, USA

Octave Levenspiel

<http://www.springer.com/978-1-4899-7453-2>

Engineering Flow and Heat Exchange

Levenspiel, O.

2014, XXIV, 398 p. 311 illus., Hardcover

ISBN: 978-1-4899-7453-2