

BOOK REVIEW

R. B. KEEY, **Drying Principles and Practice**. Pergamon Press. (1973). £10, 358 pp.

THE TERM "drying" can be applied to many processes in both natural and industrial operations but for this book it is restricted to the removal of moisture from porous solids using surface evaporation and inherently involving transfer of heat. The author presents the fundamentals and describes the application of them to the most common industrial examples, i.e. the textile, paper, brick and food processing industries. The book should be readily understandable to practising engineers who have a reasonably high level of background in heat and mass transfer. For all such readers the book supplies a concise summary of physical principles, transport equations, available solutions and the significant experimental results in a form which should be readily understood and quickly applicable in practical situations.

The book could be separated into three sections—Fundamental Principles, Analysis of the Drying Process and Description of Techniques. Each occupies about one-third of the length. The fundamentals which are covered come from a broad range of topics all of which could be of importance in drying processes. However, the range is so large the coverage tends to be spotty. For example, the discussion of moisture–solid equilibria is presented in detail along with sufficient experimental data to cover any conceivable practical case. On the other hand, the chapters on Transport Phenomena and Heat Transfer are not extensive enough to be understandable for a reader not possessing a specialist's background. These chapters do serve a useful purpose, however, in introducing and rigorously defining the many symbols which must enter this multiple component process.

The major contribution of this book, in the writer's opinion, is the exposition of the essential mechanisms involved in the drying of a porous solid. The chapter on the Migration of Moisture in Porous Media considers transport produced by temperature gradient effects. It is a clear presentation of the essential items in a confusing set of phenomena. The body is comprised of the solid and the liquid and vapour phases of the fluid, the latter two of which are subjected to evaporation and condensation under the temperature gradient and which are set in motion by capillary and pressure forces. Through a combination of experiment and simplified analysis the important mechanisms have been defined and some simple solutions obtained which were both realistic and useful. The chapter which follows on Evaporation and Humidification is a similar concise presentation of mass transfer from practical porous surfaces. Herein is introduced the concept and

explanation of the recession of the plane of evaporation away from the surface. The next three chapters dealing with the prediction of drying rates will undoubtedly be the ones of particular interest to specialists. It is in these that the author's expertise is evident. The first one deals with drying under constant external conditions. A layer of wet porous material is subjected to a constant surface condition and thus the drying rate reflects the ease with which moisture can be transported to the surface. Simplified analytical models are derived and compared to experiments. The different drying periods are identified and schemes presented for extrapolating the experimental results for each period. In the second chapter Batch Drying is considered. This is the drying of an initially uniformly moist material by an air stream with constant inlet conditions. The moisture content and drying rate thus vary slowly along the length of the dryer and through the thickness of the material. The analysis is thus more complex than for constant external conditions but the same experimental data can be used to predict the time and space variation of drying rate. It is unfortunate that experimental verification of these unsteady rates has not yet been possible. The third chapter is the Analysis of Continuous Drying, that is, a dryer in which there is a uniform input flux of moist material and as a result the drying rate at any point along the length is steady. The analyses presented are relatively simple and straightforward.

In the final section of the book, descriptions are presented of the less common drying methods such as solvent drying, freeze drying and superheated steam drying. This serves as an introduction to these other diverse methods but the analysis is not detailed enough to allow solutions for most practical problems. Descriptions are also presented of typical dryers available in the commercial market. These provide a broad view for anyone embarking on drying as a commercial process.

The writer finds the book to be well organized and readily understood. The references to literature are extensive and the author has been particularly successful in organizing the complicated nomenclature found in the literature. All of the results are presented in SI units. The book is to be recommended to professional engineers concerned with drying as an industrial process and to university teachers offering professionally oriented courses at the graduate level. The author has provided a clear, consistent presentation of what is necessarily a complex subject.

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