

## BOOKS

**Flowing Gas-Solids Suspensions**, R. G. Boothroyd, Harper & Row, New York (1972). 289 pages. \$14.00.

Like others in the publisher's Powder Technology Series, this book examines one specific aspect of the subject, namely, the flow behavior of relatively dense suspensions of particles in a gas. Aerosols, or low mass-concentration gas-particle systems, are not treated; neither are fluidized beds or bin and hopper discharges per se, because flow is not oriented in any particular direction in the first instance and the stream is usually too dense to be considered a suspension in the second. The concern of the book is primarily with basic dynamic phenomena. It is written for the practicing engineer who has limited time for study and is without first-class library facilities who, nevertheless, encounters a design problem or who finds himself in a trouble-shooting situation.

Early chapters review the fundamentals of particle dynamics and turbulent flow. A chapter treats mass flowmeters, particle sampling, gas and particle velocity measurements, dispersed density, electrostatic charging effects, and related subjects. One chapter is devoted to the examination of suspension flow by dimensional analysis. Momentum and heat transfer and turbulence generation are each chapter subjects. The particular problems arising from particle electrification and the explosion hazards associated with electrification are treated separately as is compressible flow and suspension thermodynamics. Boundary layer flow, including turbulent deposition and surface erosion, is covered in one chapter. Finally, one rather brief chapter offers some practical guides relative to pneumatic conveying and centrifugal blowers and offers two examples of computer-aided design, one for a louver-type separator and one for a spray drier.

The material in the book is amply referenced, hence the author has emphasized physical explanation and relied on the technical literature for detailed presentation of mathematical technique. Many of the circumstances considered are extremely complex, and idealized situations have to be resorted to for examination. Such results are valuable, nevertheless, for they indicate the relative importance of parameters. All chapters are introduced with a helpful brief statement setting forth

the topic to be covered, special conditions or positions assumed, and limitations imposed. A general table of nomenclature is provided and each chapter has a separate listing for terms especially applicable to it.

Because of the restricted subject matter, not every chemical engineer will find Boothroyd's book of interest. But it will be of value to any engineer or scientist who is involved in powder handling or processing.

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**Water Pollution by Oil**, Peter Hepple, Ed., The Institute of Petroleum, London (1972). 393 pages. £ 5.50.

This publication is a compilation of papers, largely by British authors, presented at a seminar held at Aviemore, Scotland, May 4 to 8, 1970. Many aspects of water pollution by oil are discussed—from the anticipated growth of the oil industry to transportation (vehicular and pipeline), bulk storage, and refinery operations, to spill containment and countermeasures. Some spills experienced in British waters are described.

One author, P. C. Blokker, defines a most intelligent approach to the effective control of effluent discharges—the reduction in volume of process water.

Several of the papers are too brief to provide comprehensive and useful information. For example, A. C. McGeehan fleetingly discusses check valves. The importance of such valves between a bulk storage tank and the master control valve on a tank's bottom entering fill line can make the difference between a major and minor spill in the event of pipeline or flexible transfer hose failure. The same author discusses tank truck loading and service stations. No mention is made of the numerous spills experienced when tank trucks pull away from loading racks without first disconnecting cargo and grounding lines. In a description of service station operations, some pollution aspects are not covered. The economics of re-refining sump oil has eliminated the business with the result that nightly dumpings of waste oil into storm sewers

creates major spill conditions in most metropolitan areas.

The book describes spill containment techniques and frankly admits that containment booms are not yet available for open ocean use.

The oil industry's panacea for controlling contaminated discharges from tankers through the Load-on-Top technique is detailed, but the fact that the system is weather restricted and relies on the unpredictable human element are not discussed.

The effects of oil and oil dispersant chemicals on the flora and fauna is very well covered by both U.S. and British authors.

An extensive bibliography is provided in the reference listings to many papers; however, in most references the subject material is not given for ease of use.

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**Industrial Filtration of Liquids**, Derek Purchas, Chemical Rubber Company, Columbus, Ohio (1972). 492 pages. \$33.30.

The reviewer knows from personal experience that the author is a competent practitioner in the general field of filtration. Purchas has used his experience to prepare an excellent review text that anyone working in the broad field of industrial filtration will find a useful working addition to his library. He covers a wide range of equipment, encompassing gravity clarification and thickening, hydroclones, centrifuges, vacuum and pressure filtration, sand or particulate media filters, expression and other less familiar operations such as the use of coalescers.

The author's intent was to prepare a practical manual for the operating man that would provide a basic understanding of his filtration operation and assist him in improving his plant operation. In doing this, he has accomplished a great deal more and has provided industry with an up-to-date review of most aspects of liquid filtration and liquid-solid separation except conventional screening, together with an introduction to the practical basic theory associated with the various unit opera-

tions. While this book is the practical manual it was intended to be, all those involved in filtration should be able to benefit from a better understanding of associated unit operations.

Although this book is not intended as a highly research oriented treatise, it would provide an excellent background for anyone starting fundamental work in filtration. It is well organized, although it is conceded that some newcomers to the field may find the organization a little awkward at first. I learned a lot from reading the book and expect it to become a frequently used reference.

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**Handbook on Vapor Pressure and Heats of Vaporization of Hydrocarbons and Related Compounds**, R. C. Wilhort and B. J. Zwolinski, Texas A&M Research Foundation, College Station, Texas (1971). 329 pages. \$10.00.

The data sheets from API Research Project 44 are well known. However, only few individuals could own the entire compilation and keep it up to date.

A decision was reached recently to publish many of the API data in a series of small handbooks at reasonable prices. The first of these handbooks covers primarily vapor pressures and heats of vaporization for some 680 hydrocarbons and 95 related sulfur compounds.

The vapor pressure tables are direct reprints of the k and k E tables of the API 44 loose-leaf data sheets. Heats of vaporization are based on the m tables of the same reference and are derived primarily from vapor pressure data fitted to the Antoine equation and with second virial corrections for vapor non-ideality.

Ready access to data of this type is invaluable to those who are concerned with hydrocarbon properties. Perhaps the only criticism that could be tendered is the continued use of English units in most of the tables even though a brief discussion on the S.I. system and some conversion factors are still presented. Nevertheless, the metric trend is manifested in the heat of vaporization tables where BTU/lb, kcal/mol, cal/g, and kJ/mol are employed.

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**Biotechnology of Industrial Water Conservation**, B. E. Purkiss, Mills & Boon, Ltd., London (1972). 56 pages. £1.50.

This book is written to provide a general background in bacteriology for the chemical engineer who has had little or no experience in this area.

The author brings his many years of experience in water treatment in this brief survey of some of the ways bacteria, and to a lesser degree fungi and algae, can disrupt industrial processes. He shows how, in just a few days, bacteria can completely plug troughs in a cooling tower, reduce heat transfer in a heat exchanger, corrode tubes and shells, and turn good water into badly polluted water. Examples are also given from the paper industry as to the destructive effects of microorganisms. A general description of the mode of bacterial reproduction and growth is presented in an easily read and understood manner.

The two chapters devoted to water recovery and use of biocides do, however, seem unnecessarily pessimistic. The only method of waste water treatment presented is the slow sand filter. Many others are in common use and I feel that additional techniques could have been described. Unlike the earlier portions of the book which dealt with specific examples from real industries, the chapter on biocides is too general and covers the whole field in only four pages. It would have been more interesting to have had more specific examples of successful or even unsuccessful control programs rather than a brief, general coverage.

I enjoyed the book and feel that Mr. Purkiss has done a good job of recording some of his experiences in a readable manner. This book should be of interest to those involved with water and responsible for its usage in a plant or process. The coverage is elementary and chemical engineers would be able to read it and learn a good deal about microbiology.

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**Whiskers**, C. C. Evans, M & B Monograph ME/8, Mills and Boon, Ltd., London (1972). 72 pages. £1.5.

This book starts with a very brief but concise and interesting historical introduction to the subject of whiskers, the hairlike single crystals of extremely small (usually in the range 1 to 100  $\mu\text{m}^2$ ) and near uniform cross-sections. In the three chapters which follow, the monograph answers in the same brief

manner the three questions about: "Why and how a crystal grows as a whisker," "How to grow whiskers," and "What their properties (mainly mechanical) are."

If you are a person working in, or familiar with, the area, this book will not help you much. It will not answer questions which arose in your mind during your work or clarify the disturbing aspects of some of the theories. It will not even help you in terms of reference to other published works. Only a list of 17 rather standard publications in the field are supplied in an appendix as sources of further information in general.

However, if you are unfamiliar with the area and want to get an overall view of the field of whiskers, this is the book to start with. It will tell you everything you always wanted to know about whiskers (but you were very hesitant to find by searching through the details of the numerous papers reporting particular aspects of whisker crystals). You may have only one disappointment. The book may open your appetite for but be unable to help you in further reading or work. For instance, one of the tables presents examples of materials grown as whiskers by the various methods without citing any reference. Also, no reference is cited in statements like "there is some experimental evidence that whiskers do nucleate repeatedly at the same site." If you want now to grow some whiskers or to read further about the nucleating sites of whiskers, you will have to return and search through the original literature without, unfortunately, any clue from the book.

Despite the above criticisms, the book is interesting and provides an easy and worthwhile evening of reading.

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**Polymer Structure, Properties & Applications**, Rudolph D. Deanin, Cahnners Books, Boston (1972). 496 pages. \$27.50.

The stated purpose of this latest addition to the Cahnners Practical Plastics Series is to "collect and organize our present understanding of the important relationships between structure, properties and applications" of polymers. The author has achieved partial success in this very ambitious undertaking.

Beginning with a very basic review of elemental properties and polymer formulae, the author proceeds to dis-