BOOK REVIEWS

Problems in Engineering Thermodynamics. — By K. A. Bhaskaran and A. Venkatesh, Tata McGraw-Hill Publishing Co., Ltd., New Delhi, 1978, pp. 266 + viii, Price Rs. 16·50.

Thermodynamics has been an important subject in mechanical and chemical engineering. In its basic form, the subject continues to be taught to students of physics and chemistry. However, like many older subjects, the topic has gained a reputation for being obscure and hard to understand in some parts. To some extent the trouble arises from the fact that the science students, who study the why or the basics of the subject, rarely perform practical calculations to get a 'feel' for the orders of magnitude of the quantities, whereas engineering students, who routinely perform the design calculations, rarely try to understand why a material or system behaves in a given way. The authors belonging to the Department of Mechanical Engineering, Indian Institute of Technology, Madras, believe that the difficulties faced by young engineering students could be mitigated by a judicious choice of worked examples and problem solving. Therefore, in an old subject like engineering thermodynamics, with a long list of books available on the subject, one must judge the book against the goals set by the authors and the place of the book in the list of texts available on the subject.

The earlier books which are based on a large number of worked examples and problems with answers, are the texts of Phillips and Owen-Jones ("Concise Applied Thermodynamics", Van Nostrand, New York, 1966; Addressed to engineering students and uses FPS units) and of Braun and Wait ("Programmed problems in thermodynamics", McGraw-Hill, London, 1967, uses MKS units). Compared to these earlier established texts, the present book has about the same range of topics and about the same number of problems. The sequence of developing the topics is also roughly the same. Perhaps a few more figures are available to illustrate the text. A few of the problems deal with more modern aspects of applying thermodynamics to a wider range of topics. The partial use of metric units is a distinct improvement. Many examples are worked with a bias towards modern applications, instead of following the traditional approach. The NBT subsidy for the Indian authors has enabled the book to be sold at a very reasonable price. This feature should ensure a good market for the book.

The next task which remains to be done is to indicate a few points where improvements—(at least as they appear to the reviewer)—can be done in future editions by the authors and where the users can be cautioned. The first comment of this type is concerned with the system of units, discussed in Chapter 1. The SI units are getting accepted all over the world by both scientists and engineers. The authors use kilograms, metres, etc. but then stop to use kgf instead of Newton as the unit of force. It is a pity to have landed with this hybrid set of units. If the authors felt strongly that kgf was more descriptive and handy, they could have repeated at several places that l Newton is nearly equal to 1/10 kgf. The second comment concerns the second law of thermodynamics, stated in the usual fashion concerning the impossibility of certain operations. (The form ascribed to Planck is due originally to Lord Kelvin who was then Sir William Thomson). The students for generations have been left wondering why such a negative statement in the form of an inequality can have so much importance. It would therefore be advisable to add in Chapter 7 that the application of the limiting form of the inequality to a reversible operation leads to an equality and hence to the definition of a new state function, *viz.*, the entropy of a material, and thence to the basic T dS equation (eq. 10.2), which forms the basis for the rest of thermodynamic calculations. It is important to point to the student why the impossibility statement is elevated to the level of a fundamental law.

The third comment concerns "entropy", defined in Chapter 10 through a definition of the entropy change. Most science students are now aware of the statistical interpretation of entropy as a measure of the disorder or randomness in the system, following the great work of Boltzmann. When a solid melts into a liquid, the ordered arrangement of the atoms in the crystal goes over into the random motions in a liquid. The increase of disorder is reflected in the increase of entropy, measured through the entropy of fusion or latent heat of melting. While students are able to visualize the ideas of energy function, the concept of entropy as a state variable gives students perennial difficulties because the interpretation of entropy is not supplied. The student is told how to measure or calculate entropy changes, but is left with an uneasy feeling of not knowing what feature of the system is being characterized. The stage could be set easily for explaining to the students how a crystalline solid at the absolute zero of temperature forms the zero level for calculating the internal energies as well as entropies. It is a pity that the entropy concept, so widely known now-a-days to students of physics and chemistry, is not communicated to the professional engineers. Finally it is also time that every student of thermodynamics is told of the zeroth law and the third law, as well as some ideas of irreversible thermodynamics at least like the reciprocity relations of Onsager.

As mentioned earlier, these comments are mostly for the authors and instructors and do not detract in a major way from the value of the book to the students. The book is a good buy for the money spent by the students.

E. S. R. GOPAL

Organic Reaction Mechanisms. By Raj K. Bansal, Tata McGraw-Hill Publishing Company Ltd., New Delhi 110 002, pp. 504, Price Rs. 40·50.

The material is organised differently from most other books. Chapters 1–3 provide the necessary background for understanding the reaction mechanisms discussed in the rest of the book. Perhaps, some discussion on stereochemistry and physical methods which comes very handy in the study of reaction mechanism could have been included.

Chapters 4 to 13 are concerned with organic reactions and their mechanisms. The clarification seems to be based on reaction types rather than mechanism. The author has tried to discuss several types of reactions and in that process, some of the reactions have been treated only peripherally and not in depth. This is one of the drawbacks of this book. The book however, includes reactions which are not traditionally discussed in standard text books. Another drawback of this book is the absence of author index.

As it happens in many books of this magnitude errors have crept in. A few of them are cited below:

p. 180	5.44	error in structures	
290	8.16	,, ,, ,,	XIb and XIa
333	9.91	,, ,, ,,	XVII.

The author has included references to original literature at the end of each section. Added attraction is the inclusion of reviεw problems in each chapter. The book would be useful to research workers and students of organic chemistry.

T. R. KASTURI

SF_6 and Vacuum Insulation for High Voltage Applications. By M. S. Naidu and V. N. Maller. Khanna Publishers, Delhi 110 006, 1977, pp. 240, Rs. 17·00.

In this book, the authors have set out to overcome the need of research workers, graduate students and practising engineers in the electrical engineering profession who wish to refresh and augment their knowledge of fundamentals and practice of high voltage engineering with particular reference to SF_6 and vacuum in power systems. It has seven chapters with references at the end of each chapter and an appendix at the end of the book.

Chapter 1 is devoted to the breakdown mechanism in gases and vacuum including arc processes. Chapter 2 deals with vacuum techniques and switches not excluding the methods of leak detection. nI Chapter 3 is discussed those conditions of breakdown which are of significance to SF_6 giving appropriate data and figures. The electrical properties of high vacuum are presented in Chapter 5. Chapter 6 cites several SF_6 gas insulation applications—circuit breakers, metal-clad sub-stations, current transformers, bushings, cables, etc. Vacuum devices for high power apparatus constitute the subject-matter of Chapter 7.

The reviewer feels that the authors, in their anxiety to provide depth treatment to the subject, have outstretched the boundaries of the high voltage field and entered into other domains: for instance, what is the relevance of the manufacturing process of the SF_6 gas for its insulation problem ? Equally, where is the place for powder metallurgical technique in the chapter on vacuum devices ?

It is unfortunate that the valuable work carried out in the Department of High Voltage Engineering, Indian Institute of Science on the breakdown processes in vacuum under d.c., a.c. and impulse conditions has escaped their attention.

In the introduction the authors state that 500 kV a.c. transmission lines are shortly coming into operation. This needs to be changed to 400 kV. There are certain obscurities in eq. (6.2).

While SF_6 is indisputably better than air as an extinguishing medium and as an insulating gas at an equal pressure, it has the important disadvantage in high voltage circuit breakers that it cannot be used much above 200 lbs/sq.in. unless the gas is heated to avoid liquefaction. At still higher pressures the competition between air and SF_6 is keen. Even so, vacuum circuit breakers have not yet been developed for system voltages above 56 kV. Information on the techno-economic aspects of the two media in power systems would have been very welcome.

The quality of illustrations, paper, printing and get-up is very low. This comment should not, however, detract the value of the book as providing a wealth of information from various sources and extensive articles in journals which would be difficult to reach.

H. V. GOPALAKRISHNA