

BOOK REVIEW

Heat Transfer in Fires: Thermophysics, Social Aspects, Economic Impact. Edited by Perry L. Blackshear, Scripta, Washington D.C. 550 pp. \$28.50.

THIS book comprises a collection of 18 articles of various lengths given by different authors at a course on Heat Transfer in Fires in Yugoslavia in 1973. It may be a relatively painless way of producing a text on an important subject to organise a course of this kind and to publish the proceedings. However, the result can easily be a pot-pourri rather than a textbook of uniform quality, with individual items lighting up local areas, with other items of doubtful relevance and with large areas of the subject remaining unilluminated. This seems to have happened with this book.

As the title indicates, many fire themes are covered. Indeed, themes other than those mentioned are also present in large measure, these including chemical kinetics, organic chemistry and fluid dynamics. However, no one theme is comprehensively covered, nor are all important fire topics treated.

As far as the dominant theme "heat transfer" is concerned, thermal radiation as a heat transfer mechanism is thoroughly covered in a good background article by Steward. This single article comprises some 37 pages of text plus 75 pages of appendices and may be looked upon as a mini textbook on aspects of radiation relevant to fire. Also scattered throughout the book there are accounts of fire processes which clearly show the importance of radiation in fire phenomena. These include two reviews by the same author on "Fire Spread Through a Fuel Bed" and "Ignition Characteristics of Cellulosic Materials". Indeed, radiation is dealt with in too great a detail since three short papers on "Radiative Transfer Parameters" by Goulard are not of great practical significance as far as real fires are concerned. There are no corresponding texts from a fire stand point of convection and conduction and their influence in heat transfer in fires has to be searched for. Certain important aspects on convective transfer are outlined in a review by Corlett on "Interaction Between Flames and Condensed Phase Matter". Similarly, some aspects of the influence of heat conduction in solids are dealt with in passing in a review by Williams on "Condensed Phase Mass and Energy Balances". In this article the transient stage of a fuel being heated in a fire, and the stage of quasi steady regression is dealt with in some depth.

As far as "fire" is concerned, detailed consideration has been given to the spread of fire, steady burning in enclosures and in open fires, ignition of solids, decomposition of

organic fuels and the properties of flames. The treatment is by no means uniform. Some items are dealt with by two or more different authors. Thus spread of fire in the open is dealt with in different ways by Steward, Thomas and Brun, the latter in a brief review of forest fires; yet there are gaps even in this topic. There are also a number of important fire processes with extensive heat transfer interest which are not really touched upon at all. These include fire resistance, extinction, flame propagation and flammability limits. The latter two subjects are not only highly relevant in their own right but are fundamental in explosion and ignition processes.

The book is introduced by a paper by Eckert on the "Fire Problem in the United States" which gives a brief summary of the report of the President's Commission on Fire Prevention and Control. A review by Thomas on the Social and Economic Impact of Fire also helps to place the fire problem into a quantitative perspective with the social and economic environment. Thomas also provides two further brief but authoritative reviews on the "Effects of Fuel Geometries in Fires" and "Fires in Enclosures". There is a paper by Seeger on "Fires of Liquid Fuels in Tanks" which concentrates on results of experimental work carried out at the Research Institute for Fire Prevention Techniques at the University of Karlsruhe. Two papers by Williams look in detail at the decomposition processes in organic solids, this being illustrated by relevant research at the University of California. Four papers by Corlett broadly deal with the shape, structure and dynamics of the flames in open fires. These papers concentrate on an order of magnitude approach to yield useful generalisations. This is entirely justified in a field where reliable measurements are so difficult to obtain and data are scarce.

This book is not a textbook. Much of the science of fire, such as the production of smoke and noxious gases, fire retardance and the testing of materials for fire properties are untouched, or dealt with superficially. One could even have difficulty in obtaining from the book a clear idea on the way combustible materials ignite or are extinguished, particularly if one is coming fresh to the subject. Its strength is as a source book of ideas on the parts of the subject that it does cover and for this reason alone the book is to be welcomed, particularly by research workers and students in the field.

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