found that the heat transfer coefficients were not greatly affected. The correctness of the train friction factor may be readily checked with the train shear stress and the computed average velocity in the imaginary rough duct. Even with the assumed constant value of train friction factor, good consistency was obtained, which lends support to the use of the simpler procedure. Finally, the values of train heat transfer coefficient correspond closely with that given in Ref 3. It appears that the value of 90 $W/m^2 K$ given in Ref 3 is based on model experiments, so that the outcome of the present theoretical enquiry is extremely encouraging.

Conclusions

A theoretical analysis of turbulent flow and heat transfer has been made for the situation when a train is in transit through a very long tunnel. A new model has been devised, the flows adjacent the rough and smooth surfaces being simulated by parallel-wall ducted flows for which flow and heat transfer correlations are available. An iterative computational scheme has been developed for the prediction of the flow and heat transfer parameters. There is good agreement between the flow results of the new analysis and those from a previous theoretical and experimental investigation for this case[7]. Furthermore, the predicted heat transfer coefficients for the train surface in particular are close to those determined by other workers[3]. The results as a whole are extremely meaningful and in keeping with the flow and heat transfer conditions within this complex situation of mixed surfaces with relative motion.

Accordingly, further enquiry into the technique together with development of the computational procedure is warranted.

Acknowledgement

The authors wish to thank the British Railways Board for permission to publish this paper.

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Book reviews

BASIC Programs for Steam Plant Engineers

V. Ganapathy

The book is one of a series of textbooks and reference books in mechanical engineering. It comprises 30 programs written in BASIC divided into five groups respectively treating: (1) Fuels, Combustion, and Efficiency of Boilers and Heaters; (2) Fluid Flow and Pressure Drop Calculations; (3) Heat Transfer Calculations; (4) Steam Utilisation; (5) Performance of Heat Transfer Equipment. In each case the program treats a specific calculation that is commonly required during the design or analysis of steam plant. Typical programs from each group (as numbered above) are: combustion calculations for solid and liquid fuels, sizing orifices for steam flow, estimating fin tip temperatures, steam properties after expansion and performance of economisers.

The book is well laid out and easy to use. Every program has supporting material: input, output, remarks, theory, notation for program, the program itself sometimes clarified by a flow diagram, examples (one or more) and their solution. Where needed a clarifying diagram is included. When physical properties are involved, eg, thermodynamic properties of steam, function correlations are employed. Frequently an accepted empirical expression, correlation, etc, is introduced.

This reviewer, while commending the book, has two reservations. In the first place the BASIC employed is that of IBM PC and compatible systems and thus likely to be more widley useful in the USA than elsewhere where a different dialect of BASIC may be employed. If the user has to rewrite the program the advantage otherwise gained by time-saving may be lost or diminished. Having made this point, however, it is fair to add that I selected two programs impartially and keyed them into my personal computer (Amstrad 6128). Using the data from the examples given, the program ran without needing modification giving the same answers as those shown. The second reservation is more serious. This book, published in 1986, uses Imperial Units. As readers familar with the USA will known Imperial Units are still widely used there, in some cases even by companies whose names are household words, and this despite coaxing by many of the leading engineering institutions. As S.I. Units are now used in most countries the book will surely have a restricted sale outside the USA. This is not, of course, a criticism of the book—it is an unfair disadvantage imposed upon it. If a further edition is called for the author should consider including S.I. Unit equivalents within the text. The provision of a conversions table is insufficient. The principal merit of the book—which will probably govern the number sold—lies in its clear layout and the provision of useful programs ready for immediate use. Duplicated sets of units would preserve this.

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Published price $47.50, by Marcel Dekker, 270 Madison Avenue, New York, NY 10016, USA, 168 pp.