BOOK REVIEW

M. KOZÁK: Computation of Unsteady Open-channel Flow by means of Digital Computers (in Hungarian). Akadémiai Kiadó, Budapest 1977, 409 pages. ISBN 963 05 0981 4.

However, easy its calculation may be, steady flow is almost never encountered in natural conditions. Due to the intermittent and irregular occurrence of rains and snowmelt, the life of rivers is a continuous sequence of flood waves — hence, unsteady flow. But also human activity within the field of water management is responsible for creating a number of phenomena of unsteady flow. It is sufficient to refer to the operation of river barrages or hydroelectric plants, the variation of discharge in irrigation canals due to fluctuating water use, etc. The importance of the subject is thus beyond doubt, and so is the fact that problems of unsteady open-channel flow calling for a solution are incomparably more numerous than those of steady flow.

On the other hand, textbooks and standard reference works on open-channel flow show an inverse proportion of pages devoted to these two basic forms of flow. This fact, undeniable as it is, has a double explanation.

The first thing to note is that although the partial differential equations of *de St. Venant* describing unsteady flow are known since 1871, there were no ways to solve them analytically. A numerical solution, on the other hand, had been almost unthinkable until electronic computers became invented, owing to its extreme cumbersomeness. A few attempts made towards graphical solutions, despite their brilliant basic ideas, also proved unfeasible on a large scale.

The second fact, not less responsible for the insufficient spreading of our knowledge on unsteady flow is the very regrettable commercialism with computer softwares. Scientists, expected to work for the benefit of mankind, have instead established a flourishing trade with computer programs of unsteady flow. Consequently, all valuable information on the capacity and accuracy of the individual programs, on the required computer time, etc. was retained as an industrial secret and the majority of publications in this field contained valueless commonplaces, not enabling any comparison between the various programs circulating in the "market".

The book of Prof. M. Kozák (Budapest Technical University) is both a breakthrough of this objectionable trading practice and a pioneering work in many other respects, summarizing a research work carried out by the author for over two decades. The book consists of two parts.

In *Part 1*, the *theory of steady und unsteady open-channel flow* is discussed, with an obvious and overwhelming emphasis on the latter; steady flow being dealt with to an extent only that is absolutely necessary when comparing the main features of these two types of flow.

A voluminous chapter is devoted to the *differential equations of unsteady open-channel flow*, with reference to continuity, momentum and the conservation of energy. The *fundamental equations* are written up in various forms in order to comply with the variables selected as well as with the geometry and layout of the channel.

Next, the basic types of *explicit and implicit solution schemes* are discussed at large, including the *method of characteristics*, that of *finite differences* and the implicit one, reduced to a *set of linear difference equations*. In every case, the stability of the process, the initial and boundary conditions, the accuracy of the method and several other details are described in a very clear way. Informations on the choice of the appropriate method and the computer time estimation are included as well.

A special chapter deals with various computation methods envisaged for composite channel cross sections.

Part 2 of the book bears the title "*Practical applications of computing methods*" and contains voluminous chapters on the methods of calculating basic data and initial conditions,

on the application of explicit and implicit schemes, accompanied by many numerical examples and by extremely valuable instructions on every detail of the computation.

The *bibliography includes 218 references* of recent origin, followed by an *Appendix* of almost 100 pages containing nothing else but *programs* and *subroutines* written in FORTRAN IV language, serving both as illustrations to the various chapters on applications and also as *building blocks* for programs the user wants to compile to meet his own particular needs.

The outstanding merit of the book is the complete *unity of theory and practice*, enabling the reader immediately to convert his theoretical knowledge newly acquired from Part 1 into a practical application tailored to his needs, by using the information imparted through Part 2 and the Appendix. There is no need to stress how time-saving the use of such a book to the reader is. It really fills in a long-existing gap in the literature of fluid mechanics.

An English edition of the book is planned in the near future.

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