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Appendix

Wegener and Mosnier[19] describe an approximate method for determining the frequency of an oscillation. Let Δx be the distance between the nucleation zone and the condensation zone. The shock wave generated moves upstream with velocity v_s, causing a temperature increase which 'quenches' nucleation after a time $\tau_1 = \Delta x(v_s - c_k)$ where c_k is the flow velocity at the onset of condensation. After a further time $\tau_2 = \Delta x/(c_k - c_2)$ the nuclei stop arriving and the heat addition ceases, c_2 being the changed flow velocity imposed by the shock. This change in heat addition causes expansion waves to be generated which travel upstream at the local speed of sound, a, causing the temperature in the nucleation zone to drop at a time $\tau_3 = \Delta x/\{a-(c_k - c_2)\}$ later. The newly generated nuclei are then able to release heat again after a further time $\tau_4 = \Delta x/c_k$. Consequently, we have a cycle frequency $v \approx 1/(\tau_1 + \tau_2 + \tau_3 + \tau_4)$.

Using this breakdown of the oscillation mechanism it is easy to see where the mixed calculation method becomes inaccurate. There is no clear reason that the program will not be able to predict reasonable values for the time intervals τ_1 and τ_3. However, due to the fact that gas field 'real' time is made to stand still whilst droplets propagate down the duct, then the time intervals τ_2 and τ_4 are effectively reduced to zero. Thus it is likely that the mixed calculation technique would produce an oscillation frequency more accurately approximated by $v \approx 1/(\tau_1 + \tau_3)$.

Book review

Computational Methods in Viscous Flow III

Ed. W. G. Habashi

This book is a collection of articles by several leading experts in computational fluid dynamics and covers a broad range of topics in numerical methods in viscous flows. As designed by the editor, the various authors have written articles on topics that have been the centre of their own research. Most of the articles are short, typically 50 pages or so long and describe the author's experiences in perspective with related works of others. I would like to congratulate the editor for assembling such a distinguished set of researchers and organizing their reviews in a coherent style. The articles are well written and reasonably extensive. Upon reading the book, my impression was that the book serves a useful purpose of providing information to many secors of readers in various disciplines of industry and academia. The articles in the book are very interesting and cover topics such as parabolized NS equations, multigrids, hermitian methods, finite elements, shock/boundary layer interactions, turbulent flows with solid/fluid interactions, etc.

While the book is of much practical use, it is necessary to point out that it does not give enough details on any one method to the extent that a user can start programming and adapting the method to his problem. Because of this, the user can only note the theory and should then either refer to the bibliography or construct his own steps in the procedure, both of which are cumbersome and can be frustrating. Personally, I would have liked to see a volume with complete details but with less number of articles, similar to a collection of a few monographs in one book. Such a book will be unique in style as well as content and will differ from traditional review articles. Perhaps the editors may consider this for future publications. In spite of this, I recommend this book for practicing CFD researchers and engineers.

S. P. Vanka
Components Technology Division,
Argonne National Laboratory,
Argonne,
ILL, USA

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