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Preface

Flow-induced vibrations in heat exchanger tube arrays appeared as a destructive problem in shell-and-tube heat exchangers some 50 years ago and the early literature is marked by confusion over the excitation mechanisms. Intensive research during the last three decades of the 20th Century, largely driven by the nuclear industry, has clarified the picture substantially. The different excitation mechanisms have been identified and are sufficiently well understood that design guidelines have been developed. The first two papers, by Pettigrew and Taylor, in this Special Issue provide an overview of these developments.

While the basic flow excitation mechanisms are now reasonably well understood, the problems are very complex and much research remains to be done. This work may be divided roughly into three areas; numerical simulations, consideration of the effects of non-ideal flows and conditions, and the extension to new design configurations. Thus, the remaining papers are grouped accordingly.

Flow-induced vibrations in tube arrays are generally characterized by high Reynolds number, unsteady flows over moving bluff bodies. Thus, computer simulations of these flows are extremely difficult and will be the subject of much research in the years to come. The papers by Sweeney and Meskell, and Longatte et al. are contributions to such developments.

Much of the experimental research in this field has considered single span tubes with idealized supports and subjected to low turbulence, uniform flows. These are clearly not the conditions found in most heat exchangers in industrial use. Hassan et al. present a numerical simulation of tube response with loose supports while Goyder considers an assessment method for multispan tubes. Meskell and Fitzpatrick examine the nonlinear behavior of tube arrays undergoing large amplitude oscillations, while Rottmann and Popp study the effects of upstream turbulence on fluidelastic instability. The final paper in this group, by Akosile and Sumner, is a fundamental study of two tube arrangements in a shear flow.

As efforts are made to improve heat transfer and heat exchanger efficiency or to cope with new equipment requirements, novel design configurations using finned or noncircular tubes have appeared. These new designs create additional challenges, as the traditional design criteria are not directly applicable. The papers by Nishihara et al. and Inada et al. consider arrays of cruciform shaped tubes, an interesting example of such novel developments in heat exchange equipment.

Some of the papers in this issue are expanded, revised and up-dated versions of papers originally presented at *the 5th International Symposium on Fluid-Structure Interaction, Aeroelasticity, Flow-Induced Vibration and Noise* held in November 2002 within the ASME IMECE meeting in New Orleans, USA.

D.S. Weaver
Department of Mechanical Engineering, McMaster University, 1280 Main Street West Hamilton, Ontario, Canada L8S 4L7
E-mail address: weaverds@mcmaster.ca

W.J. Bryan
ANSYS, Canonsburg, PA, USA
E-mail address: william.bryan@ansys.com

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