Preface

The current volume of the "Thermal Physics" series is concerned with tube vibrations in heat exchangers. Causes of the vibrations are ascertained. Possibilities of allowing for them are considered, and scientifically grounded recommendations for suppressing them to an admissible level are given. A large body of information on studying unsteady hydrodynamic processes and forces acting on the elements of structures in a flow is presented.

The first unified data on the flow-induced tube vibrations were reported in the monographs "Convective Transfer in Heat Exchangers" (1982) by A. Žukauskas and "Fluid Dynamics and Vibrations of Tube Bundles in Flow" (1984) by A. Žukauskas, R. Ulinskas and V. Katinas. The reviews of these publications indicated that the presented data on the flow-induced tube vibrations enjoy a wide application and are of interest for many designers of heat exchangers, as well as for researchers dealing with the problems of fluid dynamics and heat transfer in industrial power plants.

In recent years the Institute has accumulated new extensive data on the flow-induced tube vibrations that were published in various literature sources. Therefove, we set out to revise the available material, complete it with the latest data and document in the plan of scientific advances. Similarity correlations for predicting stability of tube arrays in the flows of heat-transfer agents were derived and reported.

The first chapter of the book treats structural features of the tube arrays of heat-transfer constructions of the heat exchangers, gives a general information on the fluid dynamics and flow-induced tube vibrations and techniques of taking into

account the intensity of tube vibrations proceeding from the material strength.

The second chapter describes experimental facilities, operation principles of the measuring elements and investigation methods.

The third chapter is devoted to data on the unsteady fluid-dynamic processes occurring in a detached flow past the tubes and on fluid-dynaniic forces acting on the tubes.

The fourth, fifth and sixth chapters provide theoreticai results and experimental data for the flow-induced vibrations in various tube arrays, viz bundles of parallel tubes in a cross flow, radial tubes, inclined tubes, tube bundles turned relative to the flow direction, and also on individual tubes and in their systems. The studies employed smooth, finned as well as uniformly and nonuniformly placed circular and plane-oval tubes. Measures for averting the flow-induced tube vibrations were explored.

The seventh chapter covers a technique of predicting the flow-induced tube vibrations and methods of suppressing an acoustic resonance originating in heat exchangers. Indications are given on the selection of the range of operating velocities of the heat-transfer agent with consideration of stability of the heat-transfer constructions in its flows.

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