In many pressure vessel designs, attachments are often used to locally reinforce the structure. The paper by G. N. Brooks presents an efficient boundary integral method for stress and displacement analysis of rectangular attachments to spherical shells. H. Chien and S. Tu discuss a computational technique of analyzing the contact stress based on the flexibility mixed finite element method.

C. R. Steele has developed a computer code, FAST2, for analyzing nozzle-vessels intersections. In the present paper, good agreement is shown between the code computations and experimental measurements. Based on analysis results, the author also concludes that nozzle reinforcing is superior to vessel reinforcing for reducing stress concentration.

In the paper by A. N. Palazotto, R. L. Hindrichsen, and W. P. Witt a finite element method is proposed on describing the interlaminar characteristics of thick laminated plates. Through-the-thickness shear effects and large displacements are included in the formulation with composite laminate constitutive relations. In the next paper, A. N. Palazotto and T. W. Tisler discuss the effects of rectangular cutouts on the collapse instability of curved composite cylindrical panels under compressive loading.

K. P. Soldatos examines an effect of the initial membrane stress on the buckling of cross-ply laminated circular cylindrical panels under axial compression. The influence of thickness shear deformation on buckling of the cylindrical panels is also discussed.

The paper by J. Jim Lee, R. A. A. Todeschini, and J. F. Petrozelli presents a thermal buckling analysis of curved linear plates, placed on the interior surface of a cylindrical concrete wall in a nuclear containment vessel. The effects of initial displacements are examined in the buckling as well as postbuckling regimes.

W. Szyszkowski and P. G. Glockner discuss analysis methods for large, very thin-walled spherical pressure vessels where the bending and compressive stiffness are much smaller than the tensile stiffness. The paper by R. Natarajan, G. E. O. Widera, and H. R. Patel presents three dimensional finite element method to compute stress and displacement of a large horizontal saddle-supported pressure vessel.

T. A. Duffey, R. H. Warnes, and J. M. Greene investigate conditions leading to the growth of initial imperfections for ring or cylindrical shells subjected to initial inward impulsive velocity loading.

The study of P. Julisch, H.-J. Hadrich, W. Stadtmuller, and D. Sturm utilizes a high speed tensile testing machine to determine the effect of high loading rates on large welded and safety-related components.

C. W. S. To and S. Zhang obtain the recursive variance of a simple oscillator by the stochastic central difference method. Exact frequency and normal mode shape expressions for partially restrained Bernoulli-Euler beams are derived by C. K. Rao and S. Mirza. Vibration programs for nuclear piping systems are discussed by G. A. Arauz, S. F. Ferrarello, and P. H. Schmitzer.

K. Kussmaul, K. Kerkhof, D. Blind, and A. Sauter study the effect of a blowdown event on feedwater piping systems and demonstrate good correlation between theory and experiment. The paper by R. P. Keskinen presents explicit formulas for coupling a one-dimensional internal flow with a structural vibration model.

The paper by W. H. Sutherland describes a finite element computer code developed to analyze the nonlinear problems associated wtih a core restraint system of a nuclear reactor. To demonstrate the code capability, the author analyzed the FFTF core restraint system.

D. W. Nicholson discusses asymptotic stability of a general discrete time-variant second-order linear mechanical system. The author derived a condition for asymmetric systems with positive definite symmetric components of the damping and stiffness matrices.

The paper by Y.-H. Chao, A. S. Kobayashi, A. F. Emery, W. J. Love, and O. Johansson presents the results of crack arrest experiments to determine the effectiveness of pipe wall inertia augmentation and pipe wall restraints. The authors reaffirmed the axial crack of a bursting pipe is driven by the residual pressure acting on the opening flaps and thus crack arrest could be achieved by constraining this opening.

The paper by Y. Wang and G. Chen discusses a design concept and its supporting analysis for a nonbursting high pressure cylinder which will leak before burst. The proposed design would eliminate the risk of burst, thus assure safety.

Finally, M. R. Baum presents preliminary design guidelines for characterizing missiles generated by pressure vessel failure on a nuclear power plant; defining the fragment velocity of missiles and the extent of the hazard zones.

The work reported here is representative of current research activities and greatly contributes to the advancement of the state-of-the-art in structural dynamics. The editors hope this volume will serve as a useful resource for research and design engineers and stimulate further interest in structural dynamics research.

Howard Chung
Argonne National Laboratory

H. Don Fisher
Combustion Engineering, Inc.

High Pressure Engineering and Technology, ASME Special Publication PVP-Vol. 125, ASME, New York, 1987.

This publication contains a series of papers that deal with the special technology associated with the containment of high pressures. High pressures can occur naturally at great ocean depths, arise during the manufacture of low-density polyethelene or during hot isostatic pressing operations or be produced during the firing of guns. All of the papers will provide some information that will be useful in the development of a new ASME Pressure Vessel Code for high pressure vessels.

The papers are presented in three sections dealing with 1) design and safety considerations in high pressure systems, 2) stress analysis of high pressure vessels, and 3) fatigue of high pressure vessels. There are two papers in the first section. The first paper deals with the control of forced vibrations that occur when the high pressures are produced by reciprocating compressors and pumps in large processing plants. The other paper in this section deals with the hazards and safeguards that must be accounted for during high pressure fatigue testing of large thick-walled vessels.

In the section dealing with stress analysis of high pressure vessels, four papers are presented. The first paper deals with the influence of the Bauschinger effect, which commonly occurs in the steels from which most high pressure vessels are made, on the re-yielding and machining of autofrettaged vessels. The next paper presents the results of numerical stress analysis of autofrettaged cylinders with outside diameter notches and cracks. The third paper is a novel design method with which prestressed concrete can be used to contain pressures in the high pressure region. The final paper in this section presents the results of a failure analysis of an end closure of a high-pressure polyethelene reactor.

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The final section on fatigue of high pressure vessels contains four papers. The first of these presents the application of fatigue crack growth in the analysis of an isostatic press. The second paper gives a thorough treatment of the problems associated with the fatigue design of threaded end closures. The third paper deals with the effects of changing production methods on the fatigue performance of autofrettaged cylinders that fail from the outside surface. And the final report is that of a rather extensive experimental study to measure and predict the fatigue performance of autofrettaged and outside diameter notched cylinders.

J. A. Kapp

Design and Analysis of Piping, Pressure Vessels, and Components, ASME Special Publication PVP-Vol. 120, ASME, New York, 1987.

This publication is comprised of technical papers on various topics of interest to the pressure vessels and piping industries and includes international contributions by authors from Canada, the People's Republic of China, France, the Federal Republic of Germany, Japan, the United Kingdom, and the United States of America. It is separated into three categories:

Piping and components – design and analysis,
Pressure vessels and components – design and analysis,
Stress classification with code and impact on design.

Most of the papers were prepared for engineering problems, topics and codes associated with some specific industry. However, the subject matter of the various papers can be applicable to analogous situations for the chemical, petrochemical, nuclear and other industries as well.

W. E. Short

Flow-Induced Vibrations – 1987, ASME Special Publication PVP-Vol. 122, ASME, New York, 1987.

This volume contains papers presented at the annual symposium in flow-induced vibration sponsored by the Operations, Applications and Components Committee of the Pressure Vessel and Piping Division of ASME. Altogether, 20 papers from four countries cover a wide range of flow-induced vibration problems in the power generation, process and marine industries. As before, almost half of these 20 papers deal with the dynamics of tube arrays in heat exchangers – probably the most complex of all the flow-induced vibration problems. The editors are particularly pleased to see that, for the first time, there were substantial participation from the People's Republic of China.

The papers can be crudely divided into four categories. Understandably, no clear boundary can be drawn for every paper and some overlapping is unavoidable.

Cross-Flow Induced Vibration of Tube Arrays. Seven papers address this subject. Contents range from fundamental studies to applications of the technology to solving operating problems in the field.

Turbulence-Induced Vibration. Four papers cover this subject, with contents ranging from numerical simulation of the forcing function in tube arrays to response prediction of tubes and shells.

Axial and Annular Flow-Induced Vibration. Five papers present axial flow problems addressing vibration of pipes conveying fluid, large shells exposed to turbulent boundary layers and leakage flow-induced instability of slip joints.

Fluid Structure and Support-Structure Interaction Effects. Four papers address this subject, which not only includes the much discussed hydrodynamic mass and damping effects but also the all-important and often neglected effects of support-structure interaction.

The papers contained in this volume not only represent the latest advances in the state-of-the-art, but also aim at practical applications to design and troubleshooting in the field.

M. K. Au-Yang
S. S. Chen

Design and Analysis of Composite Material Vessels, ASME Special Publication PVP-Vol. 121, ASME, New York, 1987.

So much has been written about composite materials that it would be superfluous to state the reasons for their use. Nevertheless, there are still many unresolved problems associated with these materials, and hence papers and volumes such as the present one will continue to be published. The simple fact is that the promises and advantages of composite material technology extract a payment of more sophisticated analyses, understanding, and failure modes than would be encountered for more conventional materials.

The present volume is a continuation of the long list of literature addressing the special problems associated with composite materials and their use as structural components. This volume contains what we believe to be significantly new and important information pertinent not only to composite material technology, but also to beam, plate, and shell structures. The fundamental motivation for the use of composites in pressure vessels and pipings is to combine the lightweight materials with high stiffness and strength in a possibly high-stress high-temperature environment. Both macro- and micromechanics will be considered in this volume and emphasis will be placed on the design and nonlinear analysis of composite material vessels.

The papers in the technical sessions can be roughly grouped into two categories: (*i*) macromechanical behavior involving complicating effects such as transverse shear and nonlinear analysis; and (*ii*) micromechanics and failure analysis. In the first categroy, Drs. O. O. Ochoa and T. J. Kozik presented a linearly exact displacement formulation to evaluate the interlaminar transverse shear and normal stresses of these beams. Drs. F. Gordaninejad and A. Ghazavi presented a high-order shear-deformable beam theory involving parabolic distribution of shear strain through the beam thickness. Dr. E. E. Spier presented experimental data on the instability of thin-walled laminated panels and cylinders under compression. Dr. D. Bushnell examined the minimum weight designs of laminated composite flat or curved stiffened cylindrical shells using the PANDA2 computer program. Drs. R. K. Kapania

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