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

and S. Raciti presented an extensive survey article on the recent advances in vibration and buckling of laminated beams and plates. A reexamination of some of the unsolved nonlinear vibration problems of composite material cylindrical shells was studied by Drs. Y. Hirano and J. R. Vinson. Dr. R. L. Citerley examined the imperfection sensitivity of composite cylinder shells using the PVRCK computer program. Finally, Dr. C. C. Chang, R. S. Sandhu, R. L. Sierakowski, and W. E. Wolfe examined free-edge delamination using the finite element method.

In the micromechanics and failure category, Drs. A. K. Roy and S. W. Tsai studied the design of "thick" composite cylinders for maximizing the burst pressure. Drs. R. R. Arnold and J. C. Parekh examined the theoretical prediction of ultimate strength of composite curved frame members. A nonlinear constitutive model for metal matrix composites was presented by Drs. H. Murakami and G. A. Hegemier. Professor J. J. Engblom studied the effects of damage due to transverse cracking at the layer level as opposed to the laminate level. An optical method for the nondestructive evaluation of damage in composites was presented by Drs. F. Bremand, J. A. Smith, and C. P. Burger.

David Hui

Thomas J. Kozik

Performance and Evaluation of Light Water Reactor Pressure Vessels, ASME Special Publication PVP-Vol. 119, ASME, New York, 1987.

The unique importance of reactor pressure vessel integrity has been recognized throughout three decades of commercial nuclear power development in the United States. Initially, the industry sought high reliability in pressure vessels through careful attention to design, materials selection, and fabrication. A few changes and improvements were made in later vessels, in response to service experience and results of parallel research and development. However, operating experience with all reactor pressure vessels has been very good, to the credit of their designers and manufacturers. Today there is keen interest, for economic reasons, in extending the useful service life of these vessels.

The objective of this Symposium was to review a variety of subjects pertaining to the reliability and fitness-for-service evaluation of reactor pressure vessels. These invited papers are intended to summarize the current technology and the experience base which presently support long-term operation of pressure vessels now in service.

The papers can be fit broadly into three categories. They provide first, a background of historical practice and experience; second, a review of possible cause of in-service damage or degradation; and third, a discussion of techniques for evaluating the current condition of the vessel.

An introductory paper by Stahlkopf et al. reviews past practice and progressive developments in materials and fabrication. Papers by Gordon et al. and by Bamford et al. review service and integrity issues for BWR and PWR vessels, respectively.

Four papers deal with potential in-service damage mechanisms. Irradiation embrittlement, discussed by Odette, is a well-known problem for which control measures are in place. The general subject of corrosion-assisted cracking, discussed by Ford, has been a focus of recent research because it can accelerate fatigue damage processes. Van Der Sluys and Cullen discuss fatigue crack growth data more specifically. Finally, Gosselin and Siegel discuss fatigue damage in the context of ASME III design criteria for nuclear pressure vessels, but taking into account differences between actual service conditions and design conditions.

A third group of four papers describes means for acquiring information on the present condition of the reactor pressure vessel for use in fitness-for-service evaluations. Papers on in-service flaw detection (Willetts and Ammirato) and flaw evaluation (Riccardella et al.) discuss implementation of ASME XI requirements for in-service inspection. Gamble, et al. present specific criteria for evaluating fitness-for-service following an unanticipated event. Finally, Jaske describes techniques for damage assessment using results of metallurgical examinations.

Ravi Rungta
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Seismic Engineering, ASME Special Publication PVP-Vol. 127, ASME, New York, 1987.

The National Congress on Pressure Vessel and Piping Technology is sponsored soley by the Pressure Vessels and Piping Division with invited participation by other ASME Divisions. Responding to the conference theme of "Pressure Boundary Integrity in an Earthquake," the sponsoring committees developed some 17 sessions on seismic engineering. In assembling the papers presented in the sessions into this special volume, it was decided, in general, that each chapter should retain the same thematic topic as the session or symposium in which the papers were originally presented. Thus, the objectives of the session/symposium organizers were preserved in the publication in the original format. Each of the session/symposium organizers were also invited to provide a chapter introduction which outlines the special interest of his session or symposium.

The chapters in this volume deal with a wide spectrum of earthquake topics. Recognizing that there is a great deal of international interest in seismic engineering, T. H. Liu organized an International Symposium to present new concepts from other countries. He also developed the chapter on Advanced Methods which evaluate traditional conservatism and which review new and more realistic methods in design. Such realistic approach in concept is further pursued by Pei-Ying Chen and A. G. Ware. The papers presented in their symposium on Pipe Damping and System Behavior at High Strains disseminate new data relating to the important issue of damping values for use in the seismic design and analysis of nuclear power plants. These papers will help to definitize ASME Code Case N-411. The dynamic response of piping systems in industrial applications is covered by the papers in S. Mirza's chapter on Pipeline Dynamics. The effects of ground motion on liquid storage tanks are reviewed by the papers on D. C. Ma's chapter on Seismic Response of Liquid Storage Tanks and Piping Systems. A well-known method to attenuate the effects of seismic excitation by isolation is thoroughly explored by Howard Chung in his chapter on Seismic, Shock and Vibration Isolation. The papers in his chapter cover