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.

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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

buildings and nuclear power plant equipment and structures. The chapter developed by C. W. Lin is general and contains papers that complement specific topics covered in other chapters.

As long as earthquakes occur, there is a challenge to improve the reliability of engineered systems to withstand the forces of nature. New knowledge will continue to be developed. The 67 papers in this volume collectively represent our understanding of this technology today.

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Fluid Structure Vibration and Liquid Sloshing, ASME Special Publication PVP-Vol. 128, ASME, New York, 1987.

An International Symposium on Vibration and Seismic Response of Fluid-Structure Systems is being sponsored by the Operations, Applications, and Components (OAC) Committee of the Pressure Vessel and Piping Division. The aim of this symposium was to provide a forum for the discussion of the recent development in the vibrational characteristics and seismic response of the fluid-structure systems which can be either: 1) fluid contained within structures such as liquid-storage tanks; or 2) structures surrounded by fluid such as submerged reactor components.

A total of twelve papers are presented in the symposium and are published in the special publication "Fluid-structure Vibration and Liquid Sloshing." They can be divided into two groups: 1) vibration characteristics and seismic response of LMR (Liquid Metal Reactor) submerged components and structures and other fluid-structure systems; and 2) computational methods of fluid-structure interaction. In the eight papers presented in the first group, Brochard et al. present a mathematical model which considers the reactor core system as an equivalent homogeneous medium which replaces the physical heterogeneous medium (tubes and fluid). The method can be used to understand the global behavior of the core vibrational mode and may be applied to other problems such as perforated plates, flow in porous media, etc. Martelli et al. present the results of a very comprehensive dynamic test of the Italian PEC reactor core system for better understanding of fluid-structure interaction problems. Computer analysis based on CORALIE and CLASH codes on the PEC core system are also illustrated to confirm the conservatism in the design calculation. In the LMR vessel seismic response, Brabant et al. present a substructing method implemented in the TRISTANA code for solving the modal response and seismic response of the pool-type LMRs which can be treated as a system consisting of many substructures defined in their natural modes calculated with free boundary conditions at all connection modes. Ma et al. report the results of a seismic analysis performed on a 400-MWe pool-type LMR reactor. Sloshing phenomena and fluid coupling behavior between the submerged components are illustrated. Ito and Fujita present the experimental test to investigate the fluid inertia effects and sloshing behavior in a pool-type reactor vessel. The test results are also used for validating the accuracy of the computer code. Eberle et al. present theoretical predictions of frequency response calculated for both the perfect and the imperfect tanks and compare them with the corresponding experimental counterparts.

Yu and Nash present a nonlinear analysis of sloshing in circular cylindrical tanks by the perturbation method, whereas Su presents a numerical algorithm based on the volume of the fluid technique to study the nonlinear behavior of liquid sloshing in partially filled prismatic baffled tanks subjected to longitudinal acceleration.

In the four papers of the second group, Huerta and Liu present an Arbitrary Lagrangian Eulerian (ALE) viscous fluid formulation to evaluate fluid force acting on a vibrating rigid body and to simplify coupled rigid body-viscous fluid formulation to a standard structural problem using the concept of added mass and added damping. Formulas for added mass and added damping are given for a cylinder immersed in an infinite viscous fluid. Lazzeri presents a Modified Boundary Element (MBE) technique to solve the fluid-structure interaction problems. The method consists of choosing the solution of the Laplace equation in terms of a series expansion where each term satisfies such equations and in minimizing the work lost in the boundary to compute the expansion coefficients. Ibrahim and Latorre present the experimental results of dynamic parameters (i.e., added mass and damping) of an immersed rod in a viscous fluid. The results show that the liquid inertia and damping are dependent upon the tank roll frequency and fairly agree with the analytical results. In the last paper, Lakis presents a theory for prediction of the effects of internal flow on the vibration characteristics of thin vessels. Knowing the effects of inertia, centrifugal and coriolis forces of the moving fluid, this theory can predict the response of vessels due to a pressure field arising from the turbulent boundary layer of an internal flow.

It is hoped that this symposium will be beneficial for future research and will upgrade the current analysis and design methodology of fluid-structure systems under dynamic loadings.

D. C. Ma

T. C. Su

Theory and Design of Pressure Vessels, J. F. Harvey, Van Nostrand Reinhold Co., New York, N.Y., 1985, 613 pp., $48.95.

Pressure vessels have come a long way. Previously, design was based on the "seat of the pants" approach. Combined analytical and experimental endeavors have put pressure vessel design on a firm footing. Finite Element (FE) adds greater impetus to its use in modern-day power plant and chemical plant design. The author presents design methods and explicit derivations of equations which are illustrated by numerical problems. This tends to focus attention upon the applicable theory. The book is, essentially, a complete revision of a previous book with the addition of new material. This makes for a more comprehensive text. Since weight is a present priority due to the requirement to cut costs in the design of offshore platforms, mineral mining potential and aircraft pressure vessels, and aforesaid aim requires concentrated effort. The book consists of 8 chapters, an excellent section on notation plus an elaborate set of references.

Chapter 1 introduces the subject and explains stress-strain curves, ductility, use of strain gages and photoelasticity for stress measurements. This follows with stress significance and design approach mentioning FE. Chapter 2 explains stresses in circular rings, cylinders and spheres subjected to applied internal pressure. General theory of membrane stresses for cylin-