

**William J. O'Donnell, Ph.D., P.E.**

**O'DONNELL CONSULTING ENGINEERS, INC.**

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Dr. W. J. O'Donnell is founder and President of O'Donnell Consulting Engineers, Inc. He has extensive professional experience in the analysis of structural components including fatigue and fracture safety evaluations and failure analyses. As an Advisory Engineer at Westinghouse, he conducted numerous material selection and structural evaluation reviews of elevated temperature and component designs. He was also cognizant engineer for the reactor Structural Design Basis at Bettis. He has published more than ninety papers in the fields of engineering mechanics, elevated temperature design and structural materials science. His work on fatigue analysis methods, local flexibilities and effects of cracks on structural integrity is widely used in equipment evaluations.

Dr. O'Donnell has been instrumental in the development of methods for evaluating fatigue, stress corrosion cracking, irradiation and safety margins of components in elevated temperature service. He provides consulting services in methods of extending the remaining safe life of refractory lined tanks, furnaces, mechanical components and structures. He has lectured on these subjects at engineering conferences and universities in the United States, Europe, Japan and China.

He is active in the development of national consensus standards for the design, fabrication and inspection of equipment, components and structures. He is Chairman of the Subgroup of Fatigue Strength of the ASME Boiler and Pressure Vessel Code, a member of the Subcommittee on Design and an expert in the complex failure modes which occur under cyclic loads at elevated temperatures. He has performed a number of research projects for the Pressure Vessel Research Committee of the Welding Research Council. He has published innovative solutions in engineering mechanics including structural ratcheting criteria, strain limits and damage evaluation methods, and creep tensile instability. He has patents on mechanical processes and devices which have been used in 40 nuclear power plants to mitigate crack growth. He has given invited lectures at conferences, research institutes and universities worldwide.

Dr. O'Donnell received a B.S. in Mechanical Engineering from Carnegie-Mellon University and a M.S. and Ph.D. from the University of Pittsburgh. He is a member of the Minerals, Metals & Materials society (TMS), the Society for Experimental Mechanics, Sigma XI, ASM International, American Society for Testing & Materials, American Association for the Advancement of Science, American Society of Mechanical Engineers, American Nuclear Society and is a Registered Professional Engineer. He received the National Pi Tau Sigma Gold Medal Award "For Outstanding Achievement in Mechanical Engineering." He received the ASME Pressure Vessel and Piping Literature Award for the "Best Conference Technical Paper" in 1973 and again in 1988. The Pittsburgh Section of the ASME named him "Engineer of the Year" in 1988. He was awarded the national PVP Medal by the Pressure Vessel and Piping Division of ASME in 1994. He received the University of Pittsburgh Mechanical Engineering Department's Distinguished Alumni Award in 1996, and Carnegie Mellon University Distinguished Achievement Award in 2004. He is a Fellow of the American Society of Mechanical Engineers and his vita is listed in the Engineers Joint Council "Engineers of Distinction" and Marquis "Who's Who in the World."

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**EDUCATION:**

1957           Carnegie Mellon University  
                  BSME with Minor in Metallurgy  
1959           University of Pittsburgh, MSME  
1959           Advanced Mechanics Program  
                  Westinghouse Research Laboratory  
1963           Ph.D. (Mechanical Engineering) University of Pittsburgh  
                  Bettis Doctoral Fellowship Program

**EXPERIENCE:**

1957-1959     Engineer, Westinghouse Research Laboratory  
1959-1970     Engineer, Senior Engineer, Fellow Engineer and Advisory Engineer,  
                  Westinghouse Bettis Atomic Power Laboratory  
1970-1993     Founder and President of O'Donnell & Associates, Inc. an  
                  Engineering Consulting firm which became AEA O'Donnell, Inc.  
1993-         President, O'Donnell Consulting Engineers, Inc.

**PUBLICATIONS**

Over 90 technical articles in professional journals in the areas of engineering mechanics and materials.

**PAST NATIONAL CONSENSUS STANDARDS ACTIVITIES**

Chairman, ASME Task Force on Creep Analysis  
Member, Subgroup on Design Analysis  
Member, ASME Subgroup on Elevated Temperature Design

Active in ASME Section XI Subcommittee on Nuclear Inservice Inspection

- Special WG Plant Life Extension
- WG Operating Plant Criteria

## **CURRENT NATIONAL CONSENSUS STANDARDS ACTIVITIES**

Chairman ASME Subgroup on Fatigue Strength  
Member, ASME Subcommittee on Design

Active in Pressure Vessel Research committee PVRC:

- Working Group S-N Data analysis
- Working Group da/dN Data Analysis
- Working group on Evaluation Methods
- Steering Committee for Cyclic Life and Environmental Effects in Nuclear Applications
- TG Operating Plant Fatigue Assessment
- WG Flaw Evaluation

## **HONORIA/INVITED LECTURES**

Advisory Committee on Reactor Safeguards  
ALCOA Technical Center  
Argonne National Laboratory  
Beijing Iron and Steel Research Institute  
Brown University  
Carnegie Mellon University  
CEA/CEN/Saclay  
CEGB Berkeley Nuclear Laboratories, UK  
Ecole Polytechnique, Palasisan  
Electric Power Research Institute  
Exxon Research and Development  
Franklin Institute Research Laboratories  
Hanford Engineering Development Laboratory  
Idaho National engineering Laboratory  
Lehigh University  
Liquid Metal Engineering Center, Canoga Park, California  
NASA Lewis Research Laboratory  
Oak Ridge National Laboratory  
Polish Academy of Science, Warsaw  
Qinhua University, Beijing  
Sandia National Laboratory  
University of California at Los Angeles  
University of London  
University of Moscow  
University of Pittsburgh  
University of Tokyo  
U. S. Steel Research Laboratory  
U. S. Nuclear Regulatory Commission  
Westinghouse Advanced Reactors Division  
Zhejiang University, Hangzhou,

## HONORS AND AWARDS

- Machinery's Award as "Outstanding Design Student in Carnegie Tech Class of 1957"
- 1967 Pi Tau Sigma Gold Medal Award for "Outstanding Achievement in Engineering"
- 1973 ASME PVP Literature Award for "Effective Elastic Constants for the Bending of Thin Perforated Plates with Triangular and Square Penetration Patterns"
- 1976 Elected Fellow of the American Society of Mechanical Engineers
- 1988 Engineer of the Year - Pittsburgh Section ASME
- 1988 ASME PVP Literature Award for Best 1988 Conference Technical Paper - "Synthesis of S-N and da/dN Life Evaluation Technologies"
- 1994 PVP Medal Award in recognition of significant contributions to the field of pressure vessel and piping technologies
- 1996 University of Pittsburgh Mechanical Engineering Department's Distinguished Alumni Award
- 2004 Carnegie Mellon University Distinguished Achievement Award

## PATENTS

- 1984 Expansion Joint for Reactor or Heat Exchanger, No. 4,434,840, by Janek S. Porowski, William J. O'Donnell and Ray G. Fasiczka
- 1986 Pipelock, No. 4,572,548, by Janek S. Porowski and William J. O'Donnell
- 1986 Mechanical Stress Improvement Process, No. 4,612,071, by William J. O'Donnell and J. S. Porowski
- 1987 Process for Improving Resistance of Split Pins to Stress Corrosion Cracking, No. 4,702,880 by J. S. Porowski, M. L. Badlani, W. J. O'Donnell and E. J. Hampton
- 1987 Mechanical Stress Improvement Process, no. 4,683,014 by J. S. Porowski, W. J. O'Donnell, M. L. Badlani and E. J. Hampton
- 1989 Process and Apparatus for Obtaining a Gas Sample, No. 4,817,441, by Janek S. Porowski, Manu L. Badlani, Edward J. Hampton and William J. O'Donnell and E. J. Hampton
- 1989 Process for Improving Resistance of Metal Bodies to Stress Corrosion Cracking, No. 4,842,655 by J. S. Porowski, M. L. Badlani, W. J. O'Donnell and E. J. Hampton
- 1993 Apparatus for Annealing Walls of Nuclear Reactor, No. 5,185,123, by J. S. Porowski, E. J. Hampton, M. L. Badlani and William J. O'Donnell

RELEVANT PUBLICATIONS BY W.J. O'DONNELL

10. "The Fatigue Strength of Members Containing Cracks," by W. J. O'Donnell, ASME Transactions, Journal of Engineering for Industry, Vol. 86, No. 2, May 1964.
14. "Fatigue Properties of Irradiated Pressure Vessel Steels," by W. G. Gibbons, A. E. Mikoleit, and W. J. O'Donnell, ASTM publication STP-426, Effects of Irradiation on Structural Metals, November 1967.
15. "Fracture of Cylindrical Fuel Rod Cladding Due to Plastic Instability," by W. J. O'Donnell, BAPL report, WAPD-TM-651, April 1967, Summary in ANS Transactions, Vol. 10, No. 1, June 1967.
16. "Low Cycle Fatigue Properties of Irradiated Hafnium," by W. J. O'Donnell and J. G. Weinberg, American Nuclear Society Transactions, Vol. 10, No. 1, June 1967.
19. "An Analysis of Transient Clad Strains in Cylindrical Fuel Elements Including the Effects of Oxide Pellet Cracking," by W. J. O'Donnell, W. G. Clarke, and W. R. Campbell, BAPL report, WAPD-TM-653, (Available from the Clearing House for Federal Scientific Information) January 1970.
23. "Certification of Computer Programs for ASME Code Analysis," by W. J. O'Donnell, Engineering Computer Software, Book Published by the ASME (1971).
30. "Upper Bounds for Accumulated Strains Due to Creep Ratcheting," by W. J. O'Donnell and J. S. Porowski, Transactions ASME, Journal of Pressure Vessel Technology, Vol. 97, No. 3, August 1975.
35. "Fatigue Design Criteria for Pressure Vessel Alloys," by C. E. Jaske and W. J. O'Donnell, Transactions ASME, Journal of Pressure Vessel Technology, Vol. 99, No. 4, November 1977.
40. "Creep Tensile Instability," by W. J. O'Donnell and J. S. Porowski, presented at the Fourth International Conference on Pressure Vessel Technology, London, England, Proceedings, May 1980.
41. "Creep Ratcheting Bounds from Extended Elastic Core Concept," by J. S. Porowski and W. J. O'Donnell, March 1979, presented at the Fifth International Conference on Structural Mechanics in Reactor Technology, Berlin, Germany, SMIRT Transactions, Vol. L 10/3, August 1979.
42. "More Efficient Creep Ratcheting Bounds," by J. S. Porowski and W. J. O'Donnell, ORNL Report 7322/1, October 1978.
43. "Development of Inelastic Design Criteria and Codes," by W. J. O'Donnell and J. S. Porowski, invited lecture, Fifth International Conference on Structural Mechanics in Reactor Technology, Berlin, Germany, SMIRT Transactions, Vol. L 6/1, August 1979.
44. "Creep Ratcheting Bounds for Cycling Primary and Seismic Loading," by J. S. Porowski and W. J. O'Donnell, presented at ASME Pressure Vessels and Piping Conference, San Francisco, California, June 1979.

## RELEVANT PUBLICATIONS BY W.J. O'DONNELL

46. "Simplified Inelastic Methods for Bounding of Fatigue and Creep Rupture Damage," by W. J. O'Donnell, J. S. Porowski, and M. L. Badlani, presented at ASME Century II Conference, San Francisco, California, August 1980. Transactions ASME, Journal of Pressure Vessel Technology, Vol. 102, p. 394, November 1980.
47. "Stress and Strain Concentrations in Perforated Structures Under Steady Creep Conditions," by J. S. Porowski, W. J. O'Donnell, T. Tanaka, and M. L. Badlani, August 1980, Transactions ASME, Journal of Pressure Vessel Technology, Vol. 102, p. 419, November 1980.
50. "Biaxial Model for Bounding Creep Ratcheting," by W. J. O'Donnell and J. S. Porowski, ORNL Report, 7322/2, April 1981.
51. "Design Implications of Recent Advances in Elevated Temperature Bounding Techniques," by J. S. Porowski, W. J. O'Donnell, and M. L. Badlani, Welding Research Council Bulletin, No. 273, December 1981.
53. "Cyclic Follow-up with Creep in Ligaments," by M. L. Badlani, T. Tanaka, W. J. O'Donnell, and J. S. Porowski, presented at ASME PVP Conference, Orlando, Florida. Published in Material Behavior at Elevated Temperatures and Component Analysis PVP Volume, (1982).
56. "Bounding Methods in Elevated Temperature Design," by W. J. O'Donnell and J. S. Porowski, presented at the Seventh International SMIRT Conference, Chicago, Illinois, August 22-26, 1983, SMIRT Transactions L9/4.
58. "Vessels for Elevated Temperature Service," by W. J. O'Donnell and J. S. Porowski, Chapter One, Developments in Pressure Vessel Technology:4, Book published by Applied Science Publishers Ltd., England, Edited by R. W. Nichols, 1983.
59. "Development of a Simplified Procedure for Rocket Engine Thrust Chamber Life Prediction with Creep," by M. L. Badlani, B. Kasraie, J. S. Porowski, W. J. O'Donnell, and D. B. Peterson, NASA Report CR-165585, October, 1981.
62. "Fatigue and Creep Rupture Damage of Perforated Plates Subjected to Cyclic Plastic Straining in Creep Regime," by M. L. Badlani, T. Tanaka, J. S. Porowski, and W. J. O'Donnell, Welding Research Council Bulletin No, 307, August 1985.
64. "On Design of Discontinuities in Structures for Elevated Temperature Service," by G. Baylac, B. Kasraie, J. S. Porowski, W. J. O'Donnell, and M. L. Badlani, Eighth International Conference on Structural Mechanics in Reactor Technology, SMIRT Transactions, Vol. L, August 19:23, 1985.
67. "Improved Fatigue Life Evaluation Methods for LRW Components," by W. J. O'Donnell, D. P. Jones, J. S. Abel, J. S. Porowski, E. J. Hampton, and M. L. Badlani, report prepared for Division of Engineering Technology, Office of Nuclear Regulatory Research, March 1987.
69. "Synthesis of S-N and da/dn Life Evaluation Technologies," by W. J. O'Donnell, presented at the American Society of Mechanical Engineers, Pressure Vessels and Piping Conference, Pittsburgh, Pa., PVP Vol. 10, 1988.

## RELEVANT PUBLICATIONS BY W.J. O'DONNELL

70. "Advanced Methods of Improving Resistance to Stress Corrosion Cracking in BWR Piping Systems," by J. S. Abel, J. Titrington, R. Jordan, J. S. Porowski, W. J. O'Donnell, M. L. Badlani, and E. J. Hampton, presented at the American Society of Mechanical Engineers Pressure Vessels and Piping Conference, June 19 - 23, 1988, PVP Vol. 13, 1988.
72. "Proposed New ASME Code Rules for Elastic Creep-Fatigue Evaluations," by W. J. O'Donnell, IMechE Seminar on Recent Advances in Design Procedures for High Temperature Plant, United Kingdom, November 1988.
75. "Development of Fatigue Criteria for Remaining Life Assessment of Shell Structures," by J. S. Porowski, W. J. O'Donnell, M. L. Badlani, S. Chattopadhyay, and S. S. Palusamy, MPC-Vol. 29, pp. 115-123, December 1988.
76. "Bounds on Creep Ratcheting in ASME Code," J. S. Porowski, M. L. Badlani, and W. J. O'Donnell, 1989 PVP Conference, Honolulu, Hawaii, July 23-27, 1989.
77. "ASME Code Program to Develop Improved fatigue Design Criteria," by W. J. O'Donnell, J.S. Porowski, M. L. Badlani, E. J. Hampton (SMC O'Donnell), G.H. Weidenhamer (U.S. Nuclear Regulatory Commission). Post-SMIRT Conference, Seminar No. 15, Construction Codes & Engineering Mechanics, Anaheim, California, August 22, 1989.
79. "Emerging Technology for Component Life Assessment," by W. J. O'Donnell and J. S. Porowski, presented at ASME Pressure Vessel and Piping Conference, San Diego, California, June 24, 1991. International Journal Pressure Vessel & Piping, No. 50 (1992) pp. 37-61.
84. "Crack Growth and Fatigue in Reactor Water," by W. J. O'Donnell, presented at ASME Pressure Vessel & Piping Conference, Honolulu, Hawaii, July 23-27, 1995, International Journal of Pressure Vessels & Piping Codes & Standards, PVP-Vol. 313-1, p. 189.
93. "The Fatigue Limit and Its Elimination," by K. J. Miller and W.J. O'Donnell, Fatigue & Fracture of Engineering Materials & Structures, Vol. 22, No. 7, July 1999, pp. 545-557.
95. "Code Design and Evaluation for Cyclic Loading, Sections III and VIII," by W.J. O'Donnell, Companion Guide to the ASME Boiler and Pressure Vessel Code, Volume 2, Chapter 39, ASME Press, 2002.
97. "Proposed New Fatigue Design Curves for Austenitic Stainless Steels, Alloy 600 and Alloy 800," by William J. O'Donnell, William John O'Donnell, Thomas P. O'Donnell, 2005 Proceedings of the ASME Pressure Vessels and Piping Conference, Vol. 1, Codes and Standards, pp. 109-132.
98. "Proposed New Fatigue Design Curves for Carbon and Low Alloy Steels in High Temperature Water," by William J. O'Donnell, William John O'Donnell, Thomas P. O'Donnell, 2005 Proceedings of the ASME Pressure Vessels and Piping Conference, Vol. 1, Codes and Standards, pp. 133-157.

## Pressure Vessel and Piping Award

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WILLIAM J. O'DONNELL

*Conferred at the Pressure Vessel and Piping Conference and Exposition, Minneapolis, Minnesota, June 19-23, 1994*

THE PRESSURE VESSEL AND PIPING AWARD, established in 1980, is bestowed for outstanding contributions in the field of pressure vessel and piping technology including, but not limited to, research, development, teaching, and significant advancements of the state of the art.

WILLIAM J. O'DONNELL, Ph.D., P.E., President, O'Donnell Consulting Engineers Inc., Bethel Park, Pennsylvania, *in recognition of his significant contributions to the field of pressure vessel and piping technology, particularly for advancing the state-of-the-art in fatigue, fracture, creep ratcheting, design and analysis of pressure vessel heads and heat exchanger tube sheets, for developing plastic design methods, and for the well-known design method of "O'Donnell-Porowski Bounds" for creep ratcheting.*



Dr. O'Donnell is president of O'Donnell Consulting Engineers Inc., a consulting firm specializing in the design and analysis of mechanical components. He has done extensive work in the evaluation of safety margins, fatigue life, notch sensitivity, corrosion fatigue, and crack propagation and has published 82 papers in professional journals in the area of stress analysis methods, fatigue life evaluation methods, and failure criteria.

He earned a B.S. in mechanical engineering in 1957 from Carnegie Mellon University, Pittsburgh, and an M.S. and Ph.D. in the same field from the University of Pittsburgh in 1959 and 1963, respectively. He is a registered professional engineer in

Pennsylvania and Illinois.

Dr. O'Donnell is active in the development of national consensus standards for the design, fabrication and inspection of mechanical components. An expert in the complex failure modes that occur in mechanical equipment subjected to cyclic loads, he is chairman of the Subgroup on Fatigue of the ASME Boiler and Pressure Vessel Code as well as a member of the Subcommittee on Design.

He has published extensively in engineering mechanics, writing on structural ratcheting criteria, strain limits, and damage evaluation methods and has been invited to give numerous lectures at conferences, research institutes, and universities worldwide. He holds patents on processes and devices which have been used in more than 30 plants.

For his achievements, Dr. O'Donnell has been awarded the 1967 Pi Tau Sigma Gold Medal and was elected Engineer of the Year in 1988 by the ASME Pittsburgh Section. He has also received PVP literature awards for technical papers both in 1973 and 1988.

An active member of ASME, Dr. O'Donnell was elected Fellow in 1976. In the past, he has served as chairman of the Task Force on Creep Analysis and as a member of the Subgroup on Design Analysis, the Subgroup on Elevated Temperature Design, and the Subcommittee on Properties.

Dr. O'Donnell also holds memberships in the Society for Experimental Testing, the American Society for Testing and Materials, the American Society for the Advancement of Science, the American Nuclear Society, Tau Beta Pi, and Sigma Xi.