

**CHRISTOPHER R. ALEXANDER**

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Specialized Professional Competence

Analysis, design and testing of structural components using experience with solid mechanics and finite element modeling. While at Stress Engineering Services, Inc., Dr. Alexander's activities have included experimental and analytical efforts to assess the structural integrity of fixtures, pressure vessels, piping systems, pipelines, and plastic components. Specific emphasis has been in the area of dents and gouges and their effect on the fatigue life of pipelines and the use of composites in repairing pipelines and piping systems. Activities have also involved the analysis, design, and testing of plastic structures for the medical, packaging, and food service industries. Areas of competence include solid mechanics, fracture mechanics, experimental methods, finite element analysis, and heat transfer.

Recent activities have involved the detailed analyses of subsea pipeline and flowline systems considering a variety of loading conditions including thermal expansion, resistance to buckling, thermal upheaval buckling, effects of outside anchor impacts including modeling high speed impact loads, fatigue assessments, and analyses considering the strain-based rules of API RP 1111 and the ASME Boiler & Pressure Vessel Code, Section VIII, Division 3 for high pressure designs. Dr. Alexander has also been involved in evaluating damage to subsea components considering impact from dropped objects using full-scale testing and limit analysis methods.

Research Activities

Dr. Alexander's research activities at Stress Engineering Services, Inc. have included studies associated with fatigue testing of pipes with dents and gouges. Investigations of composite reinforcement repair methods for pipelines and offshore risers have been conducted for the Pipeline Research Council International, Gas Research Institute, Minerals Management Service, and numerous manufacturers and pipeline companies. He has also performed numerous finite element analyses on pressure vessels and piping components, several of which involved complex heat transfer considerations. His research activities associated with Ph.D. graduate work included the development, analysis, and full-scale testing of a carbon/epoxy composite repair system for reinforcing offshore risers. His Master's work at the Turbomachinery Laboratory, Texas A&M University, included rotordynamic testing of honeycomb, labyrinth, helically-grooved, felt-metal, and smooth seals.

Employment History

Principal, Stress Engineering Services, Inc., 2007 - Present
Staff Consultant/Senior Associate, Stress Engineering Services, Inc., 2002 - 2007
President, Guidon, Inc., 2000 - 2002
Senior Associate, Stress Engineering Services, Inc., 1999 - 2000
Associate, Stress Engineering Services, Inc., 1997 - 1999
Analyst, Stress Engineering Services, Inc., 1993 - 1997
Research Assistant, Turbomachinery Laboratory at Texas A&M, 1991 - 1993

Academic Background

Ph.D., Mechanical Engineering, Texas A&M University, 2007
M.S., Mechanical Engineering, Texas A&M University, 1993
B.S., Mechanical Engineering, Texas A&M University, 1991

Professional Societies

American Society of Mechanical Engineers

Member of the ASME Post-Construction Committee (PCC-2)

Professional Honors

2006 International Offshore Pipeline Forum Best Paper Award (October 26, 2006)

2007 Dry Tree Forum Best Presentation Award (November 28, 2007)

Herbert Allen Award for Technical Achievement in an Engineer under 35, presented by the South Texas Section of ASME (April 2006)

ASME South Texas Section Meritorious Service Awards: 2005, 2006, 2007, and 2008.

Publications

1. Alexander, C.R., "Limit State Design Based on Experimental Methods for High Pressure Subsea Pipeline Design," Proceedings of IOPF 2009 (Paper No. IOPF2009-2002), ASME International Offshore Pipeline Forum, October 28-29, 2009, Houston, Texas.
2. Alexander, C.R., "Evaluating Damaged Subsea Pipelines Using an Engineering-Based Integrity Management Program," Proceedings of IOPF 2009 (Paper No. IOPF2009-6002), ASME International Offshore Pipeline Forum, October 28-29, 2009, Houston, Texas.
3. Alexander, C.R., "Recent Advances in the Evaluating Composite Repair Technology Used to Repair Transmission Pipelines," Clarion Evaluation and Rehabilitation of Pipelines Conference, Pittsburgh Marriott City Center, October 21-22, 2009.
4. Alexander, C.R., "Development of Standards for Composite Repair Systems," Article 4 in a 4-part series, Pipeline & Gas Technology Magazine, Hart Energy Publishing, LP, October 2009 edition.
5. Alexander, C.R., "Evaluating the Ability of Composite Materials to Restore Mechanical Integrity to Pipelines Having Wrinkle Bends," Article 3 in a 4-part series, Pipeline & Gas Technology Magazine, Hart Energy Publishing, LP, September 2009 edition.
6. Alexander, C.R., "Repair of Pipelines Having Mechanical Damage and Plain Dents Using Composite Materials," Article 2 in a 4-part series, Pipeline & Gas Technology Magazine, Hart Energy Publishing, LP, August 2009 edition.
7. Alexander, C.R., "Advances in the Repair of Pipelines Using Composite Materials," Article 1 in a 4-part series, Pipeline & Gas Technology Magazine, Hart Energy Publishing, LP, July 2009 edition.
8. Alexander, C.R., "Evaluating Damage to Onshore and Offshore Pipelines Using Data Acquired Using In-line Inspection Efforts," The 21st International Pipeline Pigging & Integrity Management Conference, February 11-12, 2009.
9. Alexander, C.R., "Using Testing Methods to Evaluate Subsea Pipeline Performance and Integrity," Paper No. IOPF2008-902, Proceedings of the ASME International Offshore Pipeline Forum, October 29-30, 2008, Houston, Texas.
10. Alexander, C.R., Manimala, Y., Stubbs, L., and Spikula, D., "Evaluating the Performance of a Pipeline Protection System to Prevent Damage to Subsea Pipelines from Dropped Objects," Paper No. IOPF2008-903, Proceedings of the ASME International Offshore Pipeline Forum, October 29-30, 2008, Houston, Texas.
11. Alexander, C.R., Blockhus, D.J., and Babin, J., "Use of Limit Analysis to Assess High Strain Conditions During Installation of Tees in Deepwater Pipelines," Paper No. IOPF2008-911, Proceedings of the ASME International Offshore Pipeline Forum, October 29-30, 2008, Houston, Texas.
12. Alexander, C., "Using Testing Methods to Evaluate Pipeline Mechanical Integrity," Proceedings of IPC2008 (Paper No. IPC2008-64038), 7th International Pipeline Conference, September 29-October 3, 2008, Calgary, Alberta, Canada.

13. Alexander, C., and Kulkarni, S., "Evaluating the Effects of Wrinkle Bends on Pipeline Integrity," Proceedings of IPC2008 (Paper No. IPC2008-64039), 7th International Pipeline Conference, September 29-October 3, 2008, Calgary, Alberta, Canada.
14. Alexander, C., "Strain-based Design Methods for Composite Repair Systems," Proceedings of IPC2008 (Paper No. IPC2008-64076), 7th International Pipeline Conference, September 29-October 3, 2008, Calgary, Alberta, Canada.
15. Scrivner, R., and Alexander, C., "Elements of an Engineering-Based Integrity Management Program," Proceedings of IPC2008 (Paper No. IPC2008-64492), 7th International Pipeline Conference, September 29-October 3, 2008, Calgary, Alberta, Canada.
16. Bolton, B., Semiga, V., Tiku, S., Dinovitzer, A., and Alexander, C., "Towards a Validated Pipeline Dent Integrity Assessment Model," Proceedings of IPC2008 (Paper No. IPC2008-64621), 7th International Pipeline Conference, September 29-October 3, 2008, Calgary, Alberta, Canada.
17. Alexander, C., Mekha, B., Hogan, M., Rager, B., and Kumar A., (June 2008), "Design, Manufacture, Testing, and Deployment of a Cross Haul Bucket for the Independence Hub", Paper No. OMAE2008-57598, The 27th International Conference on Offshore Mechanics and Arctic Engineering, June 15-20, 2008, Estoril, Portugal.
18. Alexander, C., Cercone, L., and Lockwood, J., (June 2008), "Development of a Carbon-Fiber Composite Repair System for Offshore Risers," Paper No. OMAE2008-57599, The 27th International Conference on Offshore Mechanics and Arctic Engineering, June 15-20, 2008, Estoril, Portugal.
19. D. Raghu, R. Swanson, and C. Alexander, (May 2008), "Methodology to Establish the Fitness for Continued Service of a Hurricane Damaged Export Pipeline in 1000 m of Water," Paper No. OTC-19653-PP, 2008 Offshore Technology Conference, May 5-8, 2008, Houston, Texas.
20. Alexander, C.R., (December 2007), "Development of a Composite Repair System for Reinforcing Offshore Risers," Ph.D. Dissertation, Texas A&M University, College Station, Texas.
21. Alexander, C.R., (October 2007), "Evaluating the Use of Composite Materials in Reinforcing Offshore Risers Using Full-scale Testing Methods," Paper No. IOPF2007-104, Proceedings of the ASME International Offshore Pipeline Forum, October 23-24, 2007, Houston, Texas.
22. Alexander, C.R., (October 2007), "Assessing the Effects of Dropped Objects on Subsea Pipelines," Paper No. IOPF2007-110, Proceedings of the ASME International Offshore Pipeline Forum, October 23-24, 2007, Houston, Texas.
23. Alexander, C.R., and J.W. Frey, (July 2007), "Use of Analytical and Experimental Monitoring Techniques in Assessing the Performance of a Cold Reheat Steam Line," Paper No. PVP2007-26079, Proceedings of the ASME PVP 2007/CREEP 8 Conference, July 22 - 26, 2007, San Antonio, Texas.
24. Alexander, C.R., Armer, W., and S.J. Harbert, (July 2007), "Evaluation of the Elliptical Flange Configurations for 24-inch and 30-inch Heater/Cooler Units," Paper No. PVP2007-26080, Proceedings of the ASME PVP 2007/CREEP 8 Conference, July 22 - 26, 2007, San Antonio, Texas.
25. Alexander, C.R., (June 2007), "Assessing the Effects of Impact Forces on Subsea Flowlines and Pipelines," Paper No. OMAE2007-29450, The 26th International Conference on Offshore Mechanics and Arctic Engineering, June 10-15, 2007, San Diego, California.
26. Alexander, C.R., (March 2007), "Methodology for Assessing the Effects of Plain Dents, Wrinkle Bends, and Mechanical Damage on Pipeline Integrity," Paper No. 07139, NACE International 2007 Corrosion Conference & Exposition, March 11-15, 2007, Nashville, Tennessee.
27. Alexander, C.R., (March 2007), "Guidelines For Repairing Damaged Pipelines Using Composite Materials," Paper No. 07144, NACE International 2007 Corrosion Conference & Exposition, March 11-15, 2007, Nashville, Tennessee.
28. Alexander, C.R., (March 2007), "Assessing the Effects of Corrosion on the Mechanical Integrity of a Pipeline Suspension Bridge," Paper No. 07148, NACE International 2007 Corrosion Conference & Exposition, March 11-15, 2007, Nashville, Tennessee.
29. Alexander, C.R., (October 2006), "Use of Limit Analysis Methods to Assess the Structural Capacity of Subsea Systems And Components," Paper No. IOPF2006-010, Proceedings of the ASME International Offshore Pipeline Forum, October 24-25, 2006, Houston, Texas.

30. Alexander, C.R., (October 2006), "Assessing the Effects of External Damage on Subsea Pipelines," Paper No. IOPF2006-014, Proceedings of the ASME International Offshore Pipeline Forum, October 24-25, 2006, Houston, Texas.
31. Macdonald, K.A., Cosham, A., Alexander, C.R., Hopkins P., (September 2006), "Assessing Mechanical Damage In Offshore Pipelines - Two Case Studies," Second International Conference on Engineering Failure Analysis, September 12-15, 2006, Toronto, Canada.
32. Alexander, C.R., Francini, B., (September 2006), "State Of The Art Assessment of Composite Systems used to Repair Transmission Pipelines," Proceedings of IPC2006 (Paper No. IPC2006-10484), 6th International Pipeline Conference, September 25-29, 2006, Calgary, Alberta, Canada.
33. Alexander, C.R., Scrivner, R., (September 2006), "Analysis of Girth Welds in Pipelines Subjected to Lifting Loads," Proceedings of IPC2006 (Paper No. IPC2006-10480), 6th International Pipeline Conference, September 25-29, 2006, Calgary, Alberta, Canada.
34. Alexander, C.R., Wilson, T., (September 2006), "Reinforcing Field Fabricated Branch Connections Using Composite Materials," Proceedings of IPC2006 (Paper No. IPC2006-10483), 6th International Pipeline Conference, September 25-29, 2006, Calgary, Alberta, Canada.
35. Alexander, C.R., Worth, F., (September 2006), "Assessing the Use of Composite Materials in Repairing Mechanical Damage in Transmission Pipelines," Proceedings of IPC2006 (Paper No. IPC2006-10482), 6th International Pipeline Conference, September 25-29, 2006, Calgary, Alberta, Canada.
36. Alexander, C.R., Boswell, R.S., (July 2005), "Techniques for Modeling Thermal and Mechanical Stresses Generated in Catalytic Cracker and Coke Drum Hot Boxes," 2005 ASME Pressure Vessels and Piping Division Conference, July 17-21, 2005, Denver, Colorado.
37. Alexander, C.R., Pordal, H., (July 2005), "Modeling Leakage in a Fuel Transfer Piping Using Computational Fluid Dynamics Techniques," (July 2005), 2005 ASME Pressure Vessels and Piping Division Conference, July 17-21, 2005, Denver, Colorado.
38. Biel, R.C., Alexander, C.R., "Application of Limit Load Analyses to Assess the Structural Integrity of Pressure Vessels," (July 2005), 2005 ASME Pressure Vessels and Piping Division Conference, July 17-21, 2005, Denver, Colorado.
39. Alexander, C.R. Fisseler, G., (June 2005), "Optimization of a Subsea Electronic Housing Design Using Limit Load Analysis Techniques," Third International Conference on Structural Stability and Stability, June 19-22, 2005, Kissimmee, Florida.
40. Young, K., Alexander, C., Biel, R., and Shanks, E., (May 2005), "Updated Design Methods for HPHT Equipment," 2005 SPE Applied Technology Workshop on High Pressure/High Temperature Sour Well Design, May 17-19, 2005, Houston, Texas.
41. Alexander, C.R., Biel, R.C., (July 2004), "Certification Program for Assessing the Mechanical Integrity of Pressure Vessel Systems," 2004 ASME Pressure Vessel and Piping Conference, San Diego, California.
42. Alexander, C.R., Jagodzinski, J., Biel, R.C., (July 2004), "Stress Analysis of a 46-inch Reactor Feed/Effluent Exchanger," 2004 ASME Pressure Vessel and Piping Conference, San Diego, California.
43. Alexander, C.R., Runte, D., Long, R.J., (July 2004), "Assessing the Effects of Vibratory Loads on Pipelines Using Analysis and Monitoring Techniques," 2004 ASME Pressure Vessel and Piping Conference, San Diego, California.
44. Alexander, C.R., (2000), "Use of Grinding to Repair Dents Containing Minor Scratches," Proceedings Convergence 2000, Environmental and Pipeline Engineering Conference, ASCE (Session 1C: Pipeline Materials), July 23-26, 2000, Kansas City, Missouri.
45. Alexander, C.R., Wilson, F.D., (2000), "Assessing the Use of Composite Materials in Rerating Liquid and Gas Transmission Pipelines," Proceedings Convergence 2000, Environmental and Pipeline Engineering Conference, ASCE (Session 5C: Pipeline Transport Technology), July 23-26, 2000, Kansas City, Missouri.
46. Alexander, C.R., Wilson, F.D. (February 2000), "Recent Test Results and Field Experience with Armor Plate Pipe Wrap Repairing Corroded and Mechanically-Damaged Pipes," 2000 Piggings Conference, Houston, Texas.
47. Alexander, C.R. (February 2000), "Repair of Mechanically-Damaged Pipes Using Armor Plate Pipe Wrap," ASME ETCE/OMAE 2000 Joint Conference, New Orleans, Louisiana.

48. Alexander, C.R., Wilson, F.D. (August 1999), "Analysis, Testing, and Proposed Guidelines for Use of Composites Materials in Repairing Pipelines," 1999 Pressure Vessel and Piping Conference, Boston, Massachusetts.
49. Alexander, C.R., (August 1999), "Review of Experimental and Analytical Investigations of Dented Pipelines," 1999 Pressure Vessel and Piping Conference, Boston, Massachusetts.
50. Kiefner, J.F., Alexander, C.R. (April 1999), "Repair of Dents Containing Minor Scratches," 1999 API Pipeline Conference, Dallas, Texas.
51. Alexander, C.R., Kiefner, J.F. (April 1999), "Effects of Smooth Rock Dents on Liquid Petroleum Pipelines," 1999 API Pipeline Conference, Dallas, Texas.
52. Alexander, C.R., Wilson, F.D. (February 1999), "Analysis, Testing, and Proposed Guidelines for Repairing Pipelines with Composite Materials," 1999 Pipeline Pigging Conference, Houston, Texas.
53. Alexander, C.R., (February 1999), "Analysis of Dented Pipelines Considering Constrained and Unconstrained Configurations," 1999 Energy Sources Technology Conferences and Exhibitions, Houston, Texas.
54. Alexander, C.R., (February 1999), "Analysis of Dented Pipelines Considering Constrained and Unconstrained Configurations," 1999 Energy Sources Technology Conferences and Exhibitions, Houston, Texas.
55. Alexander, C.R., Wilson, F.D. (February 1999), "Development and Testing of the Armor Plate Pipe Wrap Repair System," 1999 Energy Sources Technology Conferences and Exhibitions, Houston, Texas.
56. Alexander, C.R., Wallace, T. C. (February 1999), "Experimental Testing of a Composite Gasket with Internal Pressure, Bending, and Thermal Loads," 1999 Energy Sources Technology Conferences and Exhibitions, Houston, Texas.
57. Alexander, C.R., Wilson, F.D. (October 1998), "Design, Testing, and Analysis of Armor Plate Pipe Wrap," 1998 NACE International Central Area Conference, Tulsa, Oklahoma.
58. Alexander, C.R., Kiefner, J.F., Fowler, J.R. (April 1998), "Repair of Dents Combined with Gouges Considering Cyclic Pressure Loading," 1998 API Pipeline Conference, Dallas, Texas.
59. Alexander, C.R., Kiefner, J.F. (April 1998), "Effects of Smooth and Rock Dents on Liquid Petroleum Pipelines," 1998 API Pipeline Conference, Dallas, Texas.
60. Alexander, C.R., Connelly, L.M. (February 1998), "Analytical Recreation of a Dent Profile Considering Varied Soil, Operating, and Boundary Conditions," 1998 Energy Sources Technology Conferences and Exhibitions, Houston, Texas.
61. Alexander, C. R., Biel, R. C., Fahrion, M. E., Connelly, L. M., "Fitness for Service Evaluation of a Platformer Reactor," 1997 ASME Pressure Vessel & Piping Conference, Orlando, Florida, PVP-Vol. 359.
62. Alexander, C. R., Fowler, J. R., Lewis, K. (January 1997), "Analysis of Composite Repair Methods for Pipeline Mechanical Damages Subjected to Cyclic Loading," 1997 Energy Week Conference.
63. Alexander, C. R., Kiefner, J. F., Fowler, J. R. (January 1997), "Repair of Dents Combined with Gouges Considering Cyclic Pressure Loading," 1997 Energy Week Conference.
64. Kiefner, J. F., Alexander, C. R. (October 1996), "Repair of Dents Containing Minor Scratches," Ninth Symposium on Pipeline Research, Houston, Texas, AGA Catalog No. L51746.
65. Fowler, J. R., Alexander, C. R., and Samman, M. M. (1996). "A Study on the Design Guidelines for High-Pressure Pipe Fittings," 1996 Energy Week Conference.
66. Fowler, J. R., Alexander, C. R., Kovach, P. J., and Connelly, L. M. (January, 1995). "Fatigue Life of Pipelines with Dents and Gouges Subjected to Cyclic Internal Pressure," ASME Pipeline Symposium, Houston, Texas, PD - Vol. 69.
67. Alexander, C. R., Childs, D. W., and Yang, Z. (January, 1995). "Theory versus Experiment for the Rotordynamic Characteristics of a Smooth Annular Gas Seal at Eccentric Positions," Journal of Tribology, Volume 117, Number 1.
68. Alexander, C. R. (August, 1993). "Comparison of Experimental and Theoretical Rotordynamic Coefficients for a Smooth Gas Seal at Eccentric Operation," Masters Thesis, Texas A&M University.

Engineering Designs and Analyses

- Design, development, and prototype testing of a carbon-based composite repair system for reinforcing offshore risers
- Analysis and testing of lap shear composites in both rupture and creep modes.
- Analysis and testing of composite reinforcements as a repair method for mechanically damaged and corroded pipelines.
- Analysis, design, and testing of offshore lifting structures.
- Analysis and testing of pipelines damaged with corrosion, dents, and mechanical damage.
- Design of an inspection tool for monitoring in-line valves of large diameter pipes.
- Numerous analyses of pressure vessels and heat exchangers.
- Analysis of flange and fitting designs for sub-sea applications.
- Design, analyses, and testing of a smooth seal at eccentric operation.
- Analysis and testing of plastic structures.

Invited Lectures

- Invited speaker at the Government/Industry Pipeline R&D Forum, sponsored by the Pipeline & Hazardous Materials Safety Administration, Washington, D.C., June 24-25, 2009.
- Invitation to address composite repair methods, Southern Gas Association's Annual Operators Conference, Houston, Texas, July 2006, October 2007.
- Keynote speaker at the Mechanical Damage Technical Workshop, sponsored by the Pipeline & Hazardous Materials Safety Administration, Houston, Texas, March 1, 2006.
- Invitation to present findings on damage to offshore pipeline, Israel Electric Corporation, Jerusalem, Israel, October 2005.
- Technical presentation to the Chinese Pipeline Bureau on composite repair methods, Beijing, China, August 2005.
- Course coordinator and lecturer for the ASME South Texas Section Pressure Vessel Engineering Seminar, Fall 2005, 2006, 2007, and 2008.
- Speaker at the Clarion Technical Conferences on Composite Repair Methods (semi-annually starting in 2005 to present).
- Speaker at the Southern Gas Association's Pipeline Repair Methods Workshop (semi-annually from 2005 to 2009).