

Kenneth P. Maynard  
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## EDUCATION AND PROFESSIONAL REGISTRATION

Master of Engineering in Acoustics, Penn State University  
Bachelor of Science in Mechanical Engineering, University of Florida  
Licensed Professional Engineer  
Master of Divinity, Columbia International University

## SYNOPSIS OF SKILLS

- Shock and vibration testing and analysis
- Finite element analysis (ANSYS, STRUDEL, others)
- Machinery prognostics and health management research
- Field mechanical troubleshooting of operating systems by testing and analysis
- Development of test and analysis techniques and procedures
- Sound measurement and noise reduction
- Flow-induced vibration analysis
- Pressure vessel/piping analysis, ASME VIII and ASME III, Class 1, 2, and 3
- Seismic qualification of piping, equipment, structures
- Low level seismic testing
- Development of special purpose finite element and other computer programs
- Computer applications (see Page 2)

## EXPERIENCE

- August, 2002 to present: Research Engineer, Penn State Applied Research Lab (part-time)
  - ◇ Reactor Coolant Pump Shaft Crack Detection
  - ◇ Finite element modeling of airfoil leading edge heat transfer of impregnated coatings
  - ◇ Signal processing of projectile impact accelerations and forces (STFT, wavelets)
  - ◇ Finite element modeling of dynamics of impact and friction on excursionary airfield (EAF) aluminum mat
  - ◇ Finite element modeling of jet impingement heat transfer for VTOL aircraft on EAF
- August, 2001 to August, 2002: Part-time instructor – Mechanical Engineering Dept., Penn State University
  - ◇ Mechanical Vibration
  - ◇ Machine Design
- August, 1997 to August, 2002: Research Engineer, Penn State Applied Research Lab, Condition Based Maintenance Dept.  
Reference: Dr. Karl Reichard (814-863-7681)
  - ◇ Principle Investigator for the following CBM research projects:
    - § Reactor Coolant Pump Shaft Crack Detection (EPRI)
    - § Centrifugal Charging Pump Gearbox Smart Sensor Development (EPRI)
    - § NERI Smart Equipment for Nuclear Power Plants (DOE)
    - § Prognostics and Health Management Research (Sandia National Laboratories)
    - § Sensors and signal processing for the Multi-Disciplinary University Research Initiative (ONR)
    - § Integrated Predictive Turbine engine machinery diagnostics, IMATE consortium (DARPA/GE)
    - § Turbine blade and shaft crack detection research (Southern Company)
    - § Aircraft engine disk cracking (NASA Glenn/GE)
    - § Wind tunnel fan blade cracking (NASA Ames)
    - § Diagnostics (MURI-IPD) (Co-PI)
  - ◇ Developed interstitial processing algorithms for identification of gear tooth and shaft faults
- August, 1989 to August, 1997 - Southern Company Services: Senior Engineer, Consulting Services (Applied Mechanics).  
Reference: David L. McKinney (205-992-7036)
  - ◇ Seismic qualification of equipment and piping (hand calcs. and finite element)
  - ◇ Seismic verification of equipment based on earthquake experience (SQUG SRT member)
  - ◇ Finite element analysis of equipment and structures (stress, dynamics, thermal)
  - ◇ Oversaw project for seismic qualification of piping based on earthquake experience
  - ◇ Developed system for non-contact detection of cracks in turbine blades at Penn State
  - ◇ Vibration troubleshooting of operating systems by testing and analysis
  - ◇ Modal testing of piping and equipment
  - ◇ Sound and vibration signal processing

- ◇ Rotordynamic analysis of pumps and turbines
- ◇ Noise reduction (community and in-plant)
- ◇ Technical focus for ANSYS analysis
- ◇ OSHA evaluation of plant noise
- February, 1988 to August, 1989 - Civil Engineering of Columbia: Reference: Bill Brown (803-798-2820)
- October, 1987 to December, 1987 - Adjunct faculty, Columbia Bible College
- September, 1984 to August, 1987 - Full-time student, Columbia Biblical Seminary
- March, 1982 to December, 1984 - President, SLI Engineering
  - ◇ Consulting engineer at Babcock and Wilcox, Utility Power Generation Division: References: Dr. M. K. Au-Yang (804-385-2000)
    - § Steam generator tube vibration analysis, including random turbulent, fluidelastic instability, and vortex shedding
    - § Flow induced vibration analysis of internal header structure, including vortex shedding, random, and flutter
    - § Flow induced vibration analysis of miscellaneous reactor and steam generator internals
    - § Data reduction and analysis of Control Rod Drive vibration test data
  - ◇ Contract engineer at Burns and Roe, Oradell, NJ:
    - § ASME Section III, Class 1 Piping analysis
- November, 1980 to March, 1982 - Design-Engineer I, Duke Power Company, Design Engineering Department. Reference: WH Scheffler (Retired)
  - ◇ Supervisor, Operations Analysis Group
    - § Failure analysis, dynamic testing and analysis of operating systems
    - § Developed pre-operational/startup vibration criteria for piping systems
    - § Developed finite element program for critical speed analysis of shafts
- September, 1979 to June, 1981 - Instructor, University of North Carolina at Charlotte, College of Engineering, sequence of undergraduate courses, "Dynamics of Linear Circuits and Systems"
- May, 1978 to November, 1980 - Engineer Associate, Duke Power Company, Design Engineering Department. Reference: WH Scheffler (Retired)
  - ◇ Supervisor, Special Stress and Dynamic Analysis Group
    - § Directed low-level seismic testing of safety related valves
    - § Directed vibration troubleshooting of operating systems
    - § Developed Finite Element code for qual. (ASME III) of instrument. lines, vents, drains
    - § Performed generic study of effects of support flexibility on seismic loads and stress
- May, 1976 to May, 1978 - Eng. Asst., Duke Power Company, Design Engineering Department, Stress Anal. Group. Reference: WH Scheffler (Retired)
  - § Developed low-level seismic testing program for over fifty safety related valves. Responsibilities included feasibility study, specification of test equipment, development of test procedures, director of testing, and development of final report
  - § Performed multi-linear dynamic analysis of pipe whip energy absorber test structure
  - § Vibration testing and analysis of operating equipment
  - § Developed computer program for evaluation of equipment anchoring systems
  - § Stress analysis of piping, equipment, and structures I/A/W ASME III

#### COMPUTER EXPERIENCE

- Finite Element Programs Used: ANSYS, STRUDL, NASTRAN, STARDYNE, SUPERPIPE, ADLPIPE
- Languages: MATLAB, FORTRAN, BASIC, SPL, DBASE III/IV
- Other Applications: Fluent with all MSOffice products (also other word processors and spreadsheets)
- Programs Written: hundreds for stress and dynamic analysis of structures, equipment, pressure vessels and piping

#### TECHNICAL SOCIETIES

ASME Sub-committee on Vibration of Heat Exchanger Internals - former member

**PERSONAL:** Married, one son Nathanael (16 years old), daughter Kedrah (9 years old)

**PUBLICATIONS:**

- C. J. Lissenden, S. P. Tissot, M. W. Trethewey and K. P. Maynard, *Torsion Response of a Cracked Stainless Steel Shaft*, Fatigue & Fracture of Engineering Materials and Structures, August 2007, Vol. 30, Issue 8, Page 673-782.
- Thornton, William R., Trethewey, Martin W., Maynard, Kenneth P., Sadler, James, *MRI Isolation System Design for a Severe Vibration Environment*, Sound and Vibration Magazine, December, 2006.
- Resor, B.R., Trethewey, M.W., Maynard, K.P., *Compensation for Encoder Geometry and Shaft Speed Variation in Time Interval Torsional Vibration Measurement*, Journal of Sound and Vibration, Vol. 286, 22 September 2005, pp. 897-920, 2005.
- Garrett, Phillip W., Guindon, Edward J., Trethewey, Martin W., Lebold, Mitchell S., Maynard, Kenneth P., *Shaft Crack Monitoring via Torsional Vibration Analysis; Part 2 – Field Applications* 2005 International Modal Analysis Conference, Orlando, FL, January 31 - February 3, 2005.
- Bieryla, Dennis J., Trethewey, Martin W., Lissenden, Clifford J., Lebold, Mitchell S., Maynard, Kenneth P., *Shaft Crack Monitoring via Torsional Vibration Analysis; Part 1 – Laboratory Tests* 2005 International Modal Analysis Conference, Orlando, FL, January 31 - February 3, 2005.
- Lebold, M. S., Maynard, K. P., Reichard, K, Trethewey, M., Bieryla, D., Lissenden, C., Dobbins, D., *Using Torsional Vibration Analysis as a Synergistic Method for Crack Detection in Rotating Equipment*, 2004 IEEE Aerospace Conference, Big Sky, MT, March 6-13, 2004.
- Groover, C. L., Trethewey, M. W., Maynard, K. P., Lebold, M. S., *Removal of Order Domain Content in Rotating Equipment Signals by Double Resampling*, IMAC-XXII, International Modal Analysis Conference, Dearborn, Mi, Jan. 26-29, 2004.
- Yildiz, B.; Golay, M.; Maynard, K. P., Maghraoui, M., *Development of a Hybrid Intelligent System For On-Line Monitoring of Nuclear Power Plant Operations*, 2002 PSAM 6 (Probabilistic Safety Assessment and Management) Conference, San Juan, Puerto Rico, June 23–28, 2002.
- Kacprzynski, G. J; Roemer, M. J.; Byington, C. S.; Modgil, G. A.; Palladino, A; Maynard, K. P., *Enhancing Gear Physics-of-Failure Models with System Level Vibration Features*, Proceedings of the 56th Meeting of the Society for Machinery Failure Prevention Technology, Virginia Beach, VA, April 15-19, 2002.
- Kacprzynski, G. J; Roemer, M. J.; Modgil, G. A.; Palladino, A; Maynard, K. P., *Enhancement of Physics-of-Failure Prognostic Models with System Level Features*, 2002 IEEE Aerospace Conference, Big Sky, MT, March 9-16, 2002.
- Maynard, K. P., and Trethewey, M. W., *Blade and Shaft Crack detection Using Torsional Vibration Measurements Part 3: Field Application Demonstrations*, Noise and Vibration Worldwide, Volume 32, No. 11, December 2001, pp. 16-23.
- Maynard, K.; Trethewey, M.; Gill, R.; Resor, B., *Gas Turbine Blade and Disk Crack Detection Using Torsional Vibration Monitoring: A Feasibility Study*, Proceedings of 14th International Congress and Exhibition on Condition Monitoring And Diagnostic Engineering Management (COMADEM), 4-6 September 2001, University of Manchester, UK.
- Yildiz, B.; Golay, M.; Maynard, K. P., Maghraoui, M., *Development of Expert System with Bayesian Networks for Application in Nuclear Power Plants*, 2001 EPRI International Maintenance Conference, Houston, TX, August 14-16, 2001.
- Maynard, K. P., Trethewey, M. W., *Application of Torsional Vibration Measurement to Blade and Shaft Crack Detection in Operating Machinery*, Maintenance and Reliability Conference, Gatlinburg, Tennessee, May 6-9, 2001.
- Harmon, D. L.; Golay, M. W.; Campbell, J. E.; Duran, F. A.; Maynard, K. P.; Spencer, J. W, *Developing "Smart" Equipment and Systems Through Collaborative Neri Research and Development: A First Year Of Progress*, Maintenance and Reliability Conference, Gatlinburg, Tennessee, May 6-9, 2001.
- Harmon, D. L.; Golay, M. W.; Campbell, J. E.; Duran, F. A.; Maynard, K. P.; Spencer, J. W, *Wising Up to Get Smart*, Nuclear Engineering International, May, 2001.

- Maynard, K. P., Trethewey, M. W., Groover, C., *Application of Torsional Vibration Measurement to Shaft Crack Monitoring in Power Plants*, Proceedings of the 55th Meeting of the Society for Machinery Failure Prevention Technology, Virginia Beach, VA, April 2-5, 2001.
- Maynard, K. P., and Trethewey, M. W., *Blade and Shaft Crack detection Using Torsional Vibration Measurements Part 2: Resampling to Improve Effective Dynamic Range*, Noise and Vibration Worldwide, Volume 32, No. 2, February 2001, pp. 23-26.
- Maynard, K. P., and Trethewey, M. W., *Blade and Shaft Crack detection Using Torsional Vibration Measurements Part 1: Feasibility Studies*, Noise and Vibration Worldwide, Volume 31, No. 11, December, 2000, pp. 9-15.
- Harmon, D. L.; Chapman, L. D.; Golay, M. W.; Maynard, K. P.; Spencer, J. W., *Developing "Smart" Equipment and Systems Through Collaborative NERI Research and Development: A First Year Of Progress*, Basin Nuclear Conference, Seoul Korea, October 29-November 2, 2000.
- Begg, C. D.; Byington, C. S.; and Maynard, K. P., *Dynamic Simulation of Mechanical Fault Transition*, Proceedings of the 54th Meeting of the Society for Machinery Failure Prevention Technology, Virginia Beach, VA, May 1-4, 2000, p. 203-212.
- Lebold, M.; McClintic, K.; Campbell, R.; Byington, C.; Maynard, K., *Review of Vibration Analysis Methods for Gearbox Diagnostics and Prognostics*, Proceedings of the 54th Meeting of the Society for Machinery Failure Prevention Technology, Virginia Beach, VA, May 1-4, 2000, p. 623-634.
- McClintic, K.; Lebold, M.; Maynard, K.; Byington, C.; Campbell, R., *Residual and Difference Feature Analysis with Transitional Gearbox Data*, Proceedings of the 54th Meeting of the Society for Machinery Failure Prevention Technology, Virginia Beach, VA, May 1-4, 2000, p. 635-645.
- Maynard, K. P.; Lebold, M.; Groover, C.; Trethewey, M., *Application of Double Resampling to Shaft Torsional Vibration Measurement for the Detection of Blade Natural Frequencies*, Proceedings of the 54th Meeting of the Society for Machinery Failure Prevention Technology, Virginia Beach, VA, May 1-4, 2000, p. 87-94.
- Reichard, Karl M.; Van Dyke, Mike; Maynard, Ken, *Application of sensor fusion and signal classification techniques in a distributed machinery condition monitoring system*, Proceedings of SPIE - The International Society for Optical Engineering Apr 25-Apr 28 2000, p 329-336.
- Harmon, D. L.; Chapman, L. D.; Golay, M. W.; Maynard, K. P.; Spencer, J. W., *Developing "Smart" Equipment and Systems Through Collaborative NERI Research and Development*, Korean Nuclear Society/Korea Atomic Industrial Forum, Seoul, Korea, April 19-21, 2000.
- Begg, C.; T. Merdes, C. S. Byington, and K. P. Maynard, *Mechanical System Modeling for Failure Diagnosis and Prognosis*, Maintenance and Reliability Conference (MARCON 99), Gatlinburg, Tennessee, May 10-12, 1999.
- Maynard, K. P.; and M. Trethewey, *On The Feasibility of Blade Crack Detection through Torsional Vibration Measurements*, Proceedings of the 53rd Meeting of the Society for Machinery Failure Prevention Technology, Virginia Beach, VA, April 19-22, 1999, pp. 451-459.
- Maynard, K. P.; *Interstitial Processing: The Application of Noise Processing to Gear Fault Detection*, Proceedings of the International Conference on Condition Monitoring, University of Wales Swansea, UK, 12th - 16th April 1999, pp. 77-86.
- Maynard, K. P.; *Validation of Helicopter Nominal and Faulted Conditions Using Fleet Data Sets*, Proceedings of the International Conference on Condition Monitoring, University of Wales Swansea, UK, 12th - 16th April 1999, pp. 129-141.
- Au-Yang, M. K.; Maynard, K. P., *Guidelines for the Reduction of Random Modal Test Data*, Proceedings of the International Modal Analysis Conference & Exhibit VI 1985, p 384-389.