



TURBOMET INTERNATIONAL

A Division of TriMet Incorporated

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Professional Resume of

V. P. "Swami" SWAMINATHAN, Ph.D, FASME
President and Principal Metallurgical Consultant
TurboMet International
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B. S., Metallurgy, Indian Institute of Technology, 1971
M. S., Metallurgy & Materials Science, Michigan State University, 1973
Ph.D. in Metallurgy and Mechanics, University of Waterloo, 1977

Dr. Swami Swaminathan has over 34 years of industrial and applied R&D experience in the areas of gas turbine and steam turbine materials, advanced power plant materials, gas turbine superalloy metallurgy, condition and life assessment of various turbine components, root cause failure analysis (RCFA), nondestructive testing (NDE), oxidation, corrosion and erosion resistant coatings, thermal barrier (TBC) coatings, problem solving and application. He published over 55 peer-reviewed technical articles, coeditor of a book on 'Advanced Materials and Coatings for Combustion Turbines.' He has made numerous presentations on steam and gas turbine material related topics in many countries; organized and chaired numerous technical sessions in gas turbine technology in international conferences. He has made many invited presentations at conferences in USA, Europe, Middle East and Asia. He gained 11 years of experience at the Westinghouse Electric Corporation where he directed both short and long range applied research and development projects on advanced steam turbine materials and design data development. At Southwest Research Institute (SwRI) he had 14 years of experience in leading and managing many gas turbine and steam turbine materials projects. As the president of TurboMet International, the company he founded in 2001, he has been working with Electric Power Research Institute (EPRI), turbine users, repair companies, insurance companies and law firms on several land based industrial gas turbine and aero-engine related projects.

Dr. Swaminathan leads several projects in development of technology and data to assess turbine material degradation, mechanical property determination and remaining life assessment of compressor and hot section components as well as coatings in gas turbines. These components include turbine discs, compressor and turbine blades/buckets, transition ducts, combustors and vanes. He has extensive experience in microstructural evaluation of several superalloy hot section components to assess the in-service material and coating degradation and remaining life assessment. Alternate transition duct alloy was evaluated under his direction. He has managed several projects for commercial clients in these areas. He conducted rainbow test evaluations of corrosion/oxidation resistant coatings on blades, and thermal barrier coatings (TBC) on transition ducts and hot gas casings. He directed a project on root cause failure analysis of turbine blades and to select coatings and conducted a rainbow test program in gas turbines. He selected coatings, which successfully mitigated hot corrosion of blades and vanes. He managed a project for an industry consortium program to develop technology to determine the durability and creep life of GTD-111 alloy buckets and coatings in the land based Frame 5, 6, 7 and 9 gas turbines. Patented life assessment software was developed from the results of this project.

Dr. Swaminathan conducted numerous **root cause failure analysis** (RCA) investigations on various gas turbine components such as turbine discs (compressor and hot-section), blades/buckets, vanes, transition ducts, compressor blades, bearings, couplings, bolts, many types of coatings, compressor casing, etc.,

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Swami conducted several ASME workshops in this area. He has in-depth experience and expertise in identifying the failure mechanisms such as high-cycle fatigue, low-cycle fatigue, thermal fatigue, creep, oxidation, hot corrosion, foreign and domestic object impact, etc. Root causes of failures were identified and in many cases resulted in improved component design, manufacturing procedures, refurbishment methods, improved coatings, maintenance and operation. Some examples are -- GE Frame 5, 6 and 7 compressor blades and hot section buckets, nozzles and turbine discs, as well as aeroderivative models LM2500, LM5000, LM6000, Roll-Royce RB-211, Rolls Royce 250-C47B engine in a Bell 407 helicopter, Avon and identified the most probable root causes of failures. Dr. Swaminathan has experience with large and small frame engines such as GE Frame 3, 5, 6, and 7/9 (E, F, FA), Siemens-Westinghouse 251, 501DA, 501D5, V84.2, V84.3, Alstom GT24/26. Many of his reports have been used in settling liability claims by turbine users, manufacturers, insurance companies and repair vendors.

The results and recommendations from these RCA and remaining life assessment programs resulted in solving and correcting many root causes of failures; resulted in cost savings of several millions of dollars due to mitigation of failures and extending the lives of critical turbine components.

In 2011, Swami issued two critical guideline reports to help the gas turbine user community in the areas of Turbine Rotor Condition and Remaining Life Assessment; and critical rotor material property determination.

Patents: Holder of two patents on life prediction technology for high-temperature steam turbine rotors; and holds a trade secret in the area of gas turbine hot section blade/bucket life prediction.

Litigation and Expert Witness Support: Dr. Swaminathan had conducted legal depositions and presented expert witness testimony in arbitration meetings. He worked on projects with gas turbine users, insurance companies and law firms in root cause failure analysis projects requiring expert witness support. He has prepared independent expert witness reports for cases involving premature failure of gas turbines for US, European (UK) and Canadian firms, including helicopter engine failures. Due to his extensive experience in public speaking and participation in numerous presentations in international conferences and panel discussions, he has the skills and expertise needed for an expert witness in court and arbitration proceedings.

PROFESSIONAL CHRONOLOGY: Advanced Engineer, Westinghouse Electric Corporation, Steam Turbine-Generator Division, 1977-81; Senior Engineer, Westinghouse Electric Corporation, Generation Technology Systems Division, 1981-1988; Principal Engineer, Southwest Research Institute, Engineering and Materials Sciences Division, 1988-1996; Staff Engineer, Southwest Research Institute, Mechanical and Materials Engineering Div., 1996-2001; President and Principal Metallurgical Consultant, TurboMet International, 2001- present.

Memberships and Honors: Elected fellow of American Society of Mechanical Engineers (ASME International; board member of local chapter). Past chairman of the Manufacturing Materials and Metallurgy committee of ASME International Gas Turbine Institute (IGTI); member of the ASME Gas Turbine User Symposium (GTUS) advisory board. ASM International (past chairman of the Alamo Chapter, San Antonio). Member of ASTM. Member of Toastmasters International and won many awards in contests.

October 2011