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Engineering & Scientific Consulting

Emanuele Grossi, Ph.D., P.E.

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Professional Profile

Dr. Grossi specializes in the performance evaluation and failure analysis of mechanical systems in various industries, but primarily in consumer products, automotive, industrial machinery, rail, and mining. Dr. Grossi often relies upon computer analysis and physical testing to perform these engineering investigations. As an ISO-certified vibration analyst, Dr. Grossi is also qualified to establish, direct, and perform programs for condition monitoring and diagnostics of machines and industrial systems.

Consumer Products

Dr. Grossi conducts engineering investigations of consumer products and has presented his findings to the U.S. Consumer Product Safety Commission (CPSC). His consumer product work includes targeted testing and analysis of products, product performance evaluation, failure analysis, and engineering analyses in the context of product safety, compliance, and recall investigations. Specifically, Dr. Grossi has investigated a wide range of consumer products including, but not limited to, kitchen appliances (e.g. pressure cookers, blenders, drinkware, can openers, ice makers), indoor and outdoor furniture (e.g. beds, office mats, chairs), toys, strollers, garden hoses, exercise equipment, consumer-use drones, air compressors, water heaters, and bicycles.

Automotive

Dr. Grossi performs mechanical analyses of automotive vehicles and vehicle components, including product performance, compliance, and durability testing. Some of the vehicle systems he has investigated include specific aspects of internal combustion engines, electric motors, tires, wheels, brake hoses, fuel pumps, timing chain systems, and alternators. Dr. Grossi also investigates vehicle accidents involving heavy trucks, buses, electric scooters, and passenger cars. During his employment at Gamma Technologies, Dr. Grossi analyzed the mechanical performance of several engine architectures, with major focus on balance, vibration and bearing analysis.

Industrial Machinery

Dr. Grossi investigates the failure of industrial machines and process systems. Leveraging his experience with a wide range of machines and products, Dr. Grossi consults with clients on machine safety and machine safeguarding investigations often involving worker injuries or fatalities. Some of the systems he has investigated include pumps, compressors, piping couplers, industrial hoses, boom lifts, forklifts, industrial lathes, milling machines, various CNC machine tools, escalators, and automatic doors.

Railroad

Dr. Grossi performs mechanical integrity assessments of railcar structures in both freight and passenger service. As examples, he has investigated derailments, analyzed railcars that transport hazardous material, and hopper cars with corroded structure. Dr. Grossi also performs stress calculations using finite element analysis (FEA) and investigates derailment and vehicle stability using multibody dynamics computer simulations.

Mining

Dr. Grossi performs engineering evaluations related to the mechanical performance of heavy machinery including excavators, haul trucks, wheel loaders, and surface miners. Dr. Grossi worked at Caterpillar, where he performed design evaluation and multibody dynamics analysis of a wide range of heavy machines. Dr. Grossi is Mining Safety and Health Administration (MSHA) Part 46 trained.

Academic Credentials & Professional Honors

Ph.D., Mechanical Engineering, University of Illinois, Chicago, 2019

M.Sc., Mechanical Engineering, Polytechnic of Turin, Italy, 2016

M.S., Mechanical Engineering, Polytechnic University of Milan, 2016

M.S., Mechanical Engineering, University of Illinois at Chicago, 2016

B.S., Mechanical Engineering, Polytechnic of Turin, Italy, 2014

National Science Foundation, Non-Academic Research Internship Supplemental Funding, 2018

Honors Student, Alta Scuola Politecnica, 2015-2016

Honorable Mention at the Italian Mathematics Olympics, 2013

Licenses and Certifications

Professional Engineer Mechanical, California, #41667

Certified Vibration Analyst (CVA) Category III

Machinery and Machine Guarding Training

MSHA Part 46 New Miner Certification

OSHA #510 Occupational Safety And Health Standards For The Construction Industry

Academic Appointments

University of Illinois at Chicago, Department of Mechanical and Industrial Engineering, 2016-2019

Teaching Assistant in several engineering courses: Computer Aided Analysis of Multibody Systems, Railroad Vehicle Dynamics, Dynamic Systems and Control, Vibration Theory, Engineering Dynamics, Introduction to Computer-Aided Design

Prior Experience

Senior Project and Applications Engineer, Gamma Technologies, 2019-2020

Multibody Dynamics Intern, Caterpillar Inc., 2019

Professional Affiliations

American Society of Mechanical Engineers (ASME)

Vibration Institute (VI)

Tire Society

American Society for Testing and Materials (ASTM)

Society of Automotive Engineers (SAE)

Languages

Italian

English

Publications

Giachetti, R.S. and Grossi, E. Brief Review of the Self-Tightening, Left-Handed Thread. International Journal of Mechanical and Mechatronics Engineering 2021; 15(4):175-179.

Samarini, E., Shabana, A.A., Grossi, E. and Somà, A. Integration of geometry and analysis for the study of continuum-based airless tyres of planetary wheeled robots. International Journal of Vehicle Performance 2020; 6(4):446-480.

Zhang, D., Grossi, E. and Shabana, A.A. Performance Evaluation of ANCF Tetrahedral Elements in the Analysis of Liquid Sloshing. Journal of Verification, Validation and Uncertainty Quantification 2020; 5(3):031003.

Shabana AA, Desai CJ, Grossi E, Patel M. Generalization of the strain-split method and evaluation of the nonlinear ANCF finite elements. Acta Mechanica 2020; 231:1365-1376.

Grossi E. Development of continuum-based liquid sloshing algorithms for multibody system dynamics. Ph.D. Dissertation, University of Illinois at Chicago, Chicago, Illinois, 2019.

Grossi E, Desai CJ, Shabana AA. Development of geometrically accurate continuum-based tire models for virtual testing. Journal of Computational and Nonlinear Dynamics 2019; 14(12):121006.

Grossi E, Shabana AA. Deformation basis and kinematic singularities of constrained systems. Mechanics Based Design of Structures and Machines 2019; 47(6):659-679.

Grossi E, Shabana AA. Analysis of high-frequency ANCF modes: Navier-Stokes physical damping and implicit numerical integration. Acta Mechanica 2019; 230(7):2581-2605.

Atif MM, Chi SW, Grossi E, Shabana AA. Evaluation of breaking wave effects in liquid sloshing problems: ANCF/SPH comparative study. Nonlinear Dynamics 2019; 97(1):45-62.

Grossi E, Shabana AA. ANCF analysis of the crude oil sloshing in railroad vehicle systems. Journal of Sound and Vibration 2018; 433:493-516.

Grossi E, Shabana AA. Verification of a total Lagrangian ANCF solution procedure for fluid-structure interaction problems. Journal of Verification, Validation and Uncertainty Quantification 2017; 2(4):041001.

Gastaldi C, Grossi E, Berruti TM. On the choice of contact parameters for the forced response calculation of a bladed disk with underplatform dampers. Journal of the Global Power and Propulsion Society 2017; 1:1-15.

Grossi E. Calculation of the forced response of a turbine bladed disk with underplatform dampers. M.S. Thesis, University of Illinois at Chicago, Chicago, Illinois, 2016.

Presentations

Grossi E., Palac, D. Navigating Consumer Product Safety: Engineering and Human Factors Insights. Presentation, IEEE International Symposium on Product Compliance Engineering, Chicago, Illinois, 2024.

Grossi E. Development of Geometrically Accurate Finite Element Tire Models for Virtual Prototyping and Durability Investigations. Presentation, The Tire Society 39th Annual Meeting and Conference, 2020.

Grossi E. Analysis of nonlinear crude oil sloshing effects on railroad vehicle dynamics using ANCF finite elements. Presentation, 18th U.S. National Congress for Theoretical and Applied Mechanics, Chicago, Illinois, 2018.

Additional Education & Training

National Science Foundation, Innovation Corps (I-Corps™) program, 2017

According to the National Science Foundation website, “The National Science Foundation’s Innovation Corps (I-Corps™) program uses experiential education to help researchers gain valuable insight into entrepreneurship, starting a business or industry requirements and challenges. I-Corps enables the transformation of invention to impact. The curriculum integrates scientific inquiry and industrial discovery in an inclusive, data-driven culture driven by rigor, relevance, and evidence. Through I-Corps training, researchers can reduce the time to translate a promising idea from the laboratory to the marketplace.”

Peer Reviews

International Journal of Vehicle Mechanics and Mobility

Multibody System Dynamics

Journal of Computational and Nonlinear Dynamics

International Journal of Vehicle Performance

Journal of Marine Science and Technology