

Exponent®
Engineering & Scientific Consulting

Matthew Horowitz, Ph.D., P.E.

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Professional Profile

Dr. Horowitz's background is in fluid mechanics, specializing in performance testing of fluid and heat transfer equipment, flow-induced vibration, the dynamics of particles moving through a fluid, flow through porous media, and experimental measurement techniques. He has worked extensively in the nuclear power industry, using experimental testing and computational fluid dynamics (CFD) to help utilities and equipment vendors qualify safety-related plant equipment, resolve problems with existing equipment, design components, and address regulatory issues.

Dr. Horowitz's testing experience involved the design and construction of large-scale custom testing facilities to reproduce prototypical operating conditions for equipment being tested.

Prior to joining Exponent, Dr. Horowitz worked at Alden Research Laboratory, Inc., where he focused on experimental testing and CFD analysis of equipment, including strainers, valves, heat exchangers, pulsation dampeners, multistage orifices, diffusers, and fans. Much of this work was performed for nuclear power applications under a 10 CFR 50 Appendix B quality assurance program. Within the nuclear industry, Dr. Horowitz has extensive experience with Emergency Core Cooling System (ECCS) debris blockage, having run large-scale ECCS strainer tests for licensees in the United States, new reactor designs, and utilities in Japan and Sweden, as well as providing support to fleet-wide owner's group initiatives. His work in other industries includes evaluation of heat exchanger performance, development of methods for predicting flow in civil hydraulic structures, and testing modifications to hydrokinetic devices.

Dr. Horowitz conducted his graduate research on the dynamics of spheres and cylinders rising and falling freely through a fluid under gravity, which, under certain conditions, may oscillate due to the periodic shedding of vortices in their wake. Dr. Horowitz developed of a map of different types of motion over a wide range of parameters and showed the relationship of these motions to different vortex shedding modes, one of which had not been observed previously. Dr. Horowitz also studied the dynamics of rising and falling cylinders, using the results to provide new insight into the related problem of cylinders with very low mass undergoing vortex-induced vibration.

Academic Credentials & Professional Honors

Ph.D., Aerospace Engineering, Cornell University, 2009

M.S., Aerospace Engineering, Cornell University, 2007

B.S., Mechanical Engineering, Cornell University, 2003

National Defense Science and Engineering Graduate Fellowship

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Publications

Horowitz, M. & Williamson, C. H. K. Vortex-induced vibration of a rising and falling cylinder. Journal of Fluid Mechanics 2010; 662:352-383.

Horowitz, M. & Williamson, C. H. K. The effect of Reynolds number on the dynamics and wakes of freely rising and falling spheres. Journal of Fluid Mechanics 2010; 651:251-294.

Horowitz, M. & Williamson, C. H. K. Critical mass and a new periodic four-ring vortex wake mode for freely rising and falling spheres. Physics of Fluids 2008; 20:101701.

Horowitz, M. & Williamson, C. H. K. Dynamics of a rising and falling cylinder. Journal of Fluids and Structures 2006; 22:877-884.

Presentations

Horowitz, M. & Williamson, C. H. K. Critical mass and new wake patterns for freely rising and falling spheres. 9th International Conference on Flow-Induced Vibrations (FIV2008) Prague, Czech Republic, 2008.

Horowitz, M. & Williamson, C. H. K. The effect of Reynolds number on the dynamics of freely rising and falling spheres. 61st Annual Meeting of the APS Division of Fluid Dynamics, San Antonio, TX, 2008.

Horowitz, M. & Williamson, C. H. K. Dynamics and wake patterns of rising and falling spheres. Proc. 5th Conf. on Bluff Body Wakes and Vortex-Induced Vibration (BBVIV-5) Costa do Sauípe, Brazil, 2007.

Horowitz, M. & Williamson, C. H. K. Dynamics and wake patterns of freely rising and falling spheres at Re = 500. 60th Annual Meeting of the APS Division of Fluid Dynamics, Salt Lake City, UT, 2007.

Horowitz, M. & Williamson, C. H. K. Critical mass and vortex dynamics for rising and falling spheres. 59th Annual Meeting of the APS Division of Fluid Dynamics, Tampa, FL, 2006.

Horowitz, M. & Williamson, C. H. K. Dynamics of rising and falling cylinders. Proc. 4th Conf. on Bluff Body Wakes and Vortex-Induced Vibration (BBVIV-4) Santorini, Greece, 2005.

Horowitz, M. & Williamson, C. H. K. Dynamics of rising and falling cylinders and spheres, 58th Annual Meeting of the APS Division of Fluid Dynamics, Chicago, IL, 2005.

Horowitz, M. & Williamson, C. H. K. Vortex-induced vibration of a rising and falling cylinder, 57th Annual Meeting of the APS Division of Fluid Dynamics, Seattle, WA, 2004.

Peer Reviews

Journal of Fluid Mechanics

Journal of Fluids and Structures

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