The Department of Mechanical Engineering/College of Engineering and Applied Sciences
Stony Brook University

TOPICS IN MECHANICAL ENGINEERING
THE FRANK W. OTTO DISTINGUISHED LECTURE SERIES

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Lecture Title: Applications of Energy Harvesting

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Abstract

This talk introduces the basics of harvesting energy from ambient vibrations using piezoelectric materials. The basic principles are then used to explain several applications that benefit from using harvested energy. The amounts of energy are relatively low, but this energy can be used to provide significant power for several diverse applications including: sensor systems for structural health monitoring, low power wind harvesting and running a heart pacemaker. Most piezoelectric based energy harvesting systems are based on linear resonance of the harvesting structure, which is usually a cantilever beam. Linear beam resonance presents two problems. The first is that linear resonance is a narrowband phenomenon and much of the ambient energy available to harvest is broadband in nature. The second problem is that linear beam resonance scales with the length of the beam in such a way that as the smaller the harvesting beam is the larger its resonance is, making small scale harvesting impractical. Solutions to both these problems are presented. The amount of energy harvested depends of course on the amount of ambient energy available to harvest. Applications are presented that have the potential for practical application.

Biography

Prof. Dan Inman is active in research involving smart materials and structures as applied to morphing aircraft, energy harvesting, structural health monitoring and clearance control in jet engines. He currently has projects in gust alleviation in UAVs, cable harnessed satellites and wind turbine blade monitoring. Formerly he was the Director of the Center for Intelligent Material Systems and Structures and the G.R. Goodson Professor in the Department of Mechanical Engineering at Virginia Tech and the Brunel Chair in Intelligent Materials and Structures at the University of Bristol, UK. A former Department Chair of the Department of Mechanical and Aerospace Engineering, State University of New York at Buffalo, he has held adjunct positions in the Division of Applied Math at Brown University and in math at the University of Southern California. Since 1980, he has published 8 books (on vibration, control, statics, and dynamics), eight software manuals, 20 book chapters, 254 journal papers and 511 proceedings papers, given 48 keynote or plenary lectures, graduated 55 Ph.D. students and supervised more than 75 MS degrees.

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