

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

Mechanical Engineering Seminar



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Lecture Title: Mystery of Vehicle Brake Judder Vibration

Friday, September 28, 2012, 2PM, Room 173 Light Engineering

Abstract

Vehicle brake noise and vibration problems are classified according to their main excitation mechanisms and human perception. Main friction induced problems include squeal (above 1 kHz), groan (100-500 Hz), and judder (less than 100 Hz). These problems generate significant consumer complaints and pose high warranty costs. In particular, this lecture examines the brake judder phenomenon that is not well understood. Variations in brake torque during a high speed stopping event create disturbances which can be felt by the driver through steering wheel, brake pedal, and floor. The source of brake torque variations is usually associated with the geometric distortions of brake rotor, and the frictional torque is generated at multiple orders of excitation frequency that is proportional to the vehicle speed. Such disturbances have strong speed-dependent characteristics including resonant amplification and nonlinear characteristics. This lecture will discuss predictive tools, illustrate sample results, suggest vibration control strategies, identify a few unresolved issues, and finally recommend some research directions.

Biography

Professor Rajendra Singh is The Donald D. Glower Chair in Engineering and Director of the NSF I/UCRC Smart Vehicle Concepts Center, as well as the Acoustics and Dynamics Laboratory at The Ohio State University (USA). He has published more than 375 papers (including 190 journal articles), and is well recognized for research in machine dynamics, vibration, acoustics, and nonlinear dynamics with applications to vehicle problems and geared systems. Dr. Singh has developed and teaches an innovative graduate course sequence in automotive noise and vibration control in partnership with General Motors. He is a Fellow of 4 professional societies (ASME, ASA, SAE, INCE/USA), and has received several national awards for both teaching and research, as well many research awards at Ohio State. Dr. Singh has served as the President of the Institute of Noise Control Engineering/USA and is currently serving on several national and international boards of professional societies and journals.

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