KEYNOTE SPEECH

Date August 6, 2014 9:00-10:00
Speaker Dr. N S Ferguson
Title Nonlinear Systems for Vibration Control

Abstract

Passive vibration control measures typically involve either introducing separately or in a combination changes to a system such as adding damping or dissipation, stiffness and mass. This presentation will explore two particular application areas namely isolation and the use of a vibration absorber.

For isolation the typical passive system has limitations, so research has been conducted into introducing nonlinear characteristics which include friction, nonlinear viscous damping and switchable stiffness changes. In some scenarios these provide additional benefits, albeit that the systems now become nonlinear, and the philosophy behind their consideration will be presented. The analysis of these configurations will then be accompanied with numerical simulations and experimental validation to clarify how and why things are different.

More recently there has been some interest in the use of a nonlinear vibration absorber. A summary of the progress to date in this field, including theoretical and experimental work, will be given. Suggestions and guidelines for its potential will be explored as will issues that might make its general adoption difficult.

Biography

Neil originally joined the ISVR in 1980 to work with Prof Bob White on the fundamental problem of rolling noise, considering the wheel-rail interaction, on a PhD project sponsored by British Rail. When this was completed a two year period was spent at Swansea University working with Prof Brian Clarkson, on the dynamic response of satellites to the launch noise and

vibration environment using a method for high frequencies (Statistical Energy Analysis (SEA)). After moving into aerospace structural dynamics he returned to the ISVR in 1986 as the British Aerospace lecturer, with particular focus on acoustic fatigue, incorporating both numerical predictions for the behaviour of carbon fibre reinforced composites and nonlinear structural dynamics. Since 1997 as lecturer and then senior lecturer the research interests have widened to consider the noise and vibration (vibroacoustics) of practical engineering structures in widely diverse areas such as transport (trains, cars, ships, satellite structures), buildings and even domestic appliances! The analysis and approaches tend to be analytical and mathematical, typically considering a wave propagation approach in order to gain insight and understanding of the underlying physics.

Present research includes considering variability and uncertainty in structural dynamics, vibration control for shock, nonlinear dynamics and applications of wave motion for structural control and response predictions.

External to the university he is a member of the ESDU (Engineering Sciences Data Unit) committee for fatigue, has taught in universities in Egypt, Sweden and France as well as having been a member of the EPSRC Peer Review College, organiser of the International Conference on Recent Advances in Structural Dynamics and collaborated on many EU projects (MID-MOD, MID-FREQUENCY, SEANET, a Tempus and a Brite Euram project).