AEROSPACE & MECHANICAL ENGINEERING

2011 COLLOQUIUM 2012
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INFORMAL COFFEE PERIOD BEFORE THE SEMINAR IN ROOM 365 FITZPATRICK HALL

UNIVERSITY OF NOTRE DAME, NOTRE DAME, INDIANA 46556

SPEAKER: **Hans DeSmidt, Ph.D**
Associate Professor of Aerospace Engineering
University of Tennessee
Knoxville, Tennessee

TOPIC: **AUTOMATIC BALANCING OF ROTOR SYSTEMS VIA PASSIVE NONLINEAR DEVICES**

DATE: Tuesday, February 28, 2012

TIME: 3:30 p.m.

PLACE: 138 DeBartolo Hall

ABSTRACT

Imbalance vibration is a significant concern in virtually all rotordynamic systems and is an important problem in engineering. Strategies for imbalance vibration mitigation typically fall into two categories; 1) passive balancing via attached eccentric masses, 2) active vibration control based on active bearing actuation. This new research advances a third, much less developed, approach based on passive nonlinear Automatic Balancing Devices (ABD). These are a special class of devices with freely moving eccentric masses, which, through nonlinear dynamic interaction with the rotor, naturally adjust to cancel the rotor's imbalance at certain operating speeds. A key advantage of the automatic balancing approach is that ABDs offer the ability to compensate for imbalance changes without requiring power, sensors or a control system. However, due to their nonlinear dynamical nature, there are several challenges related to unwanted limit-cycle oscillations and higher-mode destabilizations which are addressed in this research. This project explores and develops; (a) kinematically modified ABD concepts to suppress unwanted limit-cycle phenomena, (b) analysis methods to predict nonlinear dynamic automatic balancing behavior in flexible rotor-ABD systems, (c) new paradigms based-on distributed ABDs for multi-mode automatic balancing of flexible rotors. By pioneering the use of ABDs in flexible rotor applications and developing the understating of automatic balancing phenomena in such systems, this research enables significant safety and reliably enhancements for many infrastructures and industries such as, aerospace, power generation, automotive, and high-density data storage.

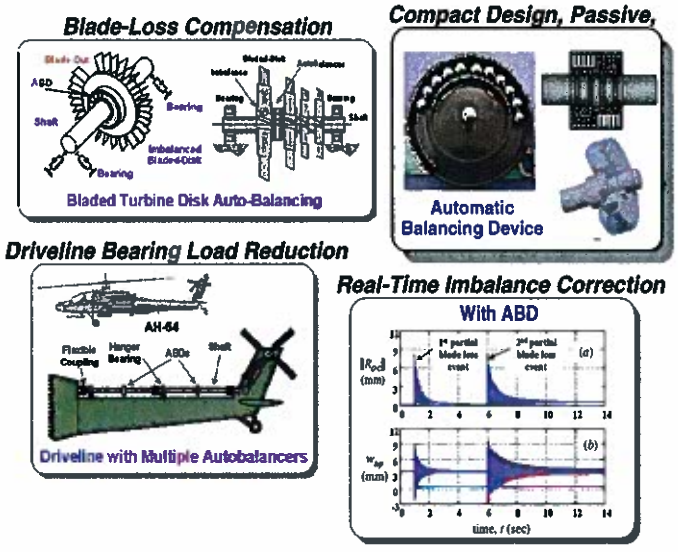

Figure 1. Bladed-disk & driveshafts with integrated passive Automatic Balancing Devices

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NOTE: ***If you are interested in meeting individually with Prof. DeSmidt, please contact Evelyn at 631-5431***