

# **On Transient Excitation of a Damped Two-Bladed Rotor**

**Johan F. Bratt**

*Division of machine design and materials technology  
Norwegian Institute of Science and Technology  
7491 Trondheim Norway*

## **1. ABSTRACT**

Studies of transient excitation of damped bladed rotors are interesting, particularly with respect to maintenance cost. Analysis of accelerations and dynamic states of stress in blades is needed in order to obtain optimal distribution of blade mechanical properties. In particular damping characteristics may improve the vibration response. Prominent among damping mechanisms are surface damping treatment, piezo-electric elements and tuned visco-elastic devices. Vibration responses depend to a large extent on the control of bending curvatures and related energies resulting from the lower modes of vibration. The present paper analyses the response to transient dynamic loads on a surface damped two-bladed rotor. The results indicate that the deflection of the second blade resembles a delayed mirror image of that in the impacted blade, and that hub stiffness and partial blade damping influence the response. Hub damping appears to be less significant. For some excitation outlines it is possible to optimise the location of the blade surface damping material.

**Keywords** Impacted damped blades, vibrating bladed systems, surface damped blades.