ABSTRACT

Statistical Energy Analysis of a Flexible Coupling Mechanism

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The flexible coupling is a common and critical component in rotor dynamic systems. Poor choice and poor design of a flexible coupling results in unwanted mechanical vibration in rotating machinery. The effects of excessive vibration may lead to the premature failure of connected machinery, reduced efficiency and may pose threats to a worker's health and comfort.

Flexible couplings have commonly been studied using deterministic models which results in just the low frequency ranges, typically 0 Hz-300 Hz, being analyzed. If the flexible coupling is to be studied thoroughly its dynamics at the higher frequency ranges (0 kHz-16 kHz) must be analyzed, since these ranges also contribute to vibration and structure borne sound.

The project uses the Statistical Energy Analysis (SEA) approach to model a three jaw elastomeric flexible coupling mechanism carrying a load. In this study a theoretical and experimental SEA model of a generic rotor dynamic system has been generated. A system of power balance equations has been

solved to determine the relative energy ratio levels of the components in the system. The energy ratio levels obtained when the system was running compared well with the theoretical SEA model, but basically showed poor agreement with the experimental SEA model. The significance of the results is that by using the predicted energy ratio levels, the theoretical SEA model can be used to relieve rotor dynamic systems of noise and vibrations through effective design and selection of flexible couplings.

Keywords: Richard Bachoo; Statistical Energy Analysis; Flexible couplings; High frequency vibrations in rotor dynamic systems.