BLADE VIBRATION: A COMPARISON OF ON BEARING AND SHAFT TORSIONAL VIBRATION

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Rotating blades are considered as the most common cause of failures in rotating machinery. The blade failure modes are normally occurred as a result of cracking due to unforeseen operating conditions and variable loads. Therefore the early detection of damage in the blades is essential to reduce the machine downtime and from the safety consideration. A number of research studies including the vibration-based methods can be found in the literature related to the blade damage detection. Different vibration-based methods found in the literature are basically includes the vibration measurement on turbine casing, torsional shaft vibration and the recent trend on the blade tip time (BTT) method. The BTT is receiving attention for the blade heath monitoring (BHM) in the recent days, however the measurement procedure and data analysis are quite complex. In the present research study, the dynamics of the blades both in the healthy and cracked conditions are studies on a small experimental rig using the on-bearing vibration and shaft torsional vibration are measured using the accelerometer and the incremental shaft encoder. The measured vibration and encoder data are analyzed by computing the responses at different engine orders (EOs) related to the blade resonance frequencies and their higher harmonics to understand the behaviour the blades. The results indicate that the shaft torsion vibration can be extended to the non-intrusive method for the BHM. The paper will discuss the rig, measurements, data analysis and the results.

REFERENCES