

Whirl Analysis of an Overhung Disk Shaft System Mounted on Non-rigid Bearings

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ABSTRACT - Eigenvalues of a simple rotating flexible disk-shaft system are obtained using different methods. The shaft is supported radially by non-rigid bearings, while the disk is situated at one end of the shaft. Eigenvalues from a finite element and a multi-body dynamic tool are compared against an established analytical formulation. The Campbell diagram based on natural frequencies obtained from the tools differ from the analytical values because of oversimplification in the analytical model. Later, detailed whirl analysis is performed using AVL Excite multi-body tool that includes understanding forward and reverse whirls in absolute and relative coordinate systems and their relationships. Responses to periodic force and base excitations at a constant rotational speed of the shaft are obtained and a modified Campbell diagram based on this is developed. Whirl of the center of the disk is plotted as an orbital or phase plot and its rotational direction noted. Finally, based on the above plots, forward and reverse whirl zones for the two excitation types are established.

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