

Rotordynamics and DDM Design Sensitivity Analysis of an APU Gas Turbine having a Spline Shaft Connection

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ABSTRACT

In this paper the DDM is directly applied to formulate an eigenvalue design sensitivity problem of general nonsymmetric-matrix rotor-bearing system. Then, FE rotordynamic analysis and critical speed design sensitivity investigation are carried out with an APU turbo-generator having a spline shaft connection. Considerations are also given to the modelings of spline shaft connection points. Results show that critical speed separation margins of more than 30% are obtained from a rated speed of 60,000 rpm without any adverse effects from the spline shaft and that the critical speed change rates to the support modeling of spline shaft connection points are extremely negligible. Further, the critical speed change rates to the shaft-element length changes show quantitatively that the spline shaft has some limited influence on the 4th critical speed but practically no influence on the 1st to 3rd critical speeds.

Keywords: FE Rotordynamics, DDM Design Sensitivity, Spline Shaft Connection, Mode Shape, Critical Speed Change Rate.