

Cracked rotating shafts: typical behaviors, modeling and diagnosis

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Cracks can develop in rotating shafts and can propagate to relevant depths without affecting consistently the normal operating conditions of the shaft. In order to avoid catastrophic failures, accurate vibration analyses have to be performed for crack detection. Identification of crack location and depth is possible by means of model based diagnostic approach, provided that the model of the crack and the model of the cracked shaft dynamical behavior are accurate and reliable.

Typical dynamical behavior of cracked shafts is shown and tests for detecting cracks are presented.

The modeling of cracks is described, the simulation of the dynamical behavior of cracked shaft is shown and numerical results are compared to experimental results.

All effects of cracks on the vibrations of rotating shafts are analyzed and some results of a numerical sensitivity analysis of the vibrations to the presence and severity of the crack are shown.

Finally the model based identification procedure is described and some results in crack identification in position and depth are shown.