

Cracked Beam Section Model Applied to Turbine Rotors

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ABSTRACT

Rotor failure due to cracking can only be prevented by monitoring based on an understanding of the dynamic behaviour of cracked rotating shafts. An overview of the literature shows that a great many results are available for particular crack situations (straight front, weight dominant loading) which cannot be used in some real-life cases (multi-cracked section, temperature effects, etc.). It is therefore necessary to turn to more general situations where 3D calculations are unavoidable. This paper deals with an original method for the calculation of cracked beam section behaviour in bending. The aim is to derive, from a 3D model taking into account contact conditions between the lips of the crack, a non-linear constitutive relationship between applied loads and resulting displacements that is consistent with beam theory in order for it to be used in a one-dimensional model. The results obtained by this method are compared with experimental measurements on a test rig and show good correspondence.

Keywords: crack, model, experiments, monitoring, shaft