Title: Elastically restrained Bernoulli-Euler beams applied to rotary machinery modelling

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Abstract: Facing the lateral vibration problem of a machine rotor as a beam on elastic supports in bending, the authors deal with the free vibration of elastically restrained Bernoulli-Euler beams carrying a finite number of concentrated elements along their length. Based on Rayleigh's quotient, an iterative strategy is developed to find the approximated torsional stiffness coefficients, which allows the reconciliation between the theoretical model results and the experimental ones, obtained through impact tests. The mentioned algorithm treats the vibration of continuous beams under a determined set of boundary and continuity conditions, including different torsional stiffness coefficients and the effect of attached concentrated masses and rotational inertias, not only in the energetic terms of the Rayleigh's quotient but also on the mode shapes, considering the shape functions defined in branches. Several loading cases are examined and examples are given to illustrate the validity of the model and accuracy of the obtained natural frequencies.

Author Keywords: Transverse Vibration of Beams; Elastic Supports; Torsional Stiffness Coefficients

KeyWords Plus: General Algorithm; Rotatory Inertia; Point Masses; Vibrations; Behavior; Ends

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