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Letter to the Editor

Comments on "Vibration characteristics of slotted shafts"

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The writers wish to compliment the authors for their excellent paper which constitutes an important technological contribution [1].

From a basic mechanics viewpoint the knowledge of the potential region on instability defined by the eigenfrequencies associated with the different lateral stiffnesses of the rotor in two perpendicular directions, as pointed out by Goodwin [2], constitutes an extremely interesting and important problem.

On the other hand, the case of vibrating structural elements with holes or slots is of interest in many technological situations since orifices are present in beams, plates or shells due to operational requirements like passage of ducts, conduits, cables, etc.

When a hole is made in an element, mass and stiffness decrease. Depending upon which cause predominates, an increase or decrease in the fundamental natural frequency may take place. When it increases the phenomenon is defined as "dynamic stiffening" and several theoretical and/or experimental studies have appeared in the open literature [3–9]. Obviously, the higher frequencies of the structure are also affected.

In the case of Ref. [1] the dynamic stiffening effect is observed in Figs. 8–10 for the case of isotropic shafts (curves which depict graphically the increase of normalized eigenfrequencies with slot dimensions, slot depth and slot width, respectively).

An important, recent contribution is due to Renshaw [10] who performed important numerical and experimental studies which showed the increase of the natural frequencies of transverse vibrations of circular disks by introducing internal channels.

Renshaw's excellent contribution was motivated by a novel design of computer disk drive disks. On the other hand, he was also highly successful in the sense that several lower natural frequencies of the structure were raised.

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