

Study of Circular Saw Vibration

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The technologies both "Tensioning" and "Slits" of the circular saw (or the tipped-saw) has been actually applied to get high cutting efficiency using high rotational speed.

However, the mechanism and theoretical background of these technologies have not been sufficiently made clear, compared with the usefulness.

In this paper, the effect of tensioning, slits and damping were investigated analytically and experimentally.

The following conclusions were reached.

First, the distributed tensioning effect has been studied using normal and tensioned disks. It has been cleared that the tensioning increases the natural frequencies and expands the stable domain.

Second, in cutting with a circular saw, the dynamic stability is affected by thermal stress. The tensioning makes high for the thermal buckling temperature.

Third, measuring static lateral deflection of a circular saw were studied as a estimation method of the tensioning effect. It is cleared that this test method is adequate to estimate the tensioning effect. The optimum tensioning is obtained under the balanced condition between the critical speed and the stiffness.

Fourth, a thermally stressed disk with radial slits was investigated. Suitable slit number and length are proposed to increase the critical speed.

Finally, vibration analysis of a viscoelastic damped sandwich disk was studied. New analytical method of natural frequency coupled with loss factor for the sandwich disk was presented. And, maximum loss factor would be obtained using this method.