MICRO SLIP DAMPING MECHANISM IN BOLTED JOINTS

M. Groper[1]
Western Michigan University
Kalamazoo, MI

ABSTRACT

In bolted structural connections the dissipation of energy/damping depends on the magnitudes of the frictional force and of the relative slide between the joined parts. However, in a joint with a large number of bolts, the magnitude of the relative slide (slip) cannot be large as the bolt hole is not much larger than the bolt diameter and, thus, some bolts may be sheared at the onset of slip. As the clamping pressure decreases with the distance away from the bolt the magnitude of slip will be larger in regions more distanced from the bolt hole. If the applied tangential load is not large enough to establish slip in an adjoining annulus to the bolt's hole there will be some slip in more remote regions of the contact surface due to the elastic deformation of the joined parts, but the joint will not fully slip. As the tangential load is increased the joint might slip completely.

As the stage of loading before gross slips occurs in the joint was less studied, the paper presents an analysis of the mechanism of frictional damping for the partial slip stage of loading. The factors which influence partial slip friction, and the distributions of the clamping pressure, coefficient of friction and slip with the distance away from the bolt are considered in a model of energy dissipation. The proposed model is then compared with the experimentally obtained hysteresis loops.

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[1]Professor, Department of Mechanical Engineering, Western Michigan University, Kalamazoo, MI 49008, (616) 387-3380