DYNAMIC CONTACT INTERACTION OF SURFACES BY DRY FRICTION

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INTRODUCTION.

Control and reduction of friction is one of the frontiers in the field of tribology. The motivation behind this work is to develop a dynamic system giving an understanding of the phenomenon of self-excited frictional vibration.

METHODOLOGY.

This study presents a model of an uneven body sliding along an uneven surface taking into consideration rheological properties of materials. Forces of contact interaction are further used for development of a two-degree dynamic model and allow estimating stability condition of two sliding bodies. Significant part of the work is dedicated to the description of the contact interaction of two uneven bodies though the bodies can move both along their contact surface and perpendicular to it.

RESULTS AND DISCUSSION.

This study considers the dynamic frictional interaction of two uneven bodies (Fig. 1) where the slider has two degrees of freedom – it can move in both horizontal (x) and vertical (y) directions; micro-asperities of both the slider and the base are described by micro-spheres and mechanical properties of both bodies are described by the Kelvin-Voigt viscoelastic model. The computations give a picture of the deformation of the surface roughness as shown in Fig. 2.

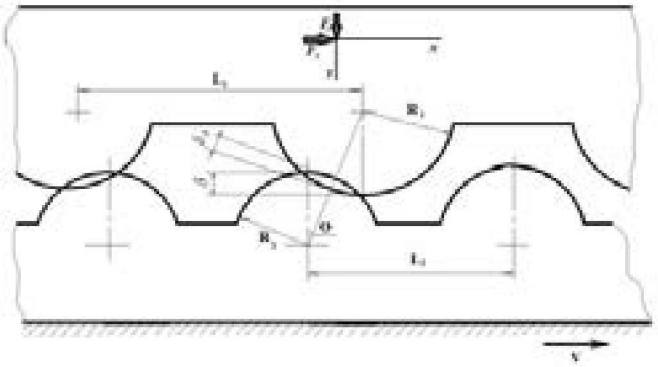

Figure 1.

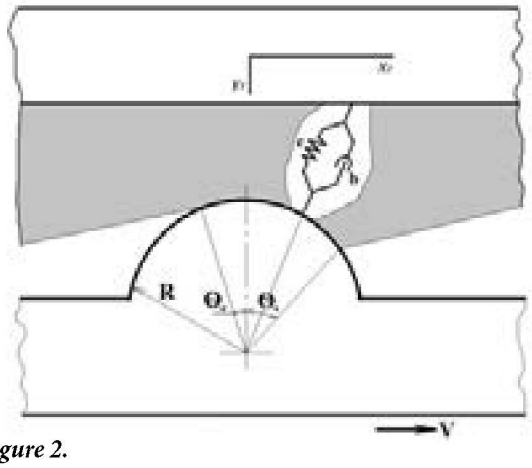

Figure 2.

Analysis of the stability of the system has also been made and sustainable slip zone without the frictional self-excited oscillations) is shown in Fig. 3 (in all cases a zone of stability is above the corresponding curve).

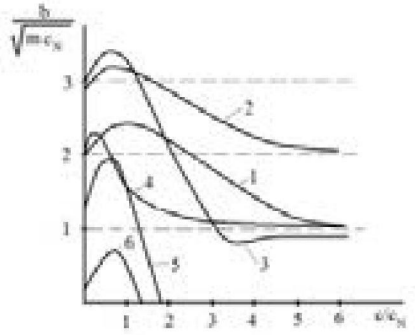

Figure 3.

CONCLUSIONS.

The developed model of the dry friction unit allows theoretical description the known experimental observations, specifically it describes the static rigidity of the contact and models self-excited frictional oscillations as interconnected oscillations in two directions – in the plane of contact and perpendicular to it.