ON THE FRICTIONAL THERMOELASTIC INSTABILITY IN A TWO-LAYERED MECHANICAL SYSTEM WITH WEAR

Jan Awrejcewicz, Yuriy Pyryev

Department of Automatics and Biomechanics, Technical University of Łódź

It is well known that during movement of two contacting bodies with a constant relative velocity the so called ThermoElastic Instability (TEI) may occur. In this work we are aimed on investigation of TEI exhibited by two thermo-elastic layers mutually pressed by a spring, which can model various engineering movable systems like movable seals, block brakes and other tribologic devices. It may happen that in the case of the constant relative velocity of the contacting moving layers, when the wear processes are taken into account, the TEI takes place, which is characterized by exponential increase of the contact characteristics (temperature and pressure), when the relative velocity exceeds its certain critical value. In this work the equation governing the relative velocity value is derived, among other.

The obtained results can be applied during estimation of engineering materials strength of the movable joints of various machines and mechanisms, during formulation of criterions regarding increase of reliability and durability of frictional joints, as well as during engineering recipes formulation regarding optimal material choice of the wear joints during investigation of braking processes of the transport machines and during investigation of heat occurrence exhibited by grinding processes.

It should be emphasized that our proposed model is, contrary to the so far applied, closer to the observed engineering processes.

1. *Awrejcewicz J., Pyryev Yu.* Thermoelastic instability in tribology system. Proceedings of the International Conference on Modelling and Simulation of the friction phenomena in the physical and technical systems, Friction 2004, Ed. J. Bajkowski, May 31, 2004, Warsaw, Poland. – P. 18–23.

2. *Awrejcewicz J., Pyryev Yu.* Frictional thermoelastic instability in a two-layers tribological system. Book of Abstarcts of the 6th Polish-Ukrainian Conference on Current Problems of Mechanics of Nonhomogeneous Media, September 6-10, 2005, Warsaw, Poland, – P. 15–16.

3. *Barber J. R.* Thermoelasticity and contact // J. Thermal Stresses. – 1999. – 22. – P. 513–525.

4. *Pyryev Yu.* Some Thermoelastic Instability Problems in Moving Tribosystems // Mechanical Engineering, – 1999. – 27, 9. –P. 15-19.