CONTACT AND THERMAL–STRESS ANALYSIS OF REAL BRAKE SYSTEMS

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ABSTRACT

The decisive effect on the frictional and wear characteristics of the brake system is exerted by temperature generated at friction. So far. to design efficient brake joints employed in vehicles it's required to take account of their heat loading during operation.

In the present work a system of interrelated problems has been considered, namely the contact, heat and thermoelastic ones. The conditions of the contact were given for the movable interface. The kinetic behavior of the thermal and contact parameters were taken into account at calculating temperature fields and stresses in the friction zone.

To calculate temperature fields. heat models of the friction contact were elaborated to make allowance for redistribution of heat flows at friction. Based on numerical methods surface and mean bulk temperatures in the friction pair were calculated. The theoretical and experimental results were found to agree well. The models developed were proved to be adequate.

It has been established that due to heat generation during friction the actual contact area in disc brakes contracts and becomes about 30% of the nominal one. This brings about inhomogeneity of temperature fields and considerable rise of surface temperatures and thermal stress in the rubbing bodies.

It has been proved that increased stiffness of the counterbody leads to lower inhomogeneity of the contact pressure across the friction lining width. to stabilization of the actual contact area under high friction temperatures and, consequently, to alleviated thefmal loading of the brake.

The proposed calculation method can be used to forecast service characteristics of brakes and to optimize brake design for given materials of the friction pair.