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Defining of the Dependence Of Maximum Temperature in Massive Highly Elastic Tyres

In mining industry, trucks use massive highly elastic (MHE) tyres of a monolithic type that are characterized by polylayer of a ring massif with low convective heat exchange ability. The principal construction scheme of MHE tyre consists of landing (1), damping (2) and protecting (3) functional parts (fig. 1). There is important issue: defining the dependence of maximum temperature in a rubber layer on the operation conditions.
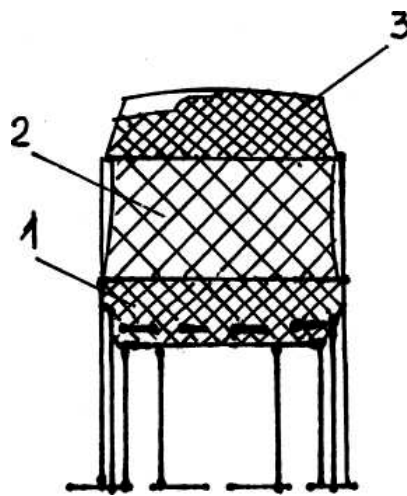

Fig.1.The principal scheme of construction of massive highly elastic tyres of a monolithic type

In work there are presented thermo mechanical calculations of rubber shock-absorber and temperatures field of polyurethane lining of a wheel without thrust force. There is also given theoretical description of a fixed temperature field in a rubber layer of a wheel weighted with torque.

Model of temperature calculating is based on the fact that the viscoelastic characters of gum for cycle of loading practically do not change, the heat conduction equation can be recorded as for a considered case:

$$\nabla^2 \cdot \theta_p + \frac{W}{k_p} = 0$$

where $\theta_p = T - T -$ increment of temperature from T_0 dgr to T;

T_0 – temperature of environment;

T − temperature in the tyre;

k_p - coefficient of thermal conductivity of gum;

$W-$ energy of dissipation;

$\nabla-$ laplacian.

In fig. 2, 3 the computational schedules of temperature of heating single-layer and MHE of the tyre are shown. The analysis of the obtained relations displays non-linear increase of temperature of heating of the tyre, and also essential increase of temperature in each following layer.
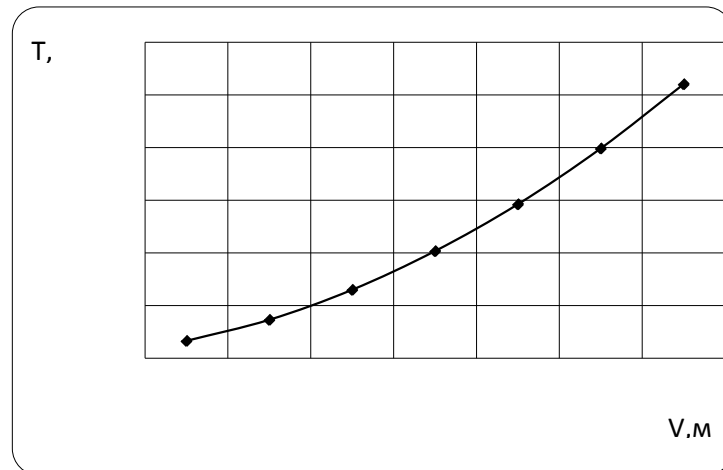

Fig. 2. Dependence of temperature of the single-layer tyre on linear speed
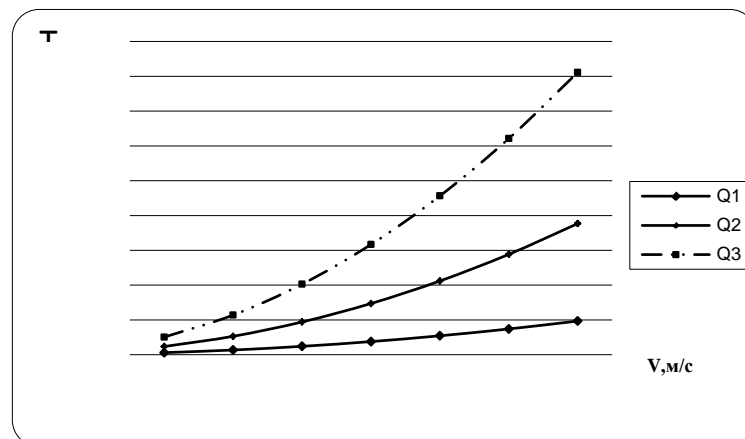

Fig. 3. Dependence of temperature in MHE tyre layers on linear speeds: Q1,2,3 - layers in the tyre

Thus, usage of offered model of calculation will allow to select tyres depending on the operation conditions and to forecast their service life, and also to use at designing MHE tyres.