**M.Stefanović, S.Aleksandrović, D.Adamović,** Friction at Sheet Metal Testing by Ironing in Conditions of High Pressure, INTERTRIBO 90, Visoke Tatre, Zbornik radova.

PECULIARITIES OF THE WEAR MECHANISM OF AIRCRAFT TIRES

A part of tread material of an aircraft tire remains on the landing runway due to friction interaction during the landing of an aircraft.

As a result of the investigation of a new landing runway it was found, that the maximum intensity of rubber deposition falls on the section where the landing shock and the driving of the aircraft wheels up to speed occur.

The wear mechanism of the aircrat tires in driving up to speed in insufficiently studied, although some theoretical suppositions have been published about the existence of high temperatures (about 400-500 °C) at the tire surface. The measuring of the tire temperature in the operation is difficult due to the dynamics and to the short time of the process. Therefore the task of the driving-up-to-speed process simulation under laboratory conditions for the evaluation of the tire wear and developing temperatures was set.

In the present work the results of the simulation of the driving-up-to-speed process of an aircraft tire at landing are considered. A full-scale simulation was conducted on a special device of the dynamic test wheel for aircraft tyres. The driving-up-to-speed of a tire for an TU-154 aircraft at the dynamic shock against the concrete runway was simulated. Several measurements were accomplished including the values for the wear and temperature along the cross-section and length of the tread. It was found that the maximum wear intensity in the driving-up-to-speed process during landing exists as the tread crown and it decreases in the direction to the boundary of the contact area according to the parabolical law. This corresponds also to the temperature changes in the friction contact area is known to be proportional to the dissipated energy, therefore the absolute value of the temperature at the tire surface depends on the landing speed. It was found for instance that at the reduction of the landing speed from 250 km/h down to 200

A temperature and visual analysis of the tire surface has allowed to determine the main wear mechanism and the range of parameters effecting the wear.

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FRICTION AT SHEET METAL TESTING BY IRONING IN CONDITIONS OF HIGH PRESSURE

In cold metal forming processes characterized by high contact pressures, local tool loading, generation of new workpiece surfaces etc., realization of appropriate lubrication regime and micro-welding elimination are of great importance. Correct choice of tribo-conditions and identification of boundary relations at the contact surfaces enables controled flow in surface layer which has the yield stress enough lower then basic material.

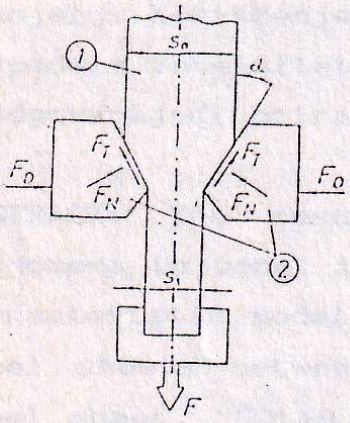
Results of presented investigations are related to cold metal forming, especially to ironing. As a characteristic tribo-model we used the stripironing of sheet metal of larger thickness between inclined die surfaces (fig. 1). Investigated was the low carbon mild steel sheet "Č0148 P3" (Yugoslav standards), appropriate for plastic forming. During this investigation the deformation force (tensile force) was measured in conditions of changing the relevant influences: lubricants, strain level (level of the thickness reduction) and specific pressure in single and multi-phase investigation. Consecutive slidings were simulating the multi-phase ironing i.e. worsen lubrication conditions and transition to boundary friction state. In figures 2, 3 is shown the characteristic example of friction coefficient changes as well as the specific pressure in contact area. During the sliding the stationary process was accomplished with constant [illegible] friction in conditions of high contact pressures ($p \leq 2000$ MPa). Friction coeffi-

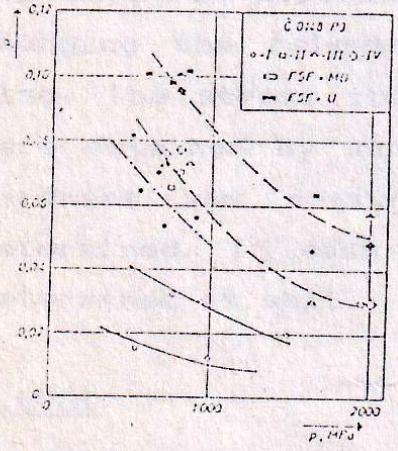
cient values are the lowest at the first pulling and does not depend on sliding distance. Essential changes occur when relative thickness reduction takes value of only 3%. Displacement of the plastic wave, which moveing along the specimen is accompanied with the intensive smoothing of peaks, at relatively stable lubrication film.

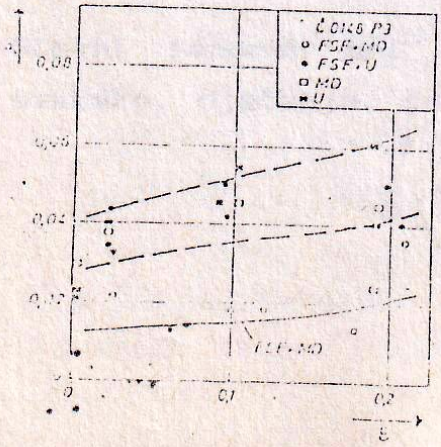
Fig. 1 Strip-ironing tribo-model

Fig. 2 Friction coefficient dependence on specific pressure

Fig. 3 Friction coefficient dependence on strain level

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## COMPUTER PROGRAM FOR SURFACE QUANTITIES AND WEAR INTENSITY CALCULATION

The computer program is based on a stationary isotropic Gaussian field for the distribution of the roughness of technological surfaces. Program is usable for the calculation of surface quantities (Expectation value of slope and curvature), contact quantities (number of plastic and/or elastic contacts, real contact area) and wear intensity considering the following cases of contacts: rough/smooth (e.g. metal/ /mineral) and rough/rough (metal/metal) applying EHD-theory.

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## INVESTIGATIONS OF MATERIALS ON CROPPING PUNCH FOR TRANSFORMER STEELS

The paper deals results of investigations of abrasion and fatigue wear resistance of selected materials for cropping punch for transformer steels. Owing to these investigations determined material and treating for these cropping punch. The best are high speed steel and nitriding process.