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THE INFLUENCE OF VARIOUS PROCESS PARAMETERS ON COEFFICIENT OF FRICTION ON DIE AT IRONING OF AlMg3 SHEET METALS

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Abstract: *Friction coefficient on die side is extremely important in ironing process. Drawing force value, and therefore the power consumed for process performance, will depend on it. That opens up a great number of specific problems, such as: change of friction coefficient on sliding path, significance of tool roughness and its interaction with initial and then varied roughness of material being formed, course of wear process and possible local welding (appearance of "galling"), possibility for lubrication and its quality etc. In the closed system tool-lubricant-material,numerous tribological factors are present, most of which can be varied throughout the process, and during particular interaction, which makes the entire problem extremely complex.*

The obtained results indicate complex influence of selected analysed parameters of ironing process on coefficient of friction on die side.

Key words: *Ironing, Friction coefficient, Dispersion analysis, Aluminium alloys*

1. INTRODUCTION

Friction at cold plastic forming, which occurs on contact surfaces of tool and forming object, is considerably different from sliding friction between different machine elements or other elastically strained couples. Investigation of friction and formulating of particular parameters is of extreme importance, both from the aspect of determining necessary forming forces, forming energy, tool wear intensity and formed parts quality and from the aspect of guiding the process of plastic material flow, distribution of strains which occur, material formability etc. These specific properties mainly arise from the fact that very high working pressures appear on contact surfaces in cold plastic forming processes – much higher pressures than those which occur in hot forming or at relative machine elements travel.

In cold plastic forming, the size of contact surface changes during the process, which means that material parts which were not in contact in the previous phase now come in contact with the tool. This and other circumstances open up a series of specific problems, such as: change of friction coefficient in plastic forming conditions, significance of tool roughness and its interaction with initial and then varied roughness of material being formed, strikingly great differences in mechanical properties of material, course of wear process and possible local welding (appearance of "*galling*"), possibility for lubrication and its quality etc [1,2].

Cold plastic forming processes are characterized by unity of positive and negative influence of outer friction forces; on some areas of contact of tool and material, friction should be intensified (e.g. on movable die surface in indirect extrusion, on punch surface in ironing, etc..), and in some other zones (in general, on almost all surfaces) friction forces must be reduced by lubrication as much as possible. This is possible due to new materials for tools with special coatings of increased hardness and also due to very efficient lubricants.

In the closed system tool-lubricant-material numerous tribological factors are present, most of