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DEVELOPMENT OF NEW LUBRICANTS FOR METAL FORMING

Abstract

One of the goals of development of metal forming processes is certainly reducing the use of lubricants or use of green lubricants. The use of environmentally friendly lubricants is a part of the strategy of sustainable development in the metal forming. This paper provides an overview of the new lubricant that can be efficiently used in specific manufacturing conditions. These processes are characterized by the use of tools with hard coatings, which can be very different. The development of new lubricants composing is especially significant in the area of cold metal forming.

Key words: Plastic metal forming, formability, ecology, lubrication

1. INTRODUCTION

During the last ten years, the legislation in developed countries made the environmental requirements for manufacturers of lubricants increasingly severe. Such requirements establish safe and healthy working conditions, and restrictions and the elimination of hazardous substances in lubricants. Environmental problems in metal forming tribology can be divided into the following areas [1], [2]: (a) health and safety of people, (b) influence on equipment and buildings, and (c) destruction and/or disposal of waste and remaining products. Special efforts are made to eliminate hazardous chemicals, such as chlorine or phosphorus additives, as well as reducing waste and extending tool life, regeneration and re-use of lubricants.

In the field of cold forging currently used zinc phosphate has to be replaced with a benign lubricant that will not create a hazardous sludge from the deposit of heavy metals. In the field of hot forging so-called white lubricant that reduces workplace contamination and allows easier manipulation is increasingly being used instead of a black one. As regards sheet metal forming, commonly used chlorinated paraffin oil is harmful to the environment. During the processing of high strength material, requirements regarding quality of lubricants are highly pronounced and the replacement of these lubricants is difficult.

It is well known that the tribo-conditions in contact are described by contact pressure, relative sliding velocity in contact and surface temperature. The general model of the tribological system, considered for metal forming processes, is shown in Figure 1 [3]. Table 1 shows the ranges of significant forming conditions at various MF.

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