

## **Computer aided design of the automotive part made of magnesium alloy**

**M. Ambrozinski\*, M. Packo\*, Z. Gronostajski<sup>†</sup>, L. Rauch\*, M. Pietrzyk\***

\* AGH University of Science and Technology  
Faculty of Metals Engineering and Industrial Computer Science  
al. Mickiewicza 30, 30-059 Krakow, Poland  
e-mail: mambroz@agh.edu.pl,

<sup>†</sup> Wroclaw University of Technology  
Forming Processes Engineering Department  
ul. Lukasiewicza 5, 50-371 Wroclaw, Poland

### **ABSTRACT**

New generations of steels (AHSS) have been increasingly developed and investigated by the automotive industry. These steels ensure the safety of car users and the range of their applications is increasing. However, in recent years an interest have occurred in the application of light alloys, such as magnesium alloys, for manufacturing of car body parts. This interest is mainly due to the light weight of those components, the scope of the accessibility and the possibility of their production. Use of light alloys in the car body can contribute to safety, environmental regulations and decrease of costs. Thus, possibilities of production of such components, as well as research on their subsequent exploitation, are developing.

Proposition of substituting the steel bracket by the magnesium alloy component is presented in the paper. In order to design the bracket made of magnesium, its strength and stiffness has to be evaluated and compared to that of the steel bracket. The objective of the research was a design of the shape of the bracket, that meets assumed criteria including manufacturing and assembly possibilities. The optimization task was formulated to reach this objective. Maximum stiffness of the part was the objective function and technological limitations were the constraints. Dimensions of the bracket were the optimization variables. Possibilities of manufacturing of the optimal part were evaluated by the FE simulation of the stamping process for this part. Local values of strains were compared with the forming limit diagram. Proposition of the shape of the magnesium alloy bracket, which can be safely manufactured by stamping, is the main output of the paper.