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III. ENGINEERING SCIENCE

DETERMINATION OF CORRELATIONS OF CONTROL PUNCHING AREA OF ECALL / ERA-GLONASS AUTOMATED EMERGENCY RESPONSE SYSTEMS

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Abstract

For selection and design of the precise parameters of shear cutting area of ERA GLONASS system, it is crucial to know the values of acceptable force, energy and speed. Accurate values of shearing force and energy can only be obtained from the actual force-penetration characteristics for specific applications. Actual force-penetration characteristics for all varieties of metal having different compositions and in use at various temperatures are not always available. The paper describes control system (closed loop) for shear cutting are of ERA GLONASS system and their correlations. The objective is this processes are impart a desired curvature to a workpiece at each point along the length of the part. Since the final part shape is determined by the shape to which workpiece is loaded and the amount of elastic spring back and since the latter is a strong function of the material properties of the workpiece, a truly closed loop controller must be accounted for these properties to insure consistent process performance.

Key words: eCall / ERA-GLONASS, GPS, Closed-loop Control, GSM

Introduction

eCall and ERA GLONASS are initiative to combine mobile communications and satellite positioning to provide rapid assistance to motorists in the event of a collision in Uzbekistan. The systems, the first based on GPS the latter on GLONASS, monitor in vehicle sensors for such events as airbag deployment to automatically transmit location details and summon assistance via emergency cellular service. The motivation for both systems is the reduction of the consequences of road accidents in regions of Uzbekistan. When activated, the in vehicle systems automatically initiate an emergency call carrying both voice and data (including location data) directly to the nearest Public Safety Answering Point to determine whether rescue services should be dispatched to the known position. The core functionality of both systems is an embedded computer that continuously monitors crash sensors and satellite positioning receiver in order to initiate an automated data and full duplex voice call via a dedicated wireless modem (e.g. GSM) in case of an emergency condition. In band modem capability, the ability to transmit data over the voice channel, is a key requirement for both systems. The goal is to equip all cars with dedicated hardware either as firstmount unit in new cars, or installed in pre existing vehicles (after market devices).

During installation of ERA GLONASS system, it is an objective to increase the quality of product constantly. A quality feature is the accuracy with which the products are manufactured. In installation of ERA GLONASS, the manufacturing tolerances are becoming further reduced.

In order to still be able to comply, a better understanding of process and the knowledge about the influence of the process variables is required. Especially in punching processes, these relationships are not always simple in nature. The rebound has a specific behavior for different process and tool settings. There are analytical models that describe the rebound, however, are the approximations that provide only for specified tool settings a realistic result. A general equation that applies to any tool settings, there is not. Furthermore, points to a sensitivity analysis, the relationships and dependencies of process and tool parameters compared and analyzed with each other. From the variations various parameters can be stated that behave the Initiate parameters differently. To get an overview of the parameters influencing the individual characteristics which will be discussed below to the individual parameters. Next to it are defined with which parameter the influence of defined influencing parameters can be detected.

Shear cutting force tangential analysis for different ma-

terials on the punching area of eCall / ERA-GLONASS.

In our study we chose five different materials (DX 1.00, DX 600 (1.25), DC 03 (1.5), AL 99(1.4), DC 03 (1.23)) all this materials have different kind of mechanical and chemical properties. The main aim is to find the same area or zone from the given force curve where we are able to use force and displacement data for bending operation calculation for precise getting bending angle for this purpose we used and calculated different materials tangential variation curves and linearity properties to know precise positions where elastic and plastic zones and correct data where we can use for future bending operations.

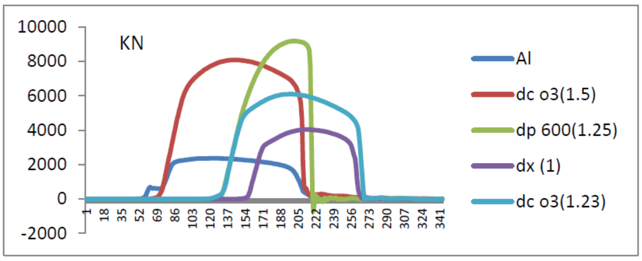
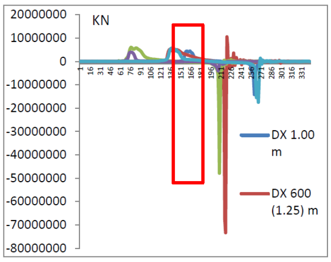


Fig 1. Stress and Strain curve for different materials

From the graph we can easily see that in the beginning of operation there is small jumps for all materials it means for different material has different elastic force but after while we can see the is the same linear angularity or tangential for all five materials so it means we can use data on that area for calculation of bending elastic zone operations. Furthermore, graph shows sharply varied frequencies it means there is different forces angle and plastic zones for different materials.



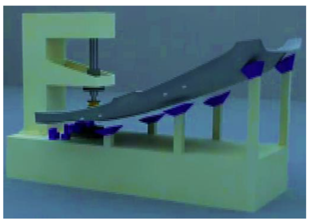


Fig 2. Five different materials tangential angle variation and relationship

On that zone where mentioned with red block we can also use given force and displacements data for calculation bending angle for future deals. There were studies with the "Smart" tool on a high speed motor performed. It may be noted that both the drive mode of the system as well as the mounting position in the press, affect measurements in stamping operations have. Through the studies on different systems could further be shown that with increasing number of strokes the lower tool system is excited by the impingement of the ram on the sheet to vibrate. The thus introduced into the system oscillations can be detected by the built-in micrometer and used for process monitoring. The different sensor positions must be distinguished. During the investigations of the cutting impact is only displayed in the lower tool. The signals of the force measuring ring not give the cutting shock again.

Conclusion

In shear cutting processes monitoring systems are often used to part quality and accuracy to detect. But usually very small component size and associated relatively small process forces, the tolerable range of the monitor is relatively small. Further, it is desirable to integrate a monitoring in the process, whereby downstream monitoring units could be omitted. To achieve this goal the sensors integrated in a punching tool. For the basics of the stamping process, the process control in metal forming and measuring systems are first drawn up. Assuming an existing tool is modified, whereby controller sensors can be integrated into the process or tool. Different sensors are incorporated into the upper and lower tool. The integrated sensors are the one force sensors in the form of micrometers and a force measuring ring and the other displacement and acceleration. Consequently, it was a tool operates in measuring chain can be formed, with which the reproducibility of measurements is ensured in stamping operations. In this context, different types of sensors and positions are considered and compared and can be used for bending operations. Depending on the position of the sensor in the tool or power flow, the qualitative and quantitative waveform must be distinguished and acuratly used for bending operations. In addition to the mounting position and the influence of different plant types was studied.

References

[1]. Garcia-Romeu, M. L.; Ciurana, J.; Ferrer, I.: Springback determination of sheet metals in an air bending process based on an experimental work. Journal of Materials Processing Technology 191, 2007, Seiten 174- 177

[2]. Gomering, R. et al.: Tabellenbuch Metall. Haan-Gruiten: Verlag Europa- Lehrmittel 2014

[3]. Johannes H. Design of an integrated monitoring for process stamping. Bachelorthesis, Institut für Produktionstechnik und Umformmaschinen der TU Darmstadt, 2013