MT 26
International Conference on Magnet Technology
Vancouver, Canada | 2019

Contribution ID: **1316** Type: **Poster Presentation**

Tue-Af-Po2.25-04 [115]: A Finite Element Study on the Distribution and Variation of the Eddy Current in Electromagnetic Sheet Free Bulging

Tuesday, 24 September 2019 14:00 (2 hours)

Electromagnetic forming is a technology that employed electromagnetic force to accomplish the deformation of the metal with high conductivity. It is reported that the improved formability and reduced spring back are observed during the EMF. Combined other advantages such as good control performance and contactless, EMF technology draw more attentions as a promising solution for the room temperature processing of lightweight alloy.
EMF is a complicated process which involves the coupling effect of the multi-field. Many processing parameters will influence the forming result. Among those, the excitation frequency is one of the most important parameters. The distribution of the eddy current and the magnetic pressure in the workpiece is directly decided by the frequency of the excitation current. In consequence, the forming results of the EMF are also influenced. Most of the researchers related the effect of the frequency to the skin depth in the workpiece. However, the relation between the optimum forming frequency and the thickness of the workpiece is still in dispute.
The distribution and changes of the eddy current in the work-piece during the EMF process is not exactly the same as that in infinite plate when Sine uniform planar electromagnetic wave incidences as the thickness of the sheet is limit. The skin depth cannot describe the distribution of the eddy current in EMF accurately. In this paper, with the employment of a full coupling simulation model, the distribution of the induced current with different charging frequencies during electromagnetic sheet free bulging are analyzed in detail, and the magnetic pressure is calculated. Based on these analysis, the research on the relations between the forming frequency influence and the forming result will be developed.

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Session Classification: Tue-Af-Po2.25 - Novel and Other Applications III