

International Conference on

Design and Production Engineering

July 25-26, 2016 Berlin, Germany

Effects of magneto-rheological (MR) properties on sheet metal formability based on the pressure of MR fluids

Nan Xiang, Zhong-Jin Wang and Peng-Yi Wang
Harbin Institute of Technology, China

Previous studies on viscous pressure bulging (VPB) tests show that the formability of sheet metal varies with the viscosity of pressure-carrying medium, i.e., viscous medium. Altering the viscosity of viscous medium in different stages of the process may improve the formability. However, it is impractical to implement. In order to change the viscosity of pressure-carrying medium in a single process, magneto-rheological (MR) fluids are employed in this work instead of viscous medium. The flow or shear properties of MR fluids can be continuously and reversibly controlled by the application of external magnetic field since MR fluids are essentially suspensions of magnetically polarizable particles in viscous fluids. In this paper, the squeezing tests of MR fluids are conducted at first. The increase of forming load with the magnetic flux density indicates the adjustable rheological properties. Bulging tests of Al1060 sheet and 1Cr18Ni9Ti sheet are carried out under different magnetic field. The Automated Strain Analysis and Measurement Environment (ASAME) is adopted to evaluate the thickness strain of specimens. Experimental results show that the dome height and maximum thickness strain of specimens increases with the magnetic flux density. It is result from the viscosity increase of MR fluids under increasing external magnetic field. It is inferred that MR fluids may become a promising pressure-carrying medium to improve the formability of sheet metal. Extensive application of MR fluids on the manufacture of complex-shaped shell components, which demands the enlarged forming range of sheet metal, will be expectable.

Biography

Nan Xiang is now a PhD student from Harbin Institute of Technology, China, 29 years old. He is major in Material Processing Engineering. His research orientation is Tube/Sheet Forming Process employing Flexible Dies, Manufacturing of Thin-walled Corrugated Components, and Numerical Simulation of Manufacturing Process.

xiangnan-87@163.com

Notes: