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A Method to Improve Forming Accuracy in Electromagnetic Forming of Sheet Metal Based on Field Shaper

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Low forming accuracy is an important defect in electromagnetic forming process of sheet metal. One of the main reasons is that shape of coil and required workpieces cylindrical and hemisphere respectively. The distance between the coil and the deformed sheet is too far at side walls, which lead to a consequence that electromagnetic force is not enough. To solve this problem, a field shaper was designed and fabricated to improve forming accuracy for electromagnetic forming of sheet metal. To validate the effectiveness of the system, a circuit-electromagnetic-structure coupling finite element model was built for analyzing deformation process. The solenoid field shaper which was made up of copper with an inner diameter of 55 mm and an outer diameter of 150 mm was used to increase the electromagnetic force at side walls. And a series of experiments on the forming of AA1060 with a diameter of 200 mm and a thickness of 3 mm have been carried out. Experiments results showed that the maximum deviation was 0.2mm with field shaper but 2.1mm without field shaper at the side walls of the die. It was clearly proved that field shaper can greatly improve the forming accuracy in electromagnetic forming of sheet metal.

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