

Numerical Determination of Transition of Cup Height between Hydroforming Processes

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Abstract : Various attempts concerning the low formability issue for lightweight materials like aluminium and magnesium alloys are being investigated in many studies. Advanced forming processes such as hydroforming is one of these attempts. In last decades sheet hydroforming process has an increasing interest, particularly in the automotive and aerospace industries. This process has many advantages such as enhanced formability, the capability to form complex parts, higher dimensional accuracy and surface quality, reduction of tool costs and reduced die wear compared to the conventional sheet metal forming processes. There are two types of sheet hydroforming. One of them is hydromechanical deep drawing (HDD) that is a special drawing process in which pressurized fluid medium is used instead of one of the die half compared to the conventional deep drawing (CDD) process. Another one is sheet hydroforming with die (SHF-D) in which blank is formed with the act of fluid pressure and it takes the shape of die half. In this study, transition of cup height according to cup diameter between the processes was determined by performing simulation of the processes in Finite Element Analysis. Firstly SHF-D process was simulated for 40 mm cup diameter at different cup heights changing from 10 mm to 30 mm and the cup height to diameter ratio value in which it is not possible to obtain a successful forming was determined. Then the same ratio was checked for a different cup diameter of 60 mm. Then thickness distributions of the cups formed by SHF-D and HDD processes were compared for the cup heights. Consequently, it was found that the thickness distribution in HDD process in the analyses was more uniform.

Keywords : finite element analysis, HDD, hydroforming sheet metal forming, SHF-D

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