

Study on the Changes in Material Strength According to Changes in Forming Methods in Hot-Stamping Process

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Abstract : Following the recent trend of having increased demand in producing lighter-weight car bodies for improvement of automobile safety and gas mileage, there is a forming method that makes use of hot-stamping technique, which satisfies all conditions mentioned above. Hot-stamping is a forming technique with advantages of excellent formability, good dimensional precision and others since it is a process in which steel plates are heated up to temperatures of at least approximately 900°C after which forming is conducted in die at room temperature followed by rapid cooling. In addition, it has characteristics of allowing for improvement in material strength through achievement of quenching effect by having simultaneous forming and rapid cooling of material of high temperatures. However, there is insufficient information on the changes in material strength according to changes in material temperature with regards to material heating method and forming process in hot-stamping. Accordingly, this study aims to design and press die for T-type product of the scale models of the center pillar and to understand the changes in material strength in relation to changes in forming methods of hot-stamping process. Thus in order to understand the changes in material strength due to quenching effect among the hot-stamping process, material strength and material forming precision were to be studied while varying the forming and forming method when forming. For test methods, material strength was observed by using boron steel that has boron additives, which was heated up to 950°C, after which it was transferred to a die and was cooled down to material temperature of 400°C followed by air cooling process. During the forming and cooling process here, experiment was conducted with forming parameters of 2 holding rates and 3 flange heating rates wherein changing appearance in material strength according to changes forming method were observed by verifying forming strength and forming precision for each of the conditions.

Keywords : hot-stamping, formability, quenching, forming, press die, forming methods

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