Assessment of Automotive Panel to Meet Handling Load Requirements: CAE Simulation

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Abstract

Material handling of sheet-metal components within the plant or one plant to the other significantly impacts quality and assembly process. Any permanent deformation of sheet metal component contributes to poor quality of an automotive subassembly. One way is to minimize occurrence of unacceptable deformation is to follow trial and error approach. However, such approach is time consuming during launch; in addition cost of stamping and testing prototype panel is high. Therefore a CAE methodology, using dynamic time domain solver 'LS-DYNA', was developed to provide design guidance and to examine probability of permanent set in the panel due to manual and robotic handling loads. An outer panel of a liftgate is used as an example to establish this methodology. The CAE results confirmed that proposed design of outer panel is capable to meet handling loads and eliminated need of redesign and saved launch time. This paper discusses a methodology to simulate handling process and evaluate behavior of sheet metal panels subjected to time varying enforced displacements. In this approach FEA techniques and a nonlinear flexible dynamic model are combined. Such approach helped to simulate handling process and to assess relations among material strength, panel topology, and locations of suction cups in end-effectors. Experimental validation of this proposed technique is in progress.