Shell Element for Thick Sheet Forming

*T. Yamamoto[1], T. Yamada[1], and K. Matsui[1]

[1]Yokohama National University, Japan

*Corresponding author: yamamoto-takeki-tg@ynu.ac.jp

Numerical simulation of sheet forming is used for realizing high-precision machining efficiently. The plate theory applied to sheet forming process is not sufficient to evaluate a deformation and a contact force in thickness direction at the bending correctly. In order to consider bending behaviors precisely, it is necessary to account for changes of stress distribution in thickness direction. In this work, we introduce approximation of a discontinuous displacement field in thickness direction at each element and we propose the structural element which consider distribution of a contact force and a deformation in thickness direction. Numerical results obtained by our approach are illustrated with satisfactory behavior of the results used with solid element. Therefore, the present element can predict stress and deformation in thickness direction in the framework of solid elements, and be applicable to the analyses of harsh bending and large deformation.

Keywords: Finite Element Method, Shell Element, Thick Sheet, Non-linear Analysis