

Accepted Manuscript

Title: Simulating sheet metal double-sided hydroforming by using thick shell element

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PII: S0924-0136(15)00042-4
DOI: <http://dx.doi.org/doi:10.1016/j.jmatprotec.2015.02.001>
Reference: PROTEC 14272

To appear in: *Journal of Materials Processing Technology*

Received date: 8-7-2014
Revised date: 20-1-2015
Accepted date: 1-2-2015

Please cite this article as: Zhang, F., Li, X., Xu, Y., Chen, J., Chen, J., Liu, G., Yuan, S., Simulating sheet metal double-sided hydroforming by using thick shell element, *Journal of Materials Processing Technology* (2015), <http://dx.doi.org/10.1016/j.jmatprotec.2015.02.001>

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Highlights

Accuracy and efficiency of thick shell is validated compared to shell and solid.

Thickness predictive ability of thick shell is proved by dual hydroforming process.

Larger normal stress is found to increase material thinning ratio in forming zone.

Larger normal stress is found to increase $\bar{\varepsilon}_p$ and $\bar{\sigma}$ in forming zone.

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