

## **Analysis and design of hydroformed thin-walled tubes using enhanced one-step method**

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### **Abstract**

This paper deals with the analysis and design of tube hydroforming parameters in order to reduce defects which may occur at the end of the forming process, such as necking and wrinkling. We propose a specific methodology based on the coupling between an enhanced one-step method for the rapid simulation of tube hydroforming process and a surrogate model based on a metamodeling technique. The basic formulation of the one-step method has been modified and adapted for the modeling of 3D tube hydroforming problems in which the initial geometry is a circular tube expanded by internal pressure and submitted to axial feeding. In the surrogate model, approximate responses are built using moving least squares method and constructed within a moving region of interest which moves across a predefined discrete grid of authorized experimental designs. Two applications of tube hydroforming of aluminum alloy 6061-T6 have been utilized to validate our methodology. The final design is validated using experiments together with the classical explicit dynamic incremental approach using ABAQUS® commercial code.

**Keywords :** Tube hydroforming, One step, Surrogate model, Design, Metamodeling.

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