Geometrical parameters optimization for tube hydroforming using response surface method

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Abstract. In tube hydroforming (THF) the optimal thickness variation of product is influenced by the geometrical, material and process parameters. In this study different values of initial tube length combined with various fillet and entry radii of the die are taken into account to predict an acceptable T-shaped tube of which the minimum wall thickness fulfills the industrial demand. To reach this goal, an integrated optimization approach, using the classical explicit dynamic (ED) incremental approach using ABAQUS® commercial code together with an optimization algorithm was developed. This latter consists in constructing an explicit form of the objective function by Response Surface Methodology (RSM) based on diffuse approximation (DA) according to the design variables. To search the global optimum of the objective function, the Sequential Quadratic Programming (SQP) algorithm has been used.

Keywords: Response Surface Method; Finite element method (FEM); T-shape THF.

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OPTIMIZATION PROCEDURE

The essential of RSM is for replacing a complex model by an approximate expression of the objective and constraint functions starting from a limited number of evaluations of the real one at various points in the design space. In this paper, the approximation is computed by using the evaluation points obtained considering CCD technique. The response surfaces are built using Moving Least Squares (MLS) approximations based on DA and...