Tube bulging test: evaluation of errors on material characterization

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Abstract. Tube hydroforming is an interesting process to manufacture hollow complex shaped components with a very good quality.
Like for others processes, numerical modelling by FEM permits to limit the cost of tool set-up. To perform predictive simulations it is essential to get precise material data. It has been demonstrated that material data obtained from the classical tensile test weren't adapted for tube hydroforming process. A specific characterization test called tube bulging test has been then developed [1].
But the evaluation of the stress-strain couple from the measurements of the internal pressure and bulging zone isn't so simple. Several approaches based on off-line or on-line measurements or even mixed ones have been proposed [2,3,4]. In this paper, the authors proposed a semi-analytical model based on on-line measurements [5]. Its major interest is that it permits to evaluate the influence of the experimental uncertainties (tube geometry, device, sensors) on the imprecision on the stress-strain curve. As a first step, a local and linear sensitivity analysis is performed and highlights the major sources of imprecision during experiments.

References

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