

# Tube and Sheet Hydroforming-Advances in Material Modeling, Tooling and Process Simulation

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**Keywords:** sheet metal, tube, hydroforming

**Abstract.** Tube Hydroforming is a well accepted production technology in automotive industry while sheet hydroforming is used in selected cases for prototyping and low volume production. Research in advanced methods (warm sheet and tube hydroforming, double blank sheet hydroforming, combination of hydroforming and mechanical sizing, use of multi-point and elastic blank holders) is expanding the capabilities of hydroforming technologies to produce parts from Al and Mg alloys, as well as Ultra High Strength Steels. In the development of advanced hydroforming methods, experience based knowledge is not readily available. Thus, robust process simulation is required, along with adequate material modeling and identification of friction coefficients as input to process simulation. This paper gives an overview of advanced hydroforming methods, including examples of novel machine and tooling designs. The use of reliable process simulation is illustrated with examples that demonstrate the significance of material and friction data for making accurate predictions. Advanced simulation methods for warm forming and for programming multiple-point blank holder are also discussed. This review illustrates that hydroforming continues to make advances and has the potential to make many contributions to production technology in the near future.