HydroFrame

Flexible joining of hollow frame structures with hydroforming

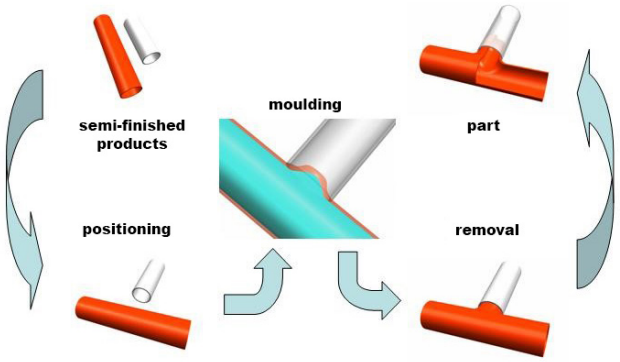
Editor	Dipl.-Ing. Falko Vogler
Duration	October 2005 – June 2008
Department	Profile Manufacturing Technology
Funded by	BMBF

Abstract

In the research project „Fluid-based, flexible joining of hollow frame structures“, the feasibility of a novel joining process was demonstrated through the production of racing bike and chair demonstrators. In the tool-based process, hollow components are joined by internal high-pressure forming in a force-fit and partially form-fit manner. This enables the implementation of complex geometries in tubular steel construction with reduced material costs, less reworking and a higher surface quality of the products.

Project description

Internal high-pressure joining is closely related to the high-pressure forming processes. At the beginning of the combined process, hollow semi-finished products are positioned in a mould cavity, which is then closed and held shut. The „base component“ (master) is then formed by applying an internal pressure, whereby a so-called dome is formed, which moulds itself into the joining component (slave) and creates an overlap of the components there. This creates the joint. By integrating the joining process into the hydroforming process, the saving of one or more process steps is achieved. Figure 1 shows the process principle using the example of a T-shaped, vertical joint.



[1] Process principle using the example of a T-shaped, vertical joint

The target of the project was to use the advantages of fluid-based moulding in an intelligent way to give shape to hollow components and simultaneously connect them together to form a frame structure.

Results

At the beginning of the HydroFrame research project, usability classes were created for products made of frame structures. These assess the conditions under which the frames are used during the product life cycle.
On the basis of the materials used and the geometric dependencies of the structures, characteristic diagrams are created that are intended to provide a statement about the feasibility of a fluid-based joining process. The usability classes created in conjunction with the characteristic diagrams developed are to be used to assess the suitability and favourable manufacturing strategy for fluid-based joining.

Acknowledgement

The results of the research project were funded by the Federal Ministry of Education and Research (BMBF) within the framework concept „Research for the Production of Tomorrow“ and supervised by the lead partner research centre Karlsruhe, Production and Manufacturing Technologies Division.

Funded by

SPONSORED BY THE

Federal Ministry of Education and Research

Project Partners

PTKA Projektträger Karlsruhe
Karlsruher Institut für Technologie

Institute for Production Engineering and Forming Machines – PtU
Prof. Dr.-Ing. Dipl.-Wirtsch.-Ing. Peter Groche | info@ptu.tu-darmstadt.de

PtU FORMING EXCELLENCE

TECHNISCHE UNIVERSITÄT DARMSTADT