

CRC 805 B2 – funding period 1

CRC 805 B2 – Production families at constant quality – funding period 1

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Abstract

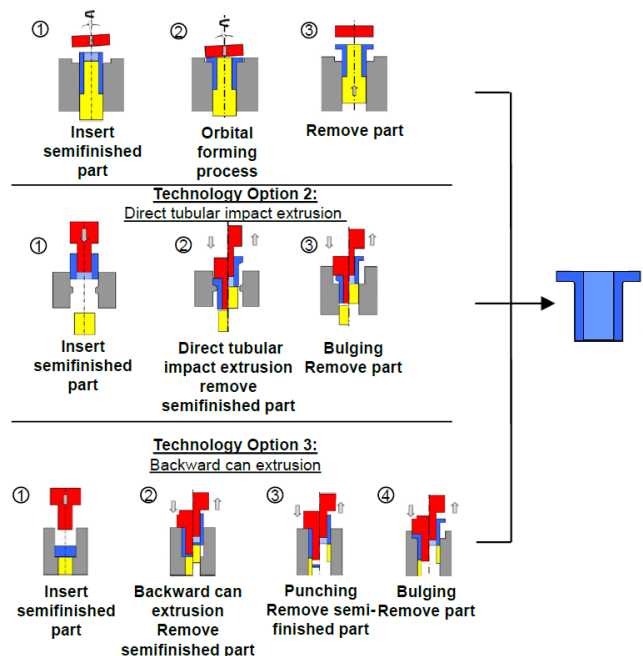
Uncertainties that occur in forming manufacturing processes due to changes in the sales or procurement markets should become controllable through the work of this sub-project. One aim of the sub-project is to create process chain families for forming manufacturing. These production families are created by changing the tool kinematics in connection with tools that become progressively more complex. Another goal of the sub-project is to control changes in the procurement-based part of the value creation system through controlled forming processes.

Project description

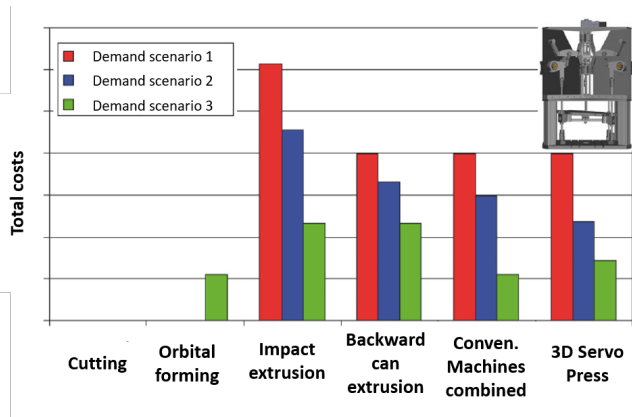
Production process chains are subject to uncertainties both with regard to the assessment of the sales market and with regard to quality fluctuations of semi-finished products and auxiliary materials. The predicted number of units to be produced decisively determines the structure of the production process chain, the coordination of the sub-processes of the chain and the properties of the manufactured components. Of particular interest here are load-bearing components that are used in load-bearing systems and whose property fluctuations can influence the strength and stability properties as a result of different production processes that depend on the number of pieces. An optimal process chain is obtained through integrated product and process development. Fundamental changes to the process chain structure in the production phase are often not possible today, as such measures change the geometric and mechanical properties of the product and require high investments. Process chains in the production phase are therefore considered largely rigid today. One aim of this sub-project is to create process chain families for the forming production of medium and higher quantities. Production families to be developed should offer the possibility of reacting without incurring additional costs and without the product thus produced experiencing any relevant deviations in its properties. In this sub-project, product properties are defined as characteristics that are considered decisive for the fulfilment of the product's utility function. The desired production families or changes in the process chain structure are to be created by changing the tool kinematics in conjunction with partial tool modifications using incremental forming processes. Another goal of the sub-project is to control changes in the procurement-based part of the value creation system through controlled forming processes.

Results

In times of fast-moving products and greatly reduced development times, it is important to assess and minimise uncertainty in production and investment planning. Conventional production systems are often insufficiently able to cope with the market dynamics, which inevitably results in uneconomical production of the individual products. The degrees of freedom of the 3D servo press open up the possibility of using the high flexibility of a single machine. In the event of a fluctuating demand scenario, a wide range of products and quantities can be produced economically with little additional financial outlay. In order to prove this, conventional manufacturing processes are compared with the 3D servo press on an economic basis using an example component. It is shown that with a flexible manufacturing system, uncertainties with regard to the development of the sales market can be reliably controlled compared to conventional production processes.



[1] Process stages of the three technology variants on the 3D servo press [GROCHE, P., et al. Rechnet sich Flexibilität in der Umformtechnik. Does Flexibility Pay Off, 2010]



[2] Total cost comparison of the technology variants based on [GROCHE, P, et al. Rechnet sich Flexibilität in der Umformtechnik. Does Flexibility Pay Off, 2010]

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Collaborative Research Center

