OBSERVABILITY OF QUALITY FEATURES OF SHEET METAL PARTS BASED ON METAMODELS

D. Harsch*[①], J. Heingärtner[①], D. Hortig[②] and P. Hora[③]

[①] inspire AG
Technoparkstrasse 1, 8005 Zürich, Tel: +41 633 78 04
e-mail: harsch@inspire.ethz.ch, Web page: www.inspire.ethz.ch

[②] Daimler AG,
Käsbrünnlestr., 71059 Sindelfingen, Germany
e-mail: dirk.hortig@daimler.com, Web page: www.daimler.com

[③] Institute of Virtual Manufacturing, ETH Zürich, Switzerland
Tannenstrasse 3, 8092 Zürich, Tel: +41 632 71 98
e-mail: pavel.hora@ivp.mavt.ethz.ch, Web page: www.ivp.ethz.ch

ABSTRACT

Deep drawn sheet metal parts are increasingly designed to the feasibility limit, thus achieving a robust process is often challenging. The fluctuation of process and material properties often leads to robustness problems. Especially skid impact lines can cause visible changes of the surface fine structure even after painting. Numerical simulations are used to detect critical regions and the influences on the skid impact lines. To enhance the agreement with the real process conditions, the measured material data and the force distribution are taken into account. The simulation metamodel contains the virtual knowledge of a particular forming process, which is determined based on a series of finite element simulations with variable input parameters. Based on these metamodels, innovative process windows can be displayed to determine the influences on the critical regions and on skid impact lines. By measuring the draw-in of the part, sensor positions can be identified. Each sensor observes the accordant quality criterion and is hence able to quantify potential splits, insufficient stretching, wrinkles or skid impact lines. Furthermore the virtual draw-in sensors and quality criteria are particularly useful for the assessment of the process observation of a subsequent process control.

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