

# Incremental Sheet Forming with an Industrial Robot – Forming Limits and Their Effect on Component Design

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**Abstract.** Incremental sheet forming (ISF) has been a subject of research for many research groups before. However, all of the published results so far have been related to either commercial ISF machines or ISF forming with NC mills or similar.

The research reported in this paper concentrates on incremental sheet forming with an industrial robot. The test equipment is based on a strong arm robot and a moving forming table, where a sheet metal blank is attached. The tool slides on the surface of the sheet and forms it incrementally to the desired shape. The robot is capable of 5-axis forming, which enables forming of inwards curved forms.

In this paper the forming limit diagram (FLD) for ISF with the robot is presented and it is compared with conventional forming limit diagrams. It will be shown that the conventional FLD does not apply to incremental forming process.

Geometrical accuracy of sample pieces is also studied. Cones of different shapes are formed with the robot equipment and their correspondence with the 3D CAD model is evaluated. The results are compared with other results of accuracy of incremental sheet forming, reported earlier by other researchers.

The third issue covered in this article is a product development point of view to incremental sheet forming. In addition to fast prototyping and low volume production of sheet metal parts, ISF brings new possibilities to sheet metal component design and manufacturing. These possibilities can only be exploited if design rules, that will take the possibilities and limitations of the method into account are created for ISF.