

Further Experimental Investigations and FEM Model Development in Sheet Incremental Forming

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Abstract. Sheet Incremental Forming (SIF) is a modern technique that deforms the sheet on a positive or negative die using a simple punch mounted on a general purpose CNC machine. Several working parameters (tool path, spiral width and tool depth) have been studied in previous papers [1, 2] analyzing their influence on a simple part when working AISI 304 or Cu DHP sheets. The main problem was to study the process feasibility, that is, the possibility of correctly deforming the pieces without breaking them. The research reported here has been focused mainly on other two important variables, studying their influence on the final part quality: the punch diameter and its velocity when deforming the sheet. Surface roughness and minimum thickness of the deformed sheet have been chosen as parameters for analyzing and evaluating the process efficiency. In FEM analysis, a simulation model was developed and implemented considering Cu DHP sheet. The comparison with experimental results was used to validate the simulation model and to identify the most suitable simulation parameter values (friction coefficient between various elements and blank holder force). The developed and validated model can be used for studying the process optimization. The results obtained in this paper can also be used as guidelines for the correct design of Sheet Incremental Forming process.