

INFLUENCE OF THE VARIABLE CONTACT PRESSURE ON THE TENSILE FORCE IN THE PROCESS OF STRIP SLIDING IN THE FLAT DIE IN IRONING

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An experimental computerized device was designed and constructed for analyzing the influence of the variable contact pressure on the sliding process of the model strip during the flat-die test. The multi-parameter experiment was conducted. Various materials of the tested pieces were applied (primarily thin sheet made of Al alloys and low-carbon steels sheet, with and without coating); different versions of the tool's contact elements were used, with various friction regimes and influential parameters (variable contact pressure during the sliding process, various sliding speeds, etc.). This experimental device practically represents a simulator for realization and studying of the physical model of an important segment of the ironing process in the completely realistic conditions (materials, tools, etc.).

Possibilities to influence the drawing process during its duration are limited and generally consist of influences at the rim of the thin sheet, mainly by the contact pressure (the holding force). The common characteristics to all the previous investigations in this field were setting of the fixed values of the holding force or the holder's pressure within the ironing tool. The objective of this investigation was continuous setting of the variable pressure during the sliding process, via the preset functions, in order to analyze the variable pressure influence on the ironing process. The aim of the work was to find the optimal combination of the variable contact pressure and the tribological parameters, so that the tensile force, as one of the process output parameters, would have the minimal value, as well as to avoid the undesired effects during the forming (difficult sliding of the rim, appearance of thin sheet's wrinkling, structural destruction, etc.).

Understanding the mutual dependence of the holder's variable pressure and other influences should enable improvement of the ironing process control and should contribute to better understanding of the phenomena occurring at the thin sheet's rim. In that way, one can minimize numerous problems, which are accompanying the ironing process in the exploitation conditions.

Keywords

flat-die test, deep drawing, tribological model, contact pressure, tensile force.

Testing equipment



Tools with various surface conditions



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