

Tribological Investigations on Coated Steel Sheets Using the Dry Film Lubricant Drylube E1

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Abstract. Tribological aspects strongly influence the deep drawing behaviour of sheet metal, being responsible for both the punch force and the material draw-in from the flange. Recent developments in lubrication technology have shown that dry film lubricants can be a good alternative to conventional fluid lubricants in case of aluminium sheets. Their main advantages are the homogeneous distribution on the blank surface, the good adhesion to the surface and the possibility of applying it already in the rolling mill. In order to introduce this technology in series production also for steel sheets more knowledge concerning the influence of the lubricant amount on the drawing forces is needed. A further important aspect to be considered is the surface quality of the steel grades and its interactions with the dry lubricant. In this paper four steel grades with different mechanical and/or surface properties are considered. After a microscopical and topographical investigation of the surface the materials were tested in a cup drawing test after applying two different amounts of the dry film lubricant Drylube E1. Further process parameters which were varied are the blank holder force F_N and the drawing ration β . In this way, information about the influence of the lubricant amount on both the drawing force and on the maximum blank holder force F_Z could be obtained for three different values of β . The experimental results have shown how a strong decrease of the lubricant amount (from 1.0 down to 0.5 g/m²) causes, at a given drawing ratio, only a small increase in the maximum drawing force as well as a small increase in the maximum blank holder force.