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THE USE OF GRID STRAIN ANALYSIS IN SHEET METAL FORMING

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This paper describes the use of a technique known as the "Grid strain analysis" for die development and process control in press shops. "Grid strain analysis", first proposed by Keeler (1963) and Goodwin (1968), involves etching a pattern of fine circles onto the sheet steel before pressing. After pressing the circles will be deformed into ellipses which can be measured to indicate major and minor strains produced in the component. An estimate of how close the metal is to fa l ure can be obtained by reference to the "Forming Limit Diagram", which is a plot of the major and minor strains at fracture over a wide range of conditions, from deep drawing (tension-compression) to stretch forming (tension-tension). Failure due to wrinkling is also incorporated in the forming limit diagram as a "Wrinkling Limit Curve".

A knowledge of how close the metal is to failure enables an estimate to be made of the criticality of the press forming operation. The strain values and their ratios, give valuable information on the type of deformation which has occurred in various areas of the press component for subsequent corrective action.

The use of this technique has improved die design procedures, reduced reject rates and has helped to keep unit production costs down.

References :

1. Keeler, S. P. (1963) Trans. A. S. M. **56**, 251.
2. Goodwin, G. H. (1968) SAE Automotive Eng. Con. Detroit 68,0093.
3. Hobbs, R. M. (1976) BHP Tech. Bull., 2, 2.