DEPARTMENT OF MECHANICAL ENGINEERING

SHEET METAL FORMING (DEEP DRAW) FACILITY

The Department of Mechanical Engineering, Sreyas Institute of Engineering and Technology has been developed facilities for study and work on sheet metal forming.

The Deep Drawing Test Rig has been established in the Department for performing tests on sheet metal forming characteristics using different metal sheets. The forming facility covers testing at different temperatures, i.e., warm farming for different shape cup production such as circular and square.

Deep drawing is a sheet metal forming process in which a sheet metal blank is radially drawn into a forming die by the mechanical action of a punch. It is thus a shape transformation process with material retention. The process is considered "deep" drawing when the depth of the drawn part exceeds its diameter. This is achieved by redrawing the part through a series of dies.

The material initially flat flanges of the blank flows to form the walls of the cup. Due to shrinkage of the outer periphery, circumferential compressive stress develops which might thicken the sheet or cause local buckling (wrinkling). The flange region (sheet metal in the die shoulder area) experiences a radial drawing stress and a tangential compressive stress due to the material retention property. These compressive stresses (hoop stresses) result in flange wrinkles (wrinkles of the first order). Wrinkles can be prevented by using a blank holder, the function of which is to facilitate controlled material flow into the die radius. For all forming operations, some important solid material's properties are involved here. Ductility is the ability of material to deform under tensile stress; this is often characterized by the material's ability to be stretched into a wire. Malleability is the ability of material to deform under compressive stress; this is often characterized by the material's ability to form a thin sheet by hammering or rolling.

Formability is the ability of material to undergo plastic deformation without being damaged. The mechanical properties are aspects of plasticity, the extent to which a solid material can be plastically deformed without fracture.

Projects performed

1. Warm Deep drawing on copper blanks
2. Deep drawing study on steel blanks
3. Fabrication and experimental study on square cup deep drawing
4. Study of weldability characteristics in stir welding.
5. Determination of LDR in deep drawing of aluminium sheets AA6111.
6. Simulation study on deep drawing process

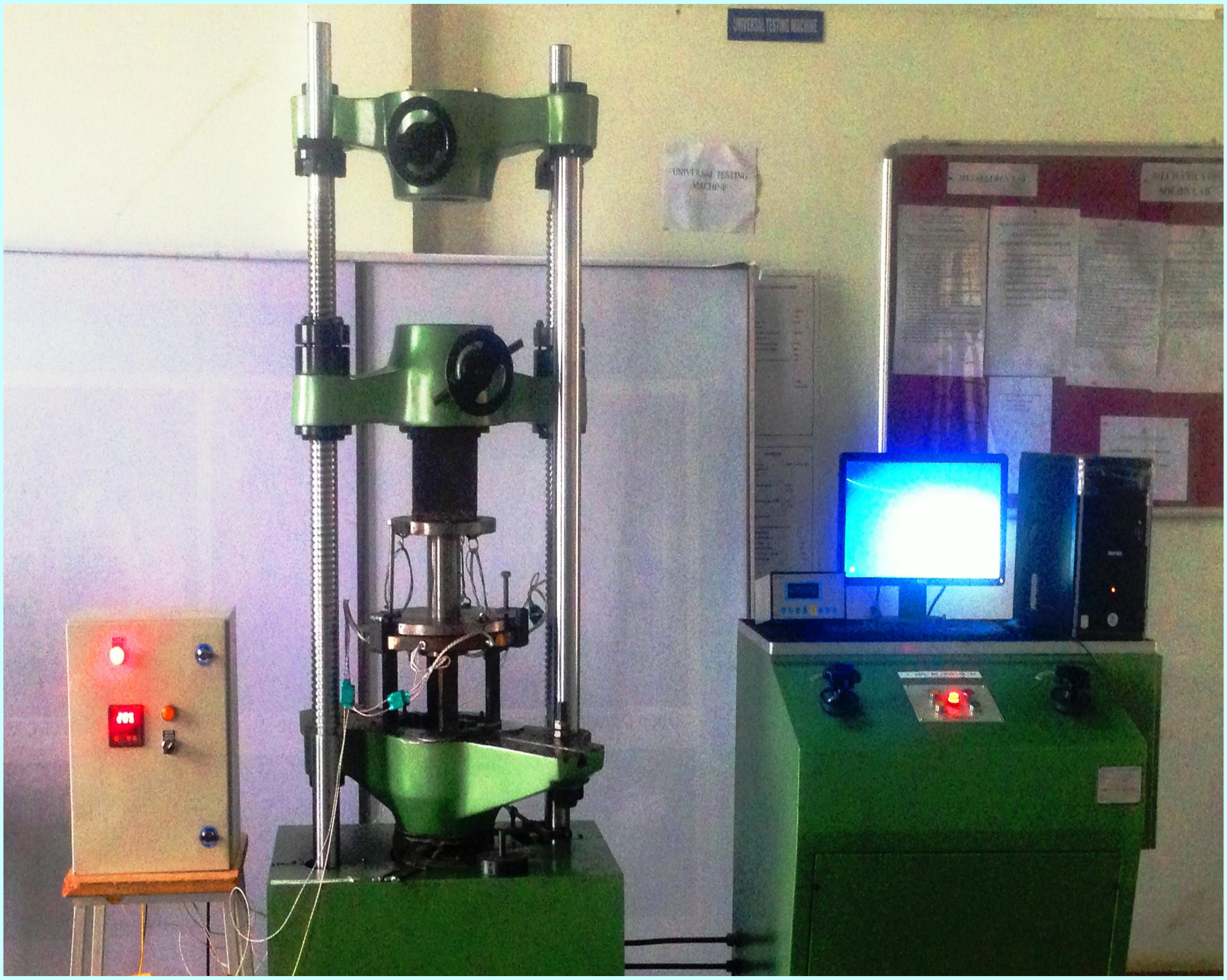


Fig: DEEP DRAWING TEST RIG

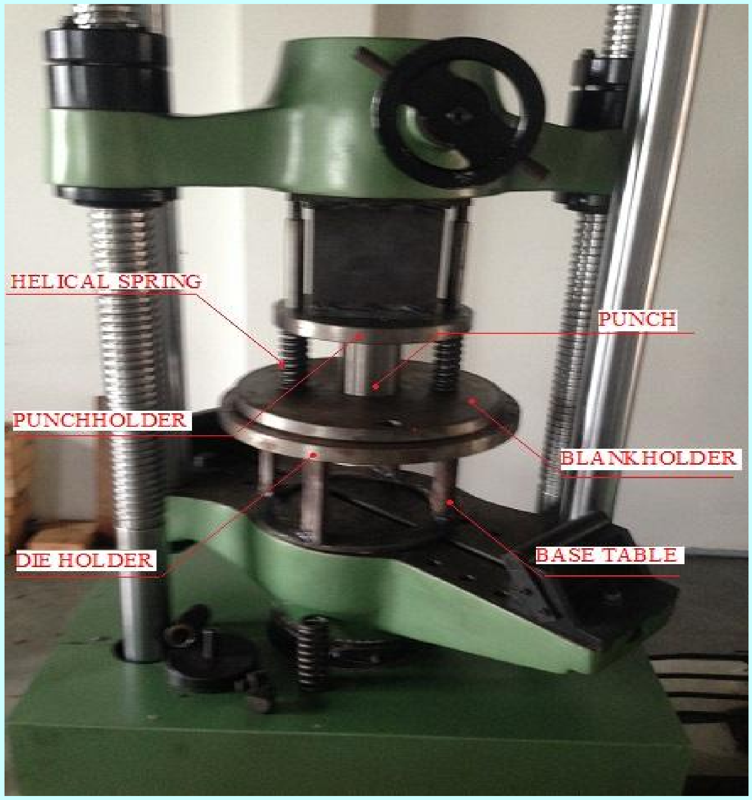
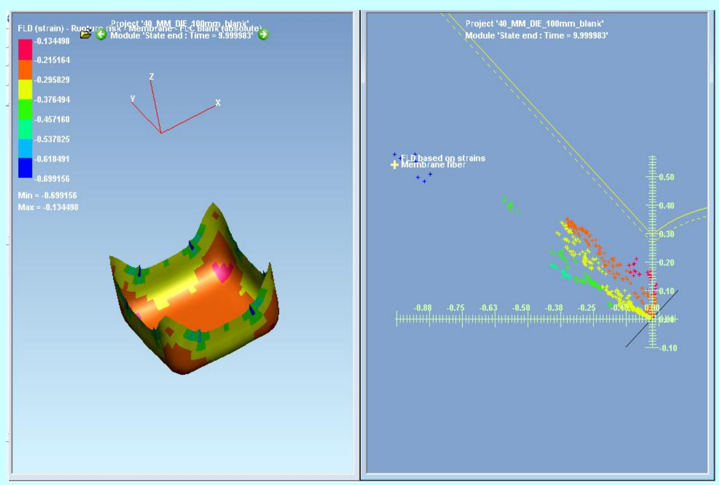


Fig: Close view of Deep Draw Die mounted on UTM



Deep drawn and simulated cups
A Y: 2018-19
Harsha and Team

Fig: Punches

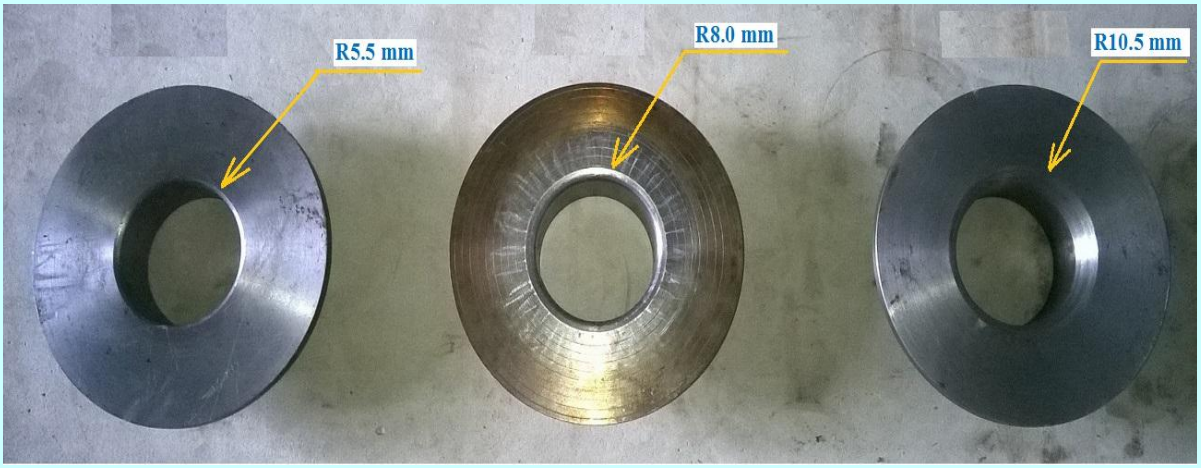
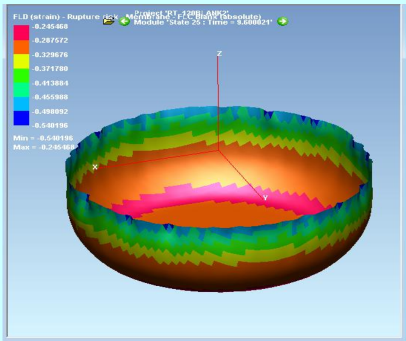
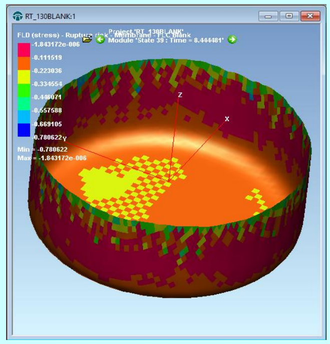
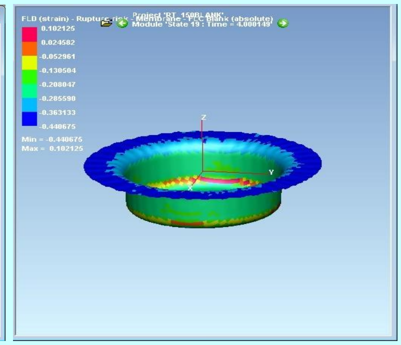


Fig: Dies

Sample cups produced in deep Draw tests







No of Projects Executed

- 2018-19 3 projects
- 2017-18 2 projects
- 2016-17 1 project

materialstoday: PROCEEDINGS
Volume 5, Issue 13, Part 3, 2018, Pages 27136-27141

Determination of LDR in deep drawing using reduced number of blanks

A.C. Sekhara Reddy, S Rajesham

Show more

https://doi.org/10.1016/j.matpr.2018.09.022

Get rights and content

Abstract

Indeed, deep drawing is one of the important sheet metal forming process, widely used in production of cup shaped articles having applications in different engineering and domestic fields such as aerospace, automobile, beverage, kitchenware etc. It is essential to determine the quality characteristics of the process for minimization of rejections as well as cost involved in it. LDR is one such quality characteristic essential to evaluate thoroughly with reduced number of steps in deep drawing. Here, the LDR is determined by means of experimental and simulation method by using the concept of " punch force is proportional to blank diameter up to limiting drawing ratio" and remains constant over the LDR for all oversized blanks resulting in failure. In this research paper, an attempt has been made to establish a standard and quick method for "determination of LDR". The LDR tests have been conducted with the use of only three blanks of different sizes; i.e., two of undersize and one blank of oversize. The LDR found through experiments and simulation are in good agreement with only 5.4% variation and this variation may be due to variation in lubrication conditions among the experimental and

Papers published

- 2018-19 1 paper
- 2016-17 1 paper

U tube videos : Link : https://www.youtube.com/watch?v=Axiv9NREon8