Design & development of Double Acting Deep Drawing Press; A Review

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Abstract: The current method of manufacturing the capacitor cap is brazing. This process is complicated and consumes much time. It also results in wrinkles on the surface of capacitor cap. Many times the product breaks which results in rejection of the product.

So it is requirement of company, that a new mechanical system should manufacture cylindrical component i.e. capacitor cap without wrinkles and the outside covering of cap should not break due to excess stress and also higher the conductivity of product. The operation which can fulfill this requirement is deep drawing machine. So the technology of Double Action Deep Drawing Hydraulic Press Machine can be developed. Machine will offer the product with high accuracy and within less time. It will result in the lesser rejection and more finish product will be obtained. For further increase in rate of production of jobs usually of smaller size and simpler geometry double action deep drawing hydraulic press machines is preferably used.

I. INTRODUCTION

Deep drawing is a sheet-metal working process used to form cup-shaped or box-shaped parts by using a punch that draws a blank into a die cavity. This process is carried out by placing a blank sheet of certain size over the opening of the die and pressing this blank into the die cavity with a punch. Typical products made by this process are beverage cans, bathtubs, containers of different sizes and shapes, sinks, and automobile panels.

Sheet-metal forming processes are technologies among the most important metalworking processes. Products made by sheet-forming process include a very large variety of different geometrical shapes and sizes, like simple bend to double curvatures even with deep recesses and very complex shapes. Typical examples are automobile bodies, aircraft panels, appliance bodies, kitchen utensils and beverage cans. Sheet-metal forming processes are widely used in the manufacturing industry. It is usually involved in developing and building tools namely die and punch. Usually, tools are costly and the cycle time for building them is long. However, once die and punch are built, the tools can be used to produce a large amount of products. Therefore, sheet-metal forming is a simple and efficient manufacturing process. Great productivity and low production cost can be expected for commercial scale production. As mentioned that the flat sheet of metal is formed into a 3-D product by deep drawing process. The basic tools of the deep drawing process are blank, punch, die and blank holder (or pressure plate). Deep drawing is affected by many factors such as material properties, tool geometry, lubrication etc. Because of these factors, some failures may occur during the process. Tearing, necking, wrinkling, earing and poor surface appearance are the main failure types that can be seen in deep drawing. Tearing and necking are caused by the tensile stresses and they are types of tensile instabilities. Another failure is wrinkling, caused by compressive stresses unlike to tearing and necking. When the radial drawing stress exceeds a certain value compressive stress in the circumferential direction becomes too high, so plastic buckling occurs. The four major defects which
can occur during deep drawing are fracture, wrinkling, earing and spring back. The phenomenon of wrinkling (flange instability) is specific to the process of deep-drawing.

Double Action Deep Drawing Hydraulic Press Machine, offers the ideal performance options for sophisticated complete machining of press die, punch and mold pieces. The product was designed for flexible tailor-made solutions to meet varying demand. The time tested and proven components ensure maximum performance, which include the integrated Hydraulic cylinder, Hydraulic motor pressure switch and the use of two die tools simultaneously. For further increase in rate of production of jobs usually of smaller size and simpler geometry double action deep drawing hydraulic press Machines is preferably used. Due to this, the more than one work piece can be machined at a time. This results in more no. of work pieces machined in a day. This increases the productivity of the machine. Due to increase in productivity, the cost per component reduces.

1.1 Scope of work
The existing method of manufacturing the capacitor cap is brazing. This process is complicated and consumes much time. It also results in wrinkles on the surface of capacitor cap. Many times the product breaks which results in rejection of the product. so it is requirement of company, that a new mechanical system should manufacture cylindrical component i.e. capacitor cap without wrinkles and the outside covering of cap should not break due to excess stress. The operation which can fulfill this requirement is deep drawing machine.

So the technology of Double Action Deep Drawing Hydraulic Press Machine is developed. Machine offers the product with high accuracy and within less time. It results in the lesser rejection and more finish product is obtained. For further increase in rate of production of jobs usually of smaller size and simpler geometry double action deep drawing hydraulic press Machines is preferably used.

II. LITERATURE REVIEW
1. Ahmed Ramahi et al; represents work implemented in designing, fabricating and operating a model of cheap hydraulic deep drawing machine. It represents work done an experience gain in designing, constructing and operating a hydraulic deep drawing machine which is currently mounted in manufacturing process lab at An-Najah University & used by students to perform experiments on deep drawing [1].

2. Juraj Hudak et.al; represents force parameters research (drawing &blank holding) in deep drawing process of flat bottomed cylindrical cup. Course of drawing &blank holding force at deep drawing process when cup broke shows the same character in the first stages, as it is in deep drawing of unbroken cup. Decreasing the drawing ratio caused maximal drawing force growth until cup breaking force [2].

3. R. Venkat Reddy et.al; represents various parameters on then wrinkling in deep drawing cylindrical cups. The height of wrinkles is reduced by increasing the blank holding force, decreasing friction, increasing the tools edge radius & reducing deep drawing depth all together in one operation. The defect of wrinkling occurs easily in this process of EDD steel alloy sheets. it is to avoid wrinkling of blank by selecting the correct BHF’s, decreasing friction, increasing the tool edge radius & reducing the deep drawing depth all together in one operation. All affecting parameters in deep drawing process to regulate wrinkling effect, tearing effect & fracture defect [3].

4. Trivedi Nirav R et.al; represents effects of various parameters in Deep Drawing Process Over Sheet Metal. It explains forming process, Forming is the process of obtaining the required shape and size on the raw material Sheet metal forming is one of the non-cutting operations that can be performed on power press. Deep drawing process is one of them [4].
5. **Michal Tropp** et.al; represents his concept of deep drawing mechatronic system working in extreme conditions. In this case, extreme conditions represents drawing process in vacuum by high temperatures required by molybdenum sheets forming. It necessary to set up all boundary conditions, requests and binding conditions [5].

6. **Ramesh Kantikar** et.al; represents analysis on deformation process in deep drawing of sheet metal part by FEM. Sheet metal formation during deep drawing process is simulated using Finite element software and analysis is carried out to find the load requirements with increase deep drawing forming process [6].

### III. FUNCTION OF EACH PART

#### 3.1 Top plate
It is the plate which is situated at the top of the machine. It will be made up of MS material. This plate will support the one cylinder which is use for punching the work piece. This plate will also support two small cylinders which are situated beside the punching cylinder. It will hold four pillars which will be fixed with the help of bolts. It will support whole weight of three cylinders which are used for different purposes in machine. It also will help to correct alignment of base plate and pressure plate with four rods at its end.

#### 3.2 Base plate
It is a plate which is situated on the frame. It will take all load of machine. It is connected with the top plate with the help of four pillars. That pillars are situated at its ends. It has T slot cut in to it. This T slot helps for mounting die set on it. It is the plate on which work piece is actually placed and then punching operation take place. An ejection system will be provided below it to eject the work piece from the die set.

#### 3.3 Pressure plate
Pressure plate is little less in dimension than base plate or top plate as it has to move up and down in the machine. This plate will move up and down with the help of two piston rod which will hold it at the two ends. This plate will hold the metal sheet and then the punch will come down and punch the metal sheet. It has center hole through which punch moves up and down. This is important part of system as it has to hold the metal sheet. Due to this plate there are fewer chances of wrinkles on the work piece.

#### 3.4 Pillars
There are total four pillars in this machine. These pillars are mounted between top plate and bottom plate. They are fixed with top and bottom plate with bolt arrangement. They support whole weight of cylinders and top plate. They reduce vibrations of the machine to transfer to the base plate and ultimately to the die set. This avoids any variation in the work piece.

#### 3.5 Frame
This is the component of the system which takes all load of machine. This take load of hydraulic cylinders, base plate, top plate, pillars. It also holds ejection system which helps in ejection of the work piece from the die set.

#### 3.6 C-clamp
This component of the system helps in ejection of the work piece from the die. It is also limit the movement of pressure plate. This C-clamp is connected to the piston rod of punching cylinder. It also has one limiting movement mechanism. With this mechanism the armature of C-clamp is made contact with pressure switch is used to stop the movement of C-clamp.
IV. EXPERIMENTAL VALIDATION

- In this project work right now we are designing the press (machine) named double acting deep drawing hydraulic press. The existing method used in company to draw sheet is brazing method which we have to replace by double acting deep drawing process, which will be helpful for company to increase product efficiency.
- We design some components which are used for making deep drawing press they are: top plate, base plate, c-clamp, pillars, frame & still we working on design of hydraulic set up. After designing we have to develop machine according to their dimensions of components & their capacity.

V. CONCLUDING REMARKS AND SCOPE FOR THE FUTURE WORK

- After Developing Double Acting Deep Drawing Press, It will increase efficiency of product.
- More accurate parts will be produce.
- It takes less time than existing.
- And In future we develop actual machine press of double acting deep drawing.

REFERENCES


