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Research Article

DRAW PRESS AUTOMATION

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ABSTRACT

In the usual draw press machine, the safety of the operator and the productivity rate has a major role to play. Usually 2-3 operators are required for the operation and also the rate at which one product (i.e. production rate) is made is less. Adding to this, the operator is not safe while performing the operation and there is a high risk of accident which cannot be ignored. That's where automation comes into picture. If we automate the draw press machine or design a new automated draw press machine, there this would also reduce the number of operators required for the operation of the machine and also increase the production rate of the machine (which is a requirement for the industry). By doing this we not only increase the production rate of the machine but also increase the safety of the operator (which is also an important consideration) reducing the risk of accidents.Nowadays as we can see the industrial areas or companies, most of them want to reduce the risk of accident which affects the reputation of the organization. Automation is growing and by the current scenario we can say that in the coming future all the industries will be automated. So this project is being one step ahead and improvement in many ways.

INTRODUCTION

Deep drawing is one of the most widely used processes in sheet metal forming. Apart from its use in many other sectors, it is applied for manufacturing various parts used in automobile, agriculture, household, domestic, construction industries. The deep drawing process is a forming process in which a flat sheet metal blank is formed into a hollow body open on one side or a hollow body is formed into a hollow body with a smaller cross-section. Deep drawing is usually carried out using rigid tools. The sheet is clamped between the die and the binder. This process slows down the flow of the sheet while it is being drawn and thereby prevents wrinkles from forming. The punch stretches the sheet over the die radius and forms it in the die. The amount of punch force necessary for forming is thereby continually increased up to the lower dead center of the punch.

There are two types of drawing processes – Deep drawing and stretch drawing. In pure deep drawing there is no reduction of sheet metal thickness, forming is achieved in stretch forming purely as a result of a decrease in sheet metal thickness. Stretch forming is extensively used for the forming of only slightly curved parts with low depth of draw.

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Deep drawing

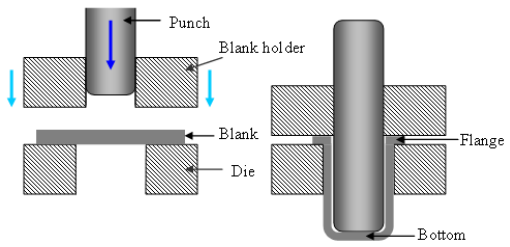

Figure no 1

Deep drawing is a fast manufacturing process in which many parts can be manufactured in a short time. If cost effective method is to be used which consists of manual feeding, the production speed as well as the safety of workers is compromised.

Automation

The hydraulic press draws thousands of domes a day. One of the main aims of initiating the automation process for the press is safety-related, i.e. 'To get the operator's hands out of the die.' Also of concern is repetitive-motion stress, as operators has to load and unload blanks. In addition to the operator having to load the blanks into the press, he first has to move each blank from the stack and into and out of a lubrication station. And, after every hit in the die, the operator has to remove the workpiece from the die.

Figure no. 2

Procedure for Draw Press

Deep drawing is a secondary forming process which in its simplest form a cylindrical shape or alike (for example a cone or dome) is produced from a thin disc of sheet metal by subjecting it to a compressive force (while it is held between a die and blank holder) through a circular punch which mainly on the blank thickness.

Deep drawing operation is also frequently used in the production of one side shut cylindrical cups and similar items in industry. The sheet piece which will be formed in that production operation has been set into die and pressure is applied with a blank holder vertically. Then the sheet between blank holder and die is transformed into cup under plastic deformation, by applying a vertical pressure by a punch which moves vertically to the work piece

During drawing of sheet into the die, there is thickening of the sheet up to 12%. Therefore, clearance is provided between the punch and die. The radial clearance therefore is equal to the sheet thickness plus the thickening of sheet. Punch pushes the bottom of the sheet into the die cavity. The flat portion of the sheet under the holding plate moves towards the die axis, then bends over the die profile. After bending over the die profile the sheet unbends to flow downward along the side wall. The vertical portion of the sheet then slips the die surface. More metal is drawn towards the center of the die in order to replace the metal that has already flown into the die wall. Friction between holding plate and blank and that between die and blank has to be overcome by the blank during its horizontal flow. The sheet metal attains the shape of the die cavity with flat bottom. Both die and punch should be provided with corner radius in order to avoid shearing of the sheet. Materials transformed into cup by deep drawing method are reshaped for transformation into another cup form with a narrower diameter.

Types of Deep Drawing Techniques

Deep drawing can be achieved with tools, an active medium, or active energy. The first two methods are the most common.

- Rigid tools are typically used for deep drawing and generally include a die, a punch, and a blank holder. The punch and the die are used for forming and the blank holder is used to regulate the material flow. This is important to guarantee deep drawing without crinkles and cracks.
- Active medium deep drawing may involve force transmission action, typically with a gas or liquid.
- Active energy deep drawing, also known as high speed forming, is an alternative method of deep drawing that has little practical use over other conventional methods.

Benefits of Drawing

Deep drawn parts offer numerous advantages over traditionally machined, cast, or molded parts. We can reverse-engineer existing components, and can often combine multiple parts into a single piece. Deep draw can:

- Reduce costs
- Reduce waste
- Lower assembly cost and time
- Improve metal structure to produce stronger finished parts.

Need of Automation

Reducing man power

Any organization in order to save the time and money of the company should invest the efforts of their employees in any other activity whichever necessary as simple and repetitive tasks can be performed by the machines.

Reducing manufacturing time

Machines need less time to perform the required task than the humans and hence, manufacturing time can be reduced by automation.

Improvement in productivity

In today's business world the production rate matters a lot as the company/organization needs to meet the growing demand of its consumers. Hence, we need to improve the productivity.

Increasing safety

There are many other types to increase the safety where desired safety can be achieved. Automation is one of the types.

Reducing human error

One of the major cause of defects in production is human error. Hence, if possible the company should rely on machines to handle the operation by implementing automation.

Considerations

Production time (per 8 hours i.e. 1 shift)

Before automation
Current man power: 2-3 persons
On date production with 2 operators: 1550 Nos.
On date production with 1 operator + 1 helper: 1000 Nos.
As recorded it produces 2.22~3 pieces per min (Approx.)

After automation
Predicted man power: 1 person
Predicted production of work pieces: 2000 Nos.
By Approx Calculations it produces 4.44-5 pieces per min

Safety Measures Other than Automation

Some devices can be used in the system, which will increase the worker's safety. They are as follows:

Gate or movable barrier device

It is a movable barrier arranged to enclose the point of operation before the press stroke can be started.

Holdout or restraint device

It is a mechanism, including attachments for operator's hands, that, when anchored and adjusted, prevent the operator's hands from entering the point of operation.

Pull-out device

It is a mechanism attached to the operator's hands and connected to the upper die or slide of the press that is designed to withdraw the operator's hands as the dies close if the operator's hands are inadvertently within the point of operation.

Sweep device

It is a single or double rod attached to the upper die or slide of the press, designed to withdraw the operator's hands as the dies close if the operator's hands are inadvertently within the point of operation.

These devices, when used in the system, will increase the safety of the workers to a large extent.

However there are many disadvantages of these systems. They are

1. If these safety devices fail to operate at some point, then the safety of workers will be compromised. In that case, a worker cannot fully rely on these safety devices.
2. As the system will be partially-automated, humans will need to work on the machines, and hence manpower will be needed.
3. Although these systems will increase the workers' safety, they cannot prevent human errors from happening.
4. The production time will not decrease.
5. The productivity will not increase.

Due to the above reasons, automation will always be preferred. Although cost is a big factor, instead using money for increasing the safety devices in the system, companies can invest their money in automating the process, as the main aim of automation is to increase safety.

Conveyor Technology

A conveyor belt is the quickest way to transfer a job from one place to another. Various conveyor belts can be used for this purpose. Different methods such as fork lifting, use of bucket elevators, conveyors systems, crane, etc. has been identified for lifting or transporting bulk materials or products from one place to another in the manufacturing industries depending on the speed of handling, height of transportation, nature, quantity, size and weight of materials to be transported. The objective of this research work is to provide design data base for the development of a reliable and efficient belt conveyor system that will reduce cost and enhance productivity while simultaneously reducing dangers to workers operating them. Conveyor system is a mechanical system used in moving materials from one place to another and finds application in most processing and manufacturing industries.

It is easier, safer, faster, more efficient and cheaper to transport materials from one processing stage to another with the aid of material handling equipment devoid of manual handling. Handling of materials which is an important factor in manufacturing is an integral part of facilities design and the efficiency of material handling equipment add to the performance level of a firm. Conveyor systems are durable and reliable in materials transportation and warehousing. Based on different principles of operation, there are different conveyor systems namely gravity, belt, screw, bucket, vibrating, pneumatic/hydraulic, chain, spiral, grain conveyor systems, etc. The choice however depends on the volume to be transported, speed of transportation, size and weight of materials to be transported, height or distance of transportation, nature of material, method of production employed. Material handling equipment ranges from those that are operated manually to semiautomatic systems.

Material handling involves movement of material in a manufacturing section. It includes loading, moving and unloading of materials from one stage of manufacturing process to another. A belt conveyor consists of an endless and flexible belt of high strength with two end pulleys (driver and driven) at fixed positions supported by rollers. In this work, 3 roll idlers are required for adequate support of materials transported and protection of the belt along its length. Pulleys are used for providing the drive to the belt through a drive unit gear box powered by an electric motor. It also helps in maintaining the proper tension to the belt. The drive imparts power to one or more pulleys to move the belt and its loads. Materials are transported over the required distance as a result of friction generated between the roller surface and the moving belt set in motion by a rotating pulley (drive pulley). The other pulley (driven or idler pulley) acts as a wheel around which the material rotates and returns in a continuous process. Continuous processes are characterized by non-stop motion of bulk or unit loads along a path without halt for loading and unloading.

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