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PNEUMATIC OPERATED FEEDER

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Abstract*—This paper emphasizes to increase the productivity and to minimize the manpower and labor cost. The main objective of our project to move the clamping device and feed to the sheet up to 0.5mm to 1.2mm and length is to 300mm to the machine to carry the other operation like blanking, shearing, etc. This is used in many industrial applications. In our paper double acting cylinder is used instead of single acting cylinder to minimize the cost of production and to achieve a lighter weight. This is operation is carried out sequence first pressurised air passed in small double acting cylinder up to 8 bar to 10 bar pressure and they clamp the sheet, at this idle time of large double acting cylinder field with pressurised air and our sheet is fed. When does it complete their forward stroke? In return stroke direction control valve 5/2 is used with changes to the position and field air passes to the muffler. Muffler is used to reduce the noise of operation. So, from this project we achieve more productivity, Reduce manpower and labour cost. It also reduces the fatigue of operators.*

I. INTRODUCTION

The alternators plates are being manufactured by the blanking operation on blanking machine. The sheet is provided manually for the blanking operation. After then blank is provided and again remove the sheet manually. Thus, it causes improper utilization sheet metal. And the time required for the operation is more and which leads to low productivity. By observing we came to conclusion that operation is not safe for the blanking and for the operator also as the fingers of the operator are hurted. As per the company norms, safety of employees is being come first. So by analyzing all these factors the company took a decision to reduce the cycle time for the blanking operation and in the interest of safety of operators we are design and manufacturing the attachment which will reduce the cycle time and absolutely safe to handle. Any physical activity in this world by human being causes great discomfort. For remaining competitive every attempt is been made to minimize the required labour and cost. Keeping focus on achieve all these objectives brain storming session was held and decided to design and develop attachment which can reduce the manual effort n great extent in terms to achieve higher productivity, safe working, accident free and economic.

II. METHODOLOGY

A. Compressor

Air compressors are the energy conversion elements in pneumatic system. They impart mechanical energy to air by compressing it. The main difference between pumps and compressor is that the fluid delivered by compressors air, is compressed and under pressure at the time it is delivered, even if there is no load on the system. Most devices used to compress air are similar in concept and perhaps even in hardware to hydraulic pump and selection considerations are also similar. An air compressor is a device that converts power (using an electric motor, diesel or gasoline engine, etc.) into potential energy stored in pressurized air (i.e compressed air). By one of several methods, an air compressor forces more and more air into a storage tank, increasing the pressure. When tank pressure reaches its upper limit the air compressor shuts off. The compressed air, then, is held in the tank until called into use.

B. Pneumatic Cylinder

Pneumatic cylinders (sometimes known as air cylinders) are mechanical devices which use the power of compressed gas to produce a force in a reciprocating linear motion. In pneumatic cylinder a compressed air is used as working fluid and converts it into kinetic energy as the air expands in an attempt to reach atmospheric pressure. This air expansion forces a piston to move in the desired direction. The piston is a disc or cylinder, and the piston rod transfers the force it develops to the object to be moved. Engineers prefer to use pneumatics because they are quieter, cleaner, and do not require large amounts or space for fluid storage. Because the operating fluid is a gas, leakage from a pneumatic cylinder will not drip out and contaminate the surroundings, making pneumatics more desirable where cleanliness is a requirement.

C. Direction Control Valve

The directional valve is one of the important parts of a pneumatic system. Commonly known as DCV, this valve is used to control the direction of air flow in the pneumatic system. The directional valve does this by changing the position of its internal movable parts. This valve was selected for speedy operation and to reduce the manual effort and also for the modification of the machine into automatic machine by means of using a solenoid valve. A solenoid is an electrical device that converts electrical

energy into straight line motion and force. These are also used to operate a mechanical operation which in turn operates the valve mechanism. Solenoids may be push type or pull type. The push type solenoid is one in which the plunger is pushed when the solenoid is energized electrically. The pull type solenoid is one in which the plunger is pulled when the solenoid is energized. The name of the parts of the solenoid should be learned so that they can be recognized when called upon to make repairs, to do service work or to install them.

D. FRL Unit

Air leaving a compressor is hot, dirty, and wet—which can damage and shorten the life of downstream equipment, such as valves and cylinders. Before air can be used it needs to be filtered, regulated and lubricated. An air line filter cleans compressed air. It strains the air and traps solid particles (dust, dirt, rust) and separates liquids (water, oil) entrained in the compressed air. Filters are installed in the air line upstream of regulators, lubricators, directional control valves, and air driven devices such as cylinders and air motors. Airline filters remove contaminants from pneumatic systems, preventing damage to equipment and reducing production losses due to contaminant related downtime. Downtime in an industrial plant is expensive; often it is the result of a contaminated and poorly maintained compressed air system.

III. DESIGN AND CALCULATIONS

A. Force Calculation:

Diameter of Piston (d) = 10mm

Diameter of Bore (D) = 32mm

Length of cylinder (L) = 300mm

TABLE I. FORCE CALCULATIONS

Sr. No.	*Pressure (Bar)*	*Force Required For Forward Stroke (N)*	*Force Required For Reverse Stroke (N)*	*Force Exerted on Clamping Device (N)*
1	2	0.160	0.145	0.160
2	4	0.321	0.290	0.321
3	6	0.482	0.435	0.482
4	8	0.043	0.580	0.043
5	10	0.804	0.725	0.804

B. Free Air Consumption:

Diameter of Piston (d) =10mm

Diameter of Bore (D) = 32mm

Length of cylinder (L) = 300mm

TABLE II. FREE AIR CONSUMPTION

Sr. No.	*Pressure (Bar)*	*Free air consumption for forward stroke (Litres)*	*Free air consumption for return stroke (Litres)*
1	2	0.160	0.145
2	4	0.321	0.290
3	6	0.482	0.435
4	8	0.043	0.580
5	10	0.804	0.725

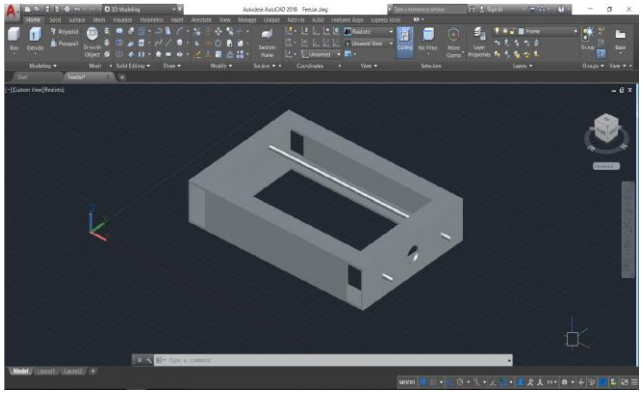

Fig. 1. CAD Drawing

IV. COST BENIFIT ANALYSIS

A. Time requirement:

Manual operation: The cycle time to produce one blank without feeder is 5-7 second. In one hour without feeder blank produces 600 on sheet. By considering shift of 8hrs the blank produces are 4200

Machine operation: The cycle time to producing one blank with feeder is 3-5 second. In one hour with feeder blank produces 900 on sheet. By considering shift of 8 hrs the blank produces are 6300.

TABLE III. TIME REQUIRED

Manual operation		*Machine operation*	
No. of jobs	*Time require (min)*	*No. of jobs*	*Time require (min)*
1	5-7	1	5-7
600	1 hr	600	1 hr
4200	8 hrs	4200	8 hrs

B. Cost per piece:

Manual Operation: The shift rate of operator is Rs. 300. And number of jobs completed in 1 shift is 4200 as per the table given above. So, the cost of one job is Rs. 0.07.

Machine Operation: The shift rate of operator is Rs. 300. And number of job completed in 1 shift is 6300 as per the table given above. So the cost of one job is Rs. 0.04.

TABLE IV. RATE FOR ONE JOB

Manual operation		*Machine operation*	
No. of jobs	*Rate (Rs)*	*No. of jobs*	*Rate (Rs)*
4200	300	4200	300
1	0.07	1	0.07

Saving for one job = Rate for manual operation for 1 job - Rate for machine operation.

In one day for one job

= Rs. 0.07 – Rs. 0.04

= Rs. 0.03

Saving for 6300 = Rs. 0.03 X 6300

Jobs in one day = Rs. 189

Monthly saving = Rs. 189 X 26

= Rs. 4,914

Yearly saving = Rs. 4914 X 12

= Rs. 58,968

C. Electricity Consumption:

TABLE V. ELECTRICITY CONSUMPTION

Component	**Power rating (KW)**	**Monthly Working Hours**
Compressor	0.746	208

Electricity cost = Unit Rate X (KW-Hr)

= Rs. 10 X 0.746 X 208

= Rs. 1,551.68

Electricity cost (Yearly) = Rs. 1,551.68 X 12

= Rs. 18,620.16

D. Total Cost:

Monthly Maintenance cost = Rs. 500

Yearly Maintenance Cost = Rs. 500 X 12

= Rs. 6,000

Total Cost Saving Yearly = Part A – (Part B + Part C)

= Rs. 58,968 – (Rs.208 + Rs. 6,000)

Total Cost Saving Yearly = Rs. 52,759

Total Cost of Machine = Rs. 9,440

Thus by above cost analysis we can calculate the attachment profitable and the attachment has a high returns on investment.

V. CONCLUSION

In this paper the design and manufacturing of pneumatic feeder is presented. The benefit of this paper is that is help to pass the metal sheet and reducing the human effort. The solution is economically viable, due to its simple construction and the use of inexpensive materials and construction methods. The reduced processing cycle also allows a higher production rate. The design of machine is simplified and robust life of machine is longer and the operator can do the blanking operation without paying too much attention and it can be easily done with less time compared to conventional method of using file for the blanking operation. As all safety precaution are implemented during manufacturing there will be no harm to a person operating the machine. With the help of this attachment we have proved that operation time is reducing 2 to 3 sec and 30% production are increased. Thus the productivity of the blanking operation is improved resulting into high profit to the company.

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BIOGRAPHIES

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