A REVIEW ON SHEET METAL CUTTING/SHEARING MACHINE

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ABSTRACT

This paper presents a review on Design and Fabrication of Pneumatic Sheet Cutting Machine. Automated pneumatic sheet metal cutting has been used for cutting sheets made of galvanized iron and aluminum of various thicknesses. The automation provides ease to enter the number of sheets to be cut and required length of the sheet. The system is working by pneumatic pressure which consists of air compressor, pipe lines, control valves and pneumatic cylinder in it. Usually hydraulic operated sheet cutting machine is used. But pneumatic system is suitable for small scale industries according to their requirements. The design is particularly suited for the applications where working space is constrained. Pneumatic systems are useful when sheet metals are need to be cut in hazardous areas such as oil and gas refineries and in chemical factories. Further it is seen that, the employment of automation system makes the cutting process more accurate, time efficient and increases productivity as compared to conventional non-automated sheet cutting machine.

Keywords: Sheet Metal, Sheet Cutting, Shearing, Pneumatic, Metal Cutting.

I. INTRODUCTION

Sheet metal is a metal formed into thin and flat pieces. It is the fundamental forms used in metal industry that can be cut or bent into variety of different shapes. Sheet metals are available in flat sheets or as a coiled strip. The shearing machine is most important in sheet metal industry. In most of the small scale industries, hand sheet cutters are used which requires human effort to cut down metal sheets. It can be replaced by a pneumatic cutting machine which can cut the sheet metal at a faster rate and in a convenient way. The main objective of our project is to perform sheet cutting operation effectively with less human efforts by using a machine with the pneumatic power. This will also reduce the time required for metal cutting by automation. By using this machine we can increase the production rate and automatically the industry will be in profit. The main advantage of pneumatic system is cheap and easy to handle. In Cutting processes, a piece of metal sheet is separated by using force which is hydraulic or pneumatic, large enough to cause failure. The most common cutting procedures are performed using shearing power, so they are sometimes called shearing procedures. If a large enough shear force is used, the shear pressure in the case will exceed the final shear strength and the material will fail and separate at the specified location. This shearing power is used with two tools, one on top and one on the bottom of the sheet. Whether these tools are punch and die or high and low blades, the tool over the sheet brings a quick downward force to the metal sheet that sits on top of the lower tool to cause failure. A small clearance exists between the edges of the upper and lower tools, making it easier to break things. The size of this removal is usually 2-10% of the thickness of the material and depends on a few factors, such as the specific shearing process, sheet thickness and equipment used. The effects of shearing on objects change as the cutting progresses and is reflected in the edges of the shaved objects. When the punch or blade touches the sheet, the clearance between the tools allows the sheet to be rotated and "rollover" at the edges. As the tool enters the sheet further, the shear causes a direct hot spot of the material, finally, the shear pressure is very high and the material breaks at an angle with a small burr formed at the edges. The height of these cut pieces depends on a number of factors, including the sharpness of the tools and the alignment between the tools.

II. LITERATURE REVIEW

Avinash Jathar

They have produced hydraulic sheet shearing machine. This machine belongs to the sheet metal industry and can be made into many machines and should be used as a straight circular cum cutting machine. The machine is easy to maintain and easy to use. So they experimented with Hydraulic Cutting Machine as the punch dropped on the metal and the pressure exerted by the punch first caused the flexibility of the metal plastic. As the clearance between punch and death is limited, plastic rotation occurs locally, the metal near the cutting edges of the punch and the edges of the die becomes heavier, causing the fracture to start on both sides of the punch.
sheet as deformation progresses. The idea for this project is to produce this machine as there is a hand-operated metal cutting machine in their college workshop. In that machine, the sheet metal is inserted between two shearing blades of the machine and the metal is pulled down to move the upper blade and cut a piece of work.

Rasika S. Khairkar
Shearing is the process of cutting metal sheets using two blades, by applying shear pressure near the thickness of the sheet. Shearing occurs with severe degeneration followed by a fracture that spreads deep in the middle. The upper blade is focused on a ram-assembling machine that moves upwards and the lower knife is fixed on a fixed base table. This project is based on the industry's need for a 5mm thick steel-cutting steel cutting machine. In this project they designed a CAD model for the shearing machine and analyzed using the FEA method.

Neeraj Pandita
This is an industrial era and in order to have accurate surface finish and obtain a high degree of flexibility in the manufacturing processes in the industries, a lot of work is done on sheet metal processing. To meet industry demand, sheet metal is cut and bent into a variety of shapes. This is a review of previous work done on a sheet of paper in which the process of cutting and folding of paper is studied under various conditions. Pneumatic sheet cutting machines are one of the most effective ways to make sheet cutting and bending processes effective. This work reviews the reliability, performance and opportunities to simplify the design of wind turbine cutting machines. The current function also updates the energy lost in the air cylinder during operation to transfer power to the cutting blade. The energy efficiency of pneumatic systems is a key factor in the overall development of a continuous production process.

Mr. Tushar Devidas Garse
Usually a sheet metal cutting machine operates with one hand for medium and small scale industries. The project states: "Water Sheet Cutting Machine Analysis and Repairs Using FEA". Any automated machine intended for the use of personal savings, machinery, and essentials when considering company profits. A metal cutting machine is used to cut a small metal sheet size. The machine is portable in size, so it is easy to carry. The sheet metal cutting machine works with the help of a hydraulic cylinder to cut the sheet. The piston is connected to a moving cutting tool that will cut the sheets.

III. RESEARCH GAP
In the current situation, sheet cutting machines can be hydraulic or manually operated. In some industries, a hand-operated hand sheet cutter is used. Therefore, we had the idea of a pneumatic sheet cutting machine capable of cutting sheet metal up to 30 mm in size which would be automatic using other sensors to cut sheets. This is actually a model that can be useful in small and medium enterprises to increase productivity and can be used effectively there. The main objective of our project is to perform the cutting operation successfully with minimal human effort using a powerful pneumatic system.

IV. WORKING PRINCIPLE
Compressed air from the compressor is used as the power for this sheet cutting operation. There is a pneumatic double acting cylinder, flow control valve, solenoid valves and a time unit used for work. The controlled air of the compressor from the flow control valve enters the solenoid valve. At one point the air enters the cylinder, pushes the piston to get a shot and in the next place the air enters the other side of the cylinder, pushing the piston back, to get the stroke to do the job. The cutting speed of the sheets and the release stroke varies by the timer control unit circuit.

V. CONCLUSION
Based on a review of published information on design and analysis of sheet cutting machine, the following conclusions can be drawn:
1) Normally the sheet metal cutting machine is manually hand operated one for medium and small scale industries.
2) Hydraulic sheet metal cutting machine is used for large scale industries for sheet metal cutting.
3) Pneumatic sheet cutting machines can be used in small or medium scale industries which will be economic.
VI. REFERENCES


