

Design and Fabrication of Model of Gas Profile Cutting Machine and Studying Cutting Speed and Time for Given Profile

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Abstract – The Project about Cutting metal Plates in various Shapes and profiles with good accuracy level and economically, automatically. we thought to device an Automized gas profile cutter, by using mechanical and electrical components. By these we would be able to cut the metal plates of particular size in given shape, with high accuracy and high cutting speed. It can cut given shape in single plane, by synchronized motion of cutting nozzle, using electro-mechanical components. It would be accurate high speed and economical.

I. INTRODUCTION

To the extent the creation division of the businesses is worried with different machines and types of gear are utilized. There is a great deal of interest for those machines which are required for cutting operation at the fancied areas up to required resistances and ebb and flow states of required thickness. So we are presenting "Profile gas cutting machine" which will be extremely helpful for little scale and also for medium scale commercial ventures that are for the most part occupied with the manufacture kind of work. Practically every gathering embraced at the shop floor requires gas cutting as one of its fundamental operation. The profile gas cutting of mellow steel, stainless steel, fast steel sheets have awesome significance in manufacture work. Every assembling strategy has an arrangement of particular prerequisite which can be met by utilizing a profile gas cutting machine. So while selecting this anticipate one of the primary intention is to have point by point investigation of gas cutting operation and the configuration of profile gas cutting machine.

Oxyacetylene gas slicing is generally used to cut gentle steel sheets. A blend of oxygen and acetylene smolders as a serious/centered fire, at around 3,500 degrees centigrade. At the point when the fire interacts with steel, it liquefies the surface shaping a liquid pool, permitting slicing to happen. Oxyacetylene can likewise be utilized for brazing, bronze welding, and forging/molding metal. Slicing is three to five times quicker than the routine metal cutting techniques. The ordinary machines, which are available now-a-days in the business sector is not having the course of action of self-portability. Our profile gas cutting machine has game plan for the slicing arm to proceed onward its own utilizing D.C electric engine .The motivation behind the assembling the machine is that it will give least cost of creation. Additionally the wastage of smoldering gas is less due to controlled movement of the

apparatus along the X, Y and Z hub. Additionally it requires less expertise and less time for cutting operation, precision picked up is likewise more.

II. MARKET SURVEY

1. In this paper we have successfully studied about the machine a market survey was carried out, on the different forms of profile gas cutting machine available in the market. Following paragraphs give brief information on the machines available in the market and how different this machine works.[1]
2. Optical profile cutting machines is a modem co-ordinates gas profile cutting machine with photoelectric control. The machine is specially developed for use in small and Medium size workshop. The machine is designed for high accuracy in cutting. This machine having cutting area about 775×660 mm. As well as cutting thickness & speed is 5-20mm & 100-1000mm/min. Maximum torch of this machine is 3. This machine Power consumption is 240v. Cost of this machine is 46500/-.[2]
3. CNC profile cutting machines is a modem gantry type dual drive CNC profile cutting machine suitable for oxy-acetylene and plasma cutting applications. These are available in different sizes, which accommodate cutting widths from 2 meters to 6 meters with a cutting speed range 70-4000 mm/min and also with rapid traverse of 10,000 mm/min. And cost of this machine is 220000/- .[3]
4. The Automatic Gas Cutting Machine is the machine manufactured by us. It is a new concept proposed, in which a magnet follows the path of the profile to be cut. It reduces operators fatigue and also save cycle work time.[4]
5. From the above information, it is can be seen that the optical gas cutting machine has less cost but has less accuracy and on the other hand the CNC gas cutting machine has more accuracy but more cost. But the profile

gas cutting machine can overcome both these disadvantages. [5]

III. OBJECTIVE OF PROJECT

The objectives of the study are:-

1. To study the process of detailed study of literature.
2. To study design and fabrication of profile gas cutting machine.
3. To study the testing and analysis of profile gas cutting machine

IV. SCOPE OF THE PROJECT

This project focuses on reducing the operator fatigue at small scale level also at an economical erection cost.

The project work is carried out for the following purpose:-

- 1) Cutting metals that are in intricate form and requires a good finish and accuracy.
- 2) For cutting the sheets and huge rods in steel industry and other workshops and selling places.

V. PROBLEM DEFINITION

The optical gas cutting machine and the CNC cutting machine which are being used in small scale and medium scale industries has certain limitations. The profile gas cutting machine has emerged with the aim of overcoming these limitations. It is necessary to have a detailed study and performance of profile gas cutting machine so that it can be used in small scale and medium scale industries.

The conventional machines, which are present now-a-days in the market is not having the arrangement of self mobility. Thus, so as to be mentioned the main criteria for the industrial applications and processes have a problem with the conventional methodology of metal cutting or profile cutting of metals to create intricate or complex shaped parts. Hence we rightly present it as the problem statement, which is further being solved by the profile gas cutting machine.

The figure shown below is a representation of how the problem rectification for the conventional metal cutting process in industrial operations is highlighted.

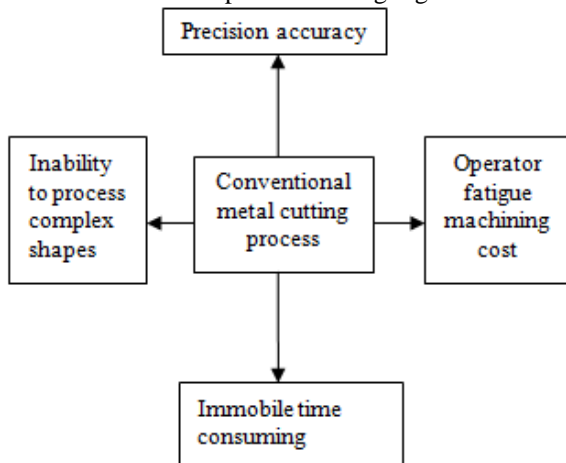


Fig.1.Limitations of conventional metal cutting process

VI. CONCEPTUAL DIAGRAM

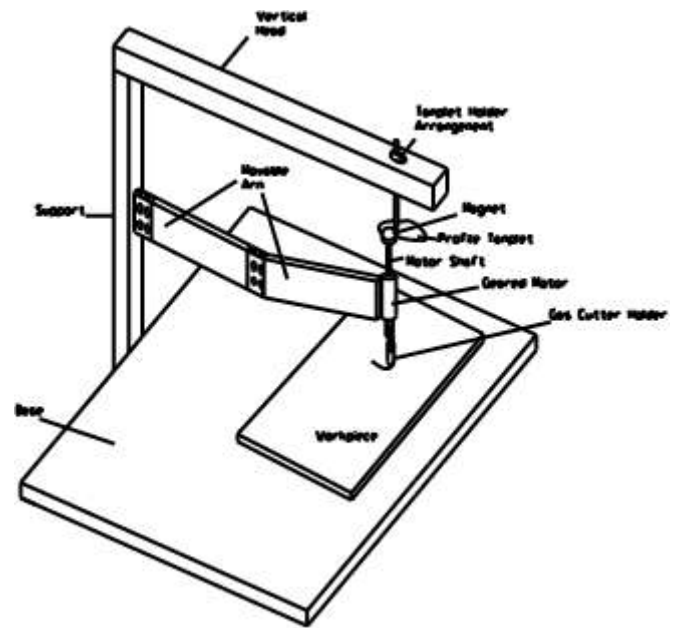


Fig2. Concept drawing of profile gas cutting machine

VII.WORKING PRINCIPAL

Now a day, it is difficult to cut the complicated shapes like a circle, rectangle, triangle, etc. At required time and accuracy.

In order to cut the metal in above shapes a template is required. This template is fixed on the template holder. On the surface of the template various shapes like rectangular, square, circular, triangular, ellipse, etc. Are formed They are shaped in the form of grooved on the template as pathways for the movement of the magnet which is fixed at the extended portion of the motor shaft and is moved automatically in the groove found on the template which helps to cut the material in to the required shapes.

When this magnet moved along the groove the nozzle holder which is fixed on one side of the link is also found to be moving in the same manner as the magnet moves. The job to be cut is fixed on a cross frame which acts as a base. The height of the template can be adjusted by means of raising the template holder with help on an external threaded handle. Job holder can be moved and can be positioned at any angle as per our convenient for cutting the material. As the machine works in a simplest way even without using any power before operation a machine setting of a job and marking has to be done

After setting the job a free error trial can be done by moving the magnet along the groove for the required shapes to be cut. After trial is over the oxygen and acetylene gas is allowed to flow from the cylinder to the required proportions of the metal in the form of flame.

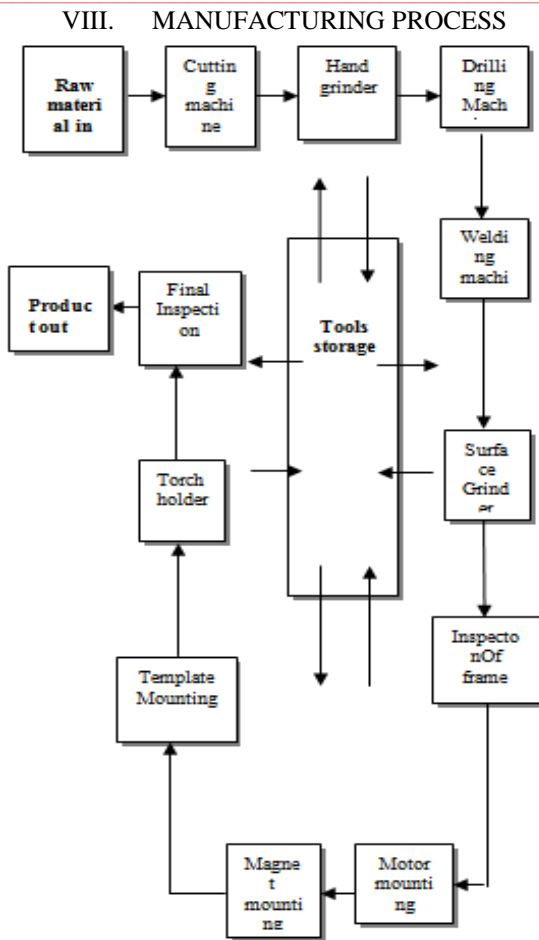


Fig 3. Manufacturing process

IX. METHODOLOGY

The entire process is a manufacturing planning and control concept. It is summarized in the figure below:

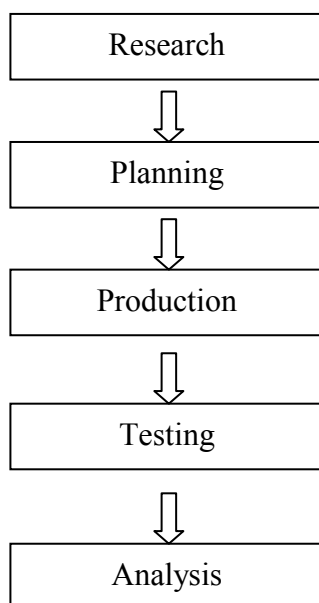


Fig. 4 Generalized methodology for the project

Advantages:

1. The gas cutting holder can move in all three axes, making it more flexible.
 2. The profile gas cutting machine is mobile i.e. it is portable.
 3. It is compact in size.
 4. It requires less time for cutting repeated jobs.
 5. It requires less power for its operation.
 6. Its maintenance is easy.
 7. It requires less skill for its operation.
 8. It is cheap as compared to CNC gas cutting machines.
- Any type of materials section can be gas cut

X. FUTURE SCOPE

1. By installing high torque low r.p.m motor, it can be used as the tapping machine.
2. By installing extra attachment it can be used as grinding or buffing machine.
3. By installing a special speed variation gear box, good surface finish of profiles can be obtained

XI. MAINTENANCE

For the longer life of the profile gas cutting machine, there are certain maintenance procedures to be followed. This ensures smooth working and durability of the machine. Below mentioned are the different maintenance procedures:

1. The gas holder is required to be replaced if it gets worn out.
2. The magnet guide-shaft is to be replaced if it slips or sometimes misaligned.
3. The bearings are required to be oiled for smooth functioning.
4. The bearing shaft is required to be replaced when it is damaged or worn out.
5. The magnet needs to be protected from moisture as it tends to loose its magnetism due to moisture.
6. As the machine is a heat resistant one, there should be periodic checking of fittings, weld and color.

XII.RESULT

After the complete manufacturing of the project following accepted result were observed:

1. The machine is able to cut various complex contours like circular and rectangular.
2. From the analysis being carried out it shows that the process is statistically under control and can operate within 4mm tolerance.
3. An allowance of -10mm is to be provided to the profile in order to get the required dimensions of the cutout component i.e. the profile should be made 10mm smaller in size to get the required exact output.
4. As compared to other machines available in the market this machine is more compact and economical.

XIII. CONCLUSION

The profile gas cutting machine is aimed at reducing cycle time for cutting operations and it can easily achieve mass production. Based on the current trend we found that the gas cutting machine is needed in almost all shop floor areas. The machine we manufactured is highly accurate and precise. The cost of profile gas cutting machine is lower to that of the optical gas cutting machine or CNC gas cutting machine. Moreover our machine requires no skill to operate and is capable of self-mobility. In the near future our machine will surely end as an emerging trend.

XIV. ACKNOWLEDGEMENT

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