Automatic Welding Machine for Exhaust Pipes Using MIG Welding Process

Sumit Salunke [1], Madhura Mali [2], Omkar Yande [3,] Prof. Venugopal Kulkarni[4]

[1]U.G. Student, Mechanical Engineering, MIT Academy of Engineering, Pune, India.
[2]U.G. Student, Mechanical Engineering, MIT Academy of Engineering, Pune, India
[3]U.G. Student, Mechanical Engineering, MIT Academy of Engineering, Pune, India.
[4]Professor, Department of Mechanical Engineering MIT Academy of Engineering, Pune, India.

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Abstract - *An abstract Industrial automation is a necessary process for getting maximum economic benefits and the production rate of a certain product. Reduction in the scrap, as well as errors and achieving a higher working (optimal) time period comparatively, with precision, is the main aim of any automation industry. The welding industry is undergoing ups and down which makes new improvements and techniques necessary. The solution for such must be through innovation and the new technology to change traditional methods and bring the industry to a higher level. MIG (metal inert gas) welding is the most commonly and widely used welding process for pipes and shafts in the automobile industry. Welded joints may not be reliable unless weld is of good quality and tough. This paper talks about the design manufacturing and testing of one such machine which provides automation in welding of the exhaust pipe to the flange. The new design has the aim to reduce the losses that came under manual approaches such as over welding, time delay and loss of contact between the electrode and surface. The new automated design uses electronic knowledge to handle the automation activities, sensor base working provides accurate result under the ongoing process and the final product.*

*Key Words***:** Automated design, Exhaust pipe, Flange, MIG welding

1. INTRODUCTION

1.1 Problem Statement

To design an automated welding machine capable of welding two circular parts circumferentially with accuracy.

1.2 Aim

Because of the way that measures are getting increasingly stringent in pipeline welding, all joints are required to be uniform and it is hard for the welder to agree to these prerequisites, and by development of funnel welding applications. The need of programmed pipe welding machine that weld pipe in its area with higher efficiency, more noteworthy weld quality, lower cost, and exactness got one of the significant prerequisites now.

1) Pick the best structure for welding from three distinct structures wherein the weld quality is high, and deformity free as could be expected under the circumstances.
2) Diminish the time required to finish the welding procedure with a decrease of laborers, which expands efficiency and benefits.
3) Automatic welding process compared with manual welding and find differences between them.

1.3 Problem Identification

According to the industry there arrives a problem at the welding operation of the two mechanical jobs of an exhaust pipe of an engine of some particular automobile.

The welding is a circumferential type of welding wherein the following problems were identified:

1) Over welding of the parts.
2) Time delay in welding the parts.
3) Low production rates due to manual operation.
4) Labor cost.

1.4 Introduction to Welding

Welding is a procedure where permanent joint is created by heating the material up to reasonable temperature with or without use of filler material. On the off chance that filler material is not quite the same as base material it is heterogenous welding.

As welding requires high temperature so there is always comes a risk about fire, various welding defects, properties change during heating. Sometimes this problem may face a drastic damage over the industrial image as well as productivity of the process. So, welding requires attention and knowledge to avoid such problems.

Welding is a manufacturing process that joints similar or dissimilar material, generally metal or thermoplastic by using different flux material. This electrode flux is used to create protective gas shield while welding which avoid the

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toxic gases which is coming out from welding to get mixed up with the environment.

1.5 Introduction to Exhaust System

The idea exhaust frameworks are created to control discharges and to constrict commotion vibration and brutality to meet the administrative necessities. The fumes framework parts are complex, close coupled and underbody exhaust systems, adaptable roar, suppressor, resonator, interfacing channels, ribs, and tailpipe. The piece of the fume's framework containing the complex, converter and the flex joint is named as hot end since this piece of the framework is moderately hot because of the hot fume's gas going through these segments.

The part comprises of middle of the road funnel, resonator and the suppressor are named as chilly end since the gas will in general chill off from the exit of the flex tube. The temperature of the hot finish of the fuel worked vehicle can be as high as 1050°C while the most noteworthy temperature of the virus end is about 650°C. Material determination of a fume's framework relies upon a few parameters like utilization temperature, land area and application. Contingent on the vehicle application, the material choice varies. The materials for the most part utilized in exhaust frameworks are solid metal, hardened steel, gentle steel/carbon steel.

2. LITERATURE REVIEW

A. The research paper titled as 'Design of Automatic Welding System for Process Pipes' [1] whose authors are Amritesh Jha, N.I. Jamadar expressed their thoughts as, Automatic welding machine (AWS) is much better than conventional welding if designed properly. The movement of welding gun is in XY direction. They designed AWS using embedded system, stepper and welding torch. The gyro sensor accelerometer collects information about the work piece geometry and manual weld progression of torch with respect to work piece. The manual weld progression welder is fed to the stepper motor when power starts the torch will do welding in way assigned to AWS. They made stand which carries the wire feed and stepper motor structure wooden so that to it can be adjusted in length and size.

B. The article titled as 'JIS G3472 Electric Resistance Welded Carbon Steel Tubes for Automobile Structural Purposes' [2] helped us to choose right material of right grade. The material for exhaust pipe to be used need not to be of high yield strength. The material should be of low carbon as low carbon steel have higher ability of welding. Therefore, material selected for manufacturing of exhaust pipe and flange respectively are- JIS G3472 (STAM 290 GA),

FE 410-S.

Grade	Designation	(Reference Traditional symbol	Remark
Grade G	STAM 290GA	STAM 30GA	Tubes used for general parts of automobile structures
	STAM 290GB	STAM 30GB	
	STAM 340G	STAM 35G	
	STAM 390G	STAM 40G	
	STAM 440G	STAM 45G	
	STAM 470G	STAM 48G	
	STAM 500G	STAM 51G	
Grade H	STAM 440H	STAM 45H	Tubes used for, among parts of automobile structures, those of which yield strength is particularly
	STAM 470H	STAM 48H	
	STAM 500H	STAM 51H	

Fig -1: Chemical Composition OF JIS G3472

3. EXISTING METHOD

In existing method, the worker needs to be highly skilled and experienced for defect less weld. The worker does not have proper fixture which is one of the main reasons for failure of weld. Also, the start and end of welding point is difficult to match as the worker manually weld circular section which require high skill. The welding sometime overall or fail to connect start and end point because worker fail to stop welding at correct time.

4. NEW DESIGN

New design is suggested to overcome the first design old method. As due to the rotation of nozzle the problem obtained can be avoided by generation a mechanism which will rotate the base plate which holding a pipe job and to kept the nozzle fixed. A nozzle and the job are concentric with each other so that gap is maintained. Due to this design we can achieve Max precision with little error. The new design provide operator a better performance as well it contains the mass production functionality so that it is flexible to use for variable diameter. Following Fig.2 (a) and Fig.2 (b) shows CATIA representation of new design.
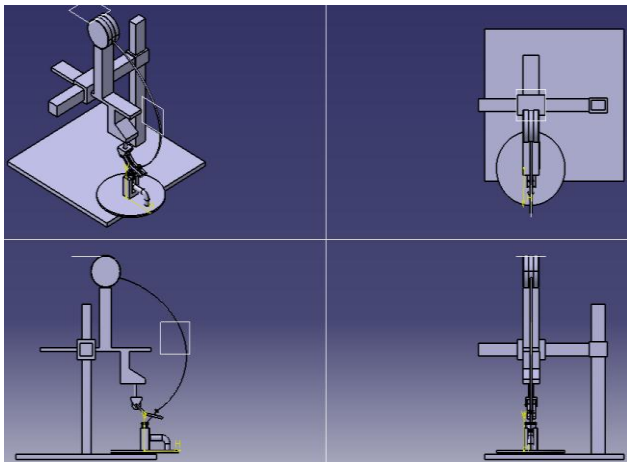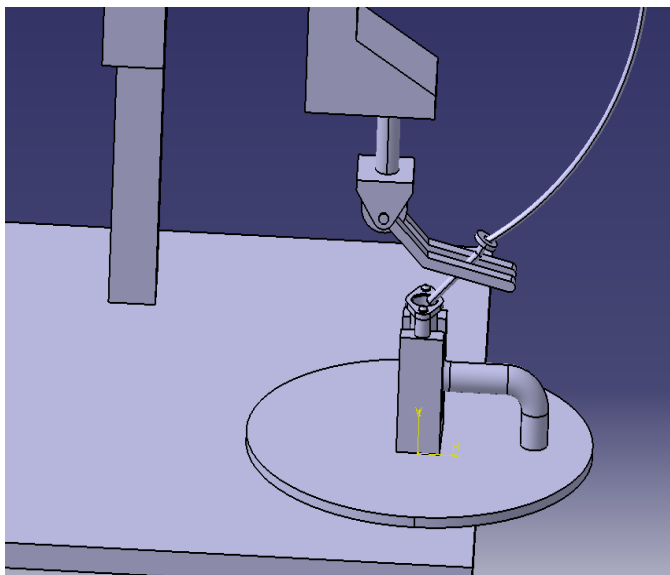
Fig- 2 (a): Views of CATIA Model

Fig- 2 (b): Views of CATIA Model

5. SUMMARY OF INVENTION

After completing the major project on Automatic Welding Machine. We would like to thank our internal guide, and experts of the concerned department who have guided us.

5.1 Advantages

- Low skilled worker required.
- Less defective parts.
- Production units increased.
- Less cycle times.

6. RESULT

Table -1: Result Analysis

Sr. No.	Parameter	Manual Machine	Automatic Machine
	Job fixing time	5 sec	2 sec
	Welding time	6 sec	3 sec
	Cycle time	11 sec	5 sec
	Problem identified	Discontinuous weld, overlapping of weld, Job burning	-
	Number of defective parts per lot (1 lot= 50 jobs)	12	2
	Quality passed Job production per day	350-400	750-800

7. FUTURE WORK

1) The fixture can be further modified for pipe and flange of different diameters.
2) Automatic job ejecting mechanism can be implemented.
3) To insert multiple job at same time hopper can be used with job alignment mechanism.

8. CONCLUSION

The thesis was on the automatic pipe welding machine, and chooses the best form of welding between the three forms that mentioned earlier. Reduce the costs that can be obtained by reducing the number of workers, in addition to reducing the damage in the material where there is no change in the welding from start to finish as the gap remains constant, and constant speed of movement of the welding gun, all this in addition to time need to finish the process reduce costs offset by an increase in profits.

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BIOGRAPHIES

Sumit Salunke, U.G. Student, Mechanical Engineering, MIT Academy of Engineering, Pune, India.

Madhura Mali, U.G. Student, Mechanical Engineering, MIT Academy of Engineering, Pune, India.

Omkar Yande, U.G. Student, Mechanical Engineering, MIT Academy of Engineering, Pune, India.

Prof. Venugopal Kulkarni, Department of Mechanical Engineering, MIT Academy of Engineering, Pune, India.