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A Research Paper on Automatic Welding Machine

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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 on going process and the final product.

I. INTRODUCTION TO AUTOMATIC WELDING MACHINE

Welding is a process of joining two metals in the presence of suitable amount of heat with or without application of pressure. Welding is responsible for permanent joints. Conventionally there was manual process of welding in industries but with time in order to increase productivity, accuracy, safety and many more parameters automation was introduced and has been increasing since. Human welders have been replaced by robot welders as it gives maximum throughput as well as they have a greater accuracy. But automation in industries is expensive thus, only large-scale industries can implement it in their plants but now-a-days it is possible to build an automated welding system of low cost by using various strategies. Welding is a critical process in manufacturing in industries like aerospace it demands highly skilled operators who can accurately perform the elements. No matter how skilled the operator is there will always be errors due to the complicated process of TIG welding, manual TIG welding demands good coordination as the welding process requires both the hands one to manually feed the filler and the other to manipulate the torch such that the arc length is short while preventing contact between torch and work piece. In order to tackle the problems caused by this our team took up the project to automate the process improving both efficiency and accuracy while reducing the cost of the welding processes.

II. PROBLEM STATEMENT

1) There are so many rejections in components because of uneven welding.
2) There are so many wastages of time as well as money.
3) Aesthetically Product Shape will be change.

III. SOFTWARE AND HARDWARE USED

- Software Used:
1) Operating System (Windows 10)
2) CAD
3) ANSYS
4) CATIA

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- Hardware Used:

1) AC Motor
2) PLC Controller
3) Welding Machine

IV. OBJECTIVE

1) To increase the production in less time and in less cost.
2) To make product aesthetically well.
3) To improve the strength of welding.

V. METHODOLOGY

Automatic welding is defined as welding operations where all parameters are pre-set and cannot be adjusted during welding.

1) Mechanized welding is where all the activities are performed automatically but the welding variables can be changed during welding.
2) Many extra.

VI. SYSTEM FOR AUTOMATIC WELDING

1) Machine Vision System

Machine vision is the interpretation of an image of a scene or an item using optical, non-contact sensor mechanics in order to gather data and manage systems or processes. Camera and controller play an essential part in machine vision systems. With a camera, a picture of the worktable with the object on it can be taken. A camera controller is used to determine the position, size, and orientation of the work piece after the image has been captured. The controller then uses. Computations to control the electrode. Welding can be done precisely in this way.

2) Weld tracking based on artificial vision

His algorithm describes a welding system that uses a laser vision approach. The design can operate on self- components and in a low-performance computer (webcam and laser). In this study, a laser-stripe system for welding process automation in heavy industries is given. The first stage in this technique is image capture; the images contain data about the laser emitted onto the work piece. After that, photos are noise-removal filtered. Every 250 milliseconds, the webcam take an image to collect data on the welding groove. Shape recognition is the next phase. For analysis and interpretation of the image, an image processing algorithm is used. After shape recognition, data is filtered to remove noise. This paper median filter is utilized here. This algorithm describes a welding system that uses a laser vision approach. The design can operate on self- components and in a low-performance computer (webcam and laser). In this study, a laser-stripe system for welding process automation in heavy industries is given. The first stage in this technique is image capture; the images contain data about the laser emitted onto the work piece. After that, photos are noise-removal filtered. Every 250 milliseconds, the webcam takes an image to collect data on the welding groove.

Shape recognition is the next phase. For analysis and interpretation of the image, an image processing algorithm is used. After shape recognition, data is filtered to remove noise.

VII. LITERATURE REVIEW

1) **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.

2) 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),

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IX. 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 fails to stop welding at correct time.

X. DESIGN

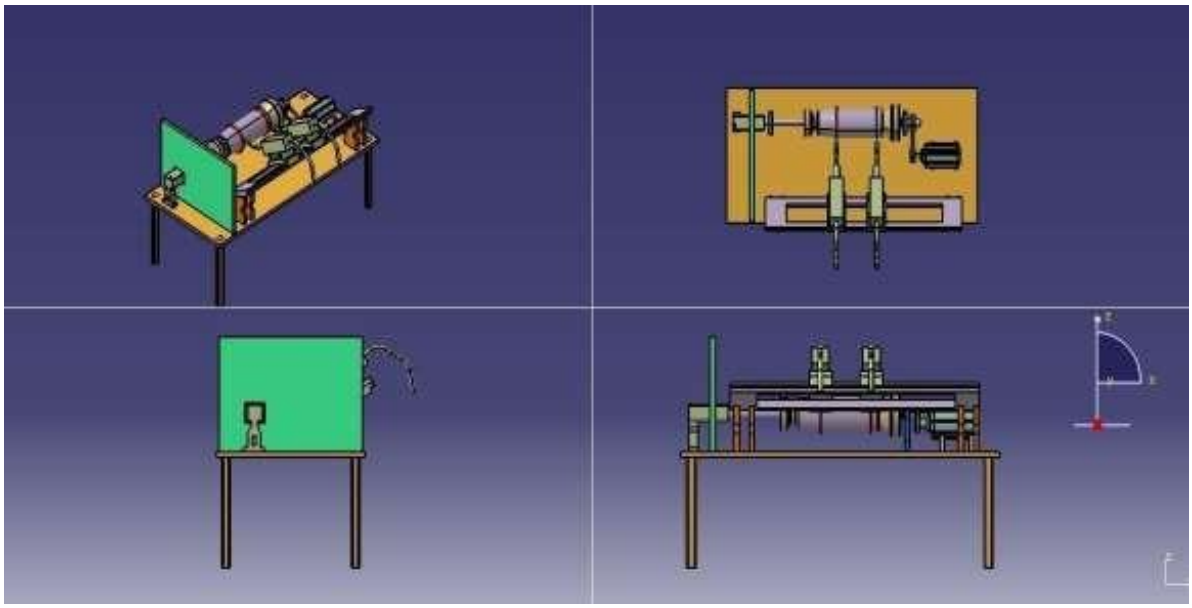

Fig- (a): Views of CATIA Model

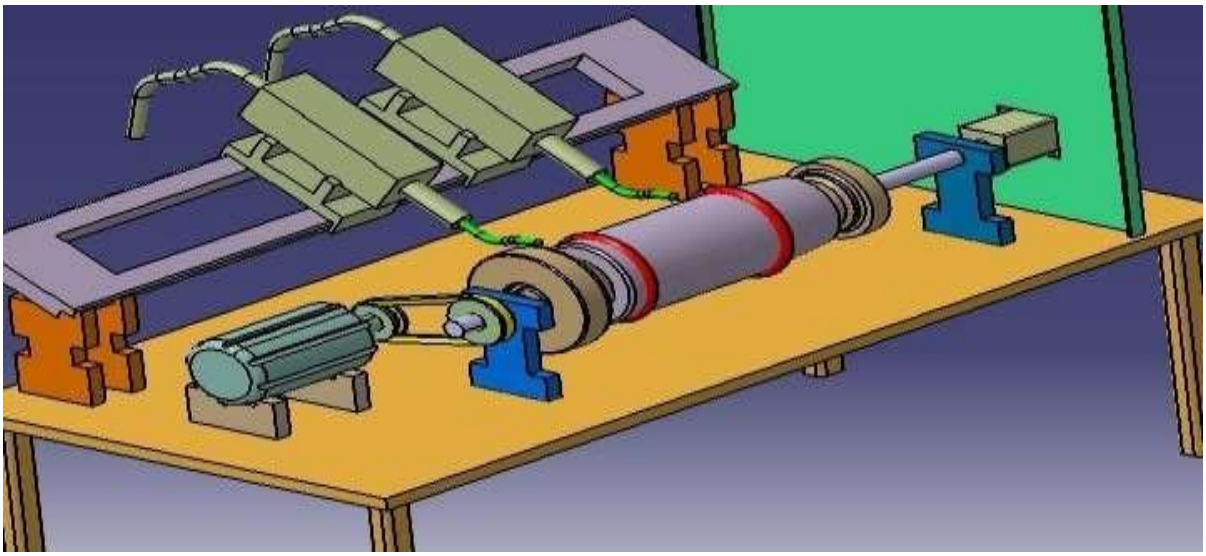

Fig- (b): Views of CATIA Model

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X. RESULT

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

XI. ADVANTAGES

1) Less cycle times.
2) Less labor cost.
3) Time Saving.
4) Increased Weld Strength/ Quality.
5) Low skilled worker required.
6) Less defective parts.

XII. APPLICATIONS

1) In Refrigeration system To join the parts of accumulator as well as dryers.
2) Ship Building construct and repair ship hulls and their internal elements (e.g., stiffeners).
3) Tank Building In tank building applications, it is used to fabricate tank floors and external shells.
4) Infrastructure Application In infrastructure applications, it is used to build bridges and bridge elements, hydroelectric dams, and penstocks.
5) Military applications In military applications, it is used to make the exterior of nuclear submarines and spacecraft and other large structures with repeatable, long seams.

XIII. CONCLUSION

This paper represents different approaches for automation in welding. Some algorithms presented above can perform welding on any type of a job and some of them are for specificjob. Systems which are designed for generalized welding has complex algorithm as it must consider all the parameters such as dimension, position, and orientation etc. Large investments are required to build such systems. To build system for specific job we do not require such complex algorithm and such systemsare inexpensive as compared to generalized robot welder.Digital image processing plays an important role in automaticwelding system, it helps in seam tracking.

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