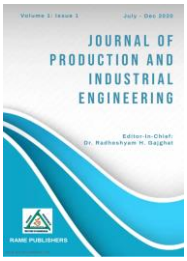

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Design and implementation of torch rotary welding SPM

Kadu Swapnil Vishnu[1],
Corresponding author
swapnilkadu700@gmail.com

P. J. Ambhore[2]
prashlucky74@gmail.com

[1]Student, M.Tech. Computer Aided Design & Manufacturing Engineering, G. H. Raiosni College of Engineering & Managment, Wagholi, Pune, India.

[2]Professor, Department of Mechanical Engineering, G.H. Raisoni College of Engineering & Managment, Wagholi, Pune, India

***Abstract* - In addition to the rational technological process, robots in industrial welding operations are commonly used. Problem with robots still in their early design and difficult for regular operators to use and program; the welding process is complicated and not very well known, and human-machine interfaces are not natural and do not work properly. Welding is an association or manufacturing process which connects materials, mostly metals or thermoplastics, through the fusion of basic metal with filler material. Gas metal arc welding is used to design the automatic Torch Rotary soldering machine. Automation plays a role in saving costs and maximizing the system productivity. Automatic flash welding process has been used. In our work, we must weld in an automotive component two circular welding points. Manual welding leads to greater manpower, low productivity and low welding quality, etc. All above problems are removed by automatic welding and the system itself is improved by manual welding. Torch Rotary Machine is used for the welding of the muffler using the GMAW process with the help of torch. A fixture is provided on the machine for this operation. Welding torch rotates around the pipe and flange during welding.**

Index terms - GMAW, Robots, Automatic welding system, Sensors.

I. INTRODUCTION

In Present Robotic World Automation or automatic control is the use of assorted control systems for operating equipment like machinery, processes in factories, drilling, welding and other applications and vehicles with reduced human intervention, with some processes which are completely automated. The advantage of automation includes labour savings, savings in electricity costs, savings in material costs, and improvements to quality, accuracy and precision.

Welding may be a fabrication or sculptural process that joins materials, usually metals or thermoplastics, by causing coalescence. This is often done by melting the work-pieces and adding a filler material that cools to become a robust joint to produce the weld.

Welding has been around for hundreds of years. Today around 100 welding methods are employed in different industry sectors. Automation may be defined because the technology involved in automated handling between machines and continuous processing at the machines. In current times, automation has widely exploited the benefits of the electronic and robot technology.

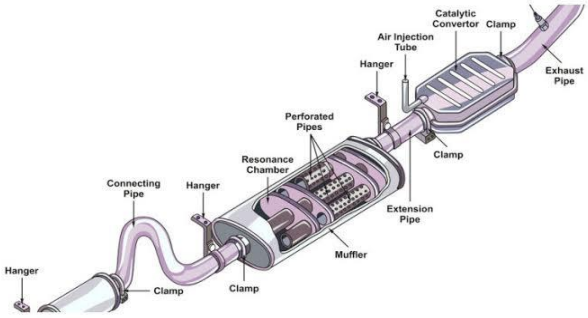

Fig. 1: Muffler Assembly [1]

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A design of a mechanism to automate TIG Welding of circular pipes and tubes is presented using robots in industrial welding operations is common but far from being a streamlined technological process. The robots are difficult to use and program, but they are still in their early design phases. They are a complex and not really famous welding process and human-machine interfaces that are unnatural and that are not functioning properly [1].

Welding means an assembly or manufacturing or structural process which, by combining base metal with filler material, usually metals or thermoplastics. Circular welding is one of the most essential manual welding processes to meet the need for automated torch rotating welding. The welding can be carried out in various ways, such as tungsten arc welding, shielding metal arc welding, tungsten inert gas and metallic inert gas. [2].

An advance in technologies are necessary for every industry to survive in competition. The main factors by improving which, the industry can survive in the market are productivity, quality & customer delivery date. In this paper he has presented the scope of improvement in the manual Gas Tungsten Arc Welding (TIG) by replacing it with automated Gas Tungsten Arc Welding. With the Automation the quality & the quantity of the production also increases. As the quality of the welding with the automation is much higher than the manual TIG, the scrap gets reduced & productivity improved [3].

By describing the mechanism that can accurately weld both the circular and the line component, the linear movement is more sophisticated and relatively less cumbersome that the traditional welding process. During design and development in mechanics, the technical limitation to achieve stability, linear and uniform welding flash speed and consistent welding thickness for quality products was to be taken into consideration. Details of the tests on different silencer shells appear on paper. For its complete atomization, it can be installed in the near future variable frequency drive (VFD). Now for a day, welding finds wide-ranging applications in almost all industries. It works widely in industry and construction in the manufacturing and erection of steel structures. It is also used in different industries such as aircraft frameworks, cars, furniture, car bodies, building ships, nuclear industries etc. [4, 6].

An automated two-sweat torch machine has been designed to deal with the problem of continuous welding of the cross-section line multi-tube radiators. The design design and main mechanisms of the welding machine are described. Its model is constructed with three-dimensional software. Motion and interference simulation based on interpolation are carried out. The fact that the welding test shows: the line is precisely welded and the efficiency of production and welding quality are enhanced. The two-welding torch is driven to make lateral and up-and-down movement by the Y-axis synchronous drive mechanism and the Z-axis synchronous drive mechanism. Each welding torch welds half of the seam. Meanwhile, in the welding process, welding torches swing to the best posture to ensure the welding quality according to changes in the location of the welding joints [5, 7].

II. Problem Definition

In this work two circular welding points in an automobile component were welded. This problem was given by Yogeshwar Industries. The component is a muffler assembly of Mahindra Scorpio. It has two points on two faces of the muffler. These two points are located at two different points in horizontal plane. Onto these two points it has the input and output pipes. To weld these two pipes onto their respective locations, it is to made a SPM which must carry an automate drive for uniform and precise welding.

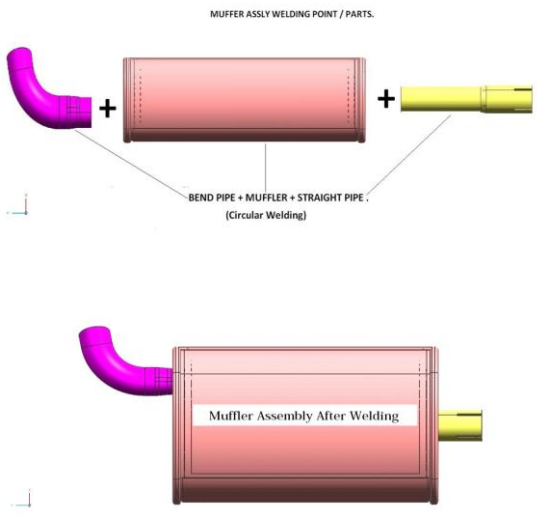

Fig. 2: Muffler Assembly after welding

III. Methodology and Principle Parts

The design methodology is depended on the literature survey which involves the gathering of assorted industrial data, economics and choosing of the selecting feasible solution.

The Principle parts & design methodology is as follows:

- Mounting table.
- Rotating disc to place the job.
- Job holding stand.
- Rpm controlled gear motor.
- Gear motor to control auto feed of filler material.
- TIG torch holding stand.
- Cooling system

A. Mounting Table

A vice is a mechanical device used to secure an object to work on. Vises are fitted in and out by the screw and lever with two parallel jaws, one fixed and the other movable.

B. Rotating Disc to Place the Job

The rotating disc is used to rotate the cylindrical work piece to achieve uniform weld coat. It runs by the action of light sensors to complete one full rotation.

C. Job Holding Stand

A Job holding stand is used to hold or support the cylindrical work pieces to facilitate welding. It can be adjusted to hold work pieces with varying lengths and diameters.

D. RPM Controlled Gear Motor Connected To Rotating Disc

A gear motor is used to achieve uniform weld coat by facilitating varied range of speeds for varied work piece dimensions. An RPM controller is used to control rotating speed of the rotating disc.

E. TIG Torch Holding Stand

TIG torch holding stand is used to place the TIG torch stationary. It is made flexible to adjust length and direction according to welding required.

F. Cooling System

Cooling system is used to circulate the coolant through torch and to remove excess of heat which otherwise might cause damages.

IV. Implementation Of Torch Rotary Welding SPM

A. Manual Mode Operating Sequence

- Operator will select the fixture Straight Pipe or Bend Pipe through selector switch & set the pipe locator manually.
- Operator will press the button of JOB CLAPM / JOB LIFT.
- Operator will select machine mode TEST / WELD through selector switch.
- Operator will press the button of Torch forward.
- Operator will select the machine rotation forward through selector switch.
- After completion of 01 rotation with overlap welding of torch machine & welding will stop on the spot.
- Operator will press the button of torch reverse torch assembly will go back at home position.

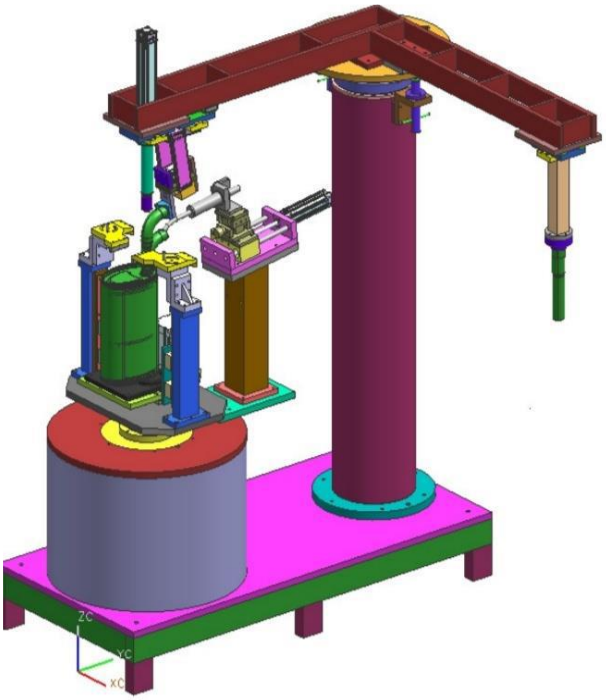

Fig. 3: Torch Rotary Welding Machine

B. Auto Mode Operating Sequence

- Operator will select the fixture Straight Pipe or Bend Pipe through selector switch & set the pipe locator manually.
- Operator will press the button of JOB CLAPM / JOB LIFT.
- Operator will select machine mode TEST / WELD through selector switch.
- Operator will press the button of cycle start.
- Torch assembly will come forward; welding & torch rotation will start immediately. After completion of 1 rotation torch will rotate for 10 mm overlap welding.
- If machine is in TEST mode welding will not done. After completion of Auto Cycle in WELD mode job counter will count the job automatically.

V. SPM Testing and Results

A. Results during Welding Operation

1. For manual welding, in 8 hours 25-50 pieces get welded. In torch rotary welding, within 8 hours 75 pieces get welded. So, in torch rotary welding 3 times more component get welded than manual welding. Hence, productivity for torch rotary welding is better than manual welding.

2. In torch rotary welding, Variable frequency drive (VFD) is connected to motor. VFD controls the motor speed. During welding, speed of component revolved & speed of melting becomes simultaneous. Hence, we get consistent welding. We get 100 % accuracy.

TABLE I
RESULTS & COMPARISON OF MANUAL WELDING WITH TORCH ROTARY WELDING MACHINE

Sr. No.	Parameter	Manual Welding	Torch Rotary welding
1	Time	In 8 Hr. 25 piece	In 8 Hr. 75 piece
2	Productivity	Less as compared to torch rotary welding	3 times more than manual welding
3	Accuracy	50 %	100 %

VI. Conclusion

This work aims at automation of circular welding which is successfully achieved within the variety of 'Torch Rotary Machine' with all desirable features a SPM carries.

Designs and dimensions obtained within the design cycle came to their supposed results, which results in error free welding cycle without susceptible failures. Quality improvement and reduce in time consumption followed the objectives. Productivity increases to an excellent extent through this project.

Cost and time for manual welding against torch rotary welding production is evaluated and concluded that torch rotary welding is better than manual welding. Unique experience of integrating and evaluating theory and practical aspects of design and manufacturing is observed. The truth of ground level functioning on the workshop floor is experienced. These valuable experiences will be useful in the future in all aspects of life.

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