IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 9, Issue 7, July 2021

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.542

International Journal of Innovative Research in Computer and Communication Engineering

|e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542

|| Volume 9, Issue 7, July 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0907081 |

Design and Manufacturing Monitoring of Torch Rotary Welding SPM for Exhaust System

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ABSTRACT: Welding is a joining or fabrication or structural process that joins materials, usually metals or thermoplastics, by causing merging of base metal with filler material. In design of "TORCH ROTARY WELDING MACHINE", Gas Metal Arc Welding is used. The main role Automation is in cost saving and to maximize the productivity of the system. Basic requirement for any manufacturing company is to have effective work output. Circular welding is one of the most critical welding processes carried out manually, to fulfill that requirement we have used automated torch rotary welding process. In our project we have to weld two circular welding points in an automobile component. The finish component is muffler assembly. 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 with assembly we have to use fixture for avoiding the mistakes of misalignment of locations, we have design and manufacture a SPM which must carry an automate drive for uniform and precise welding. Welding torch rotates around the pipe and flange during welding.

KEYWORDS: Gas Metal Arc Welding, SPM- Special Purpose Machine, Muffler.

I. INTRODUCTION

Welding is a fabrication or sculptural process that joins material, usually metals or thermoplastics, by causing coalescence. This is often done by melting the work piece and adding a filler material to form a pool of molten material (the weld pool) that cools to become a strong joint, with pressure sometimes used in conjunction with heat, or by itself, to produce the weld. This is in contrast with soldering and brazing, which involves melting a lower melting point material between the work piece to form a bond between them, without melting the work piece. There are several different ways to weld, such as: Shielded Metal Arc Welding, Gas Tungsten Arc Welding, tungsten inert gas and metallic inert gas. MIG (Metallic inert gas) involves a wire fed "gun" that feeds wire at an adjustable speed and sprays a shielding gas (Generally pure Argon or a mix of Argon and CO2) over the weld puddle to protect it from the outside world with GMAW (Gas Metal Arc Welding) becoming more widely used in the industry worldwide and increasing demand toward higher productivity the demand for higher deposition rates arose. Generally speaking, the deposition rate depends upon the wire feed speed and the wire diameter. A higher deposition rate can be used either to weld larger section per weld run, thus reducing the amount of layers necessary to fill a weld, or to increase the travel speed. MIG and TIG both are argon welding as both the process uses argon for shielding as it is an inert gas. But practically company is using 80% argon and 20% CO2 as inert gas (inert gas used to shield the electric arc from outside contaminants and gases which may react with the weld). An inert chemical is one with a full outer shell of electrons which do not normally react with other substances. Inert gases include argon and helium (some other non-inert gases are used for welding such as CO2). MIG stands for Metal Inert Gas Welding many times called as Wire-feed, also referred as GMAW. The "Metal" refers to the wire which is used to stand the arc as the filler rod. A semi-automatic process, it is fairly easy to learn and use.

II. LITERATURE SURVEY

Jiangtao Liu, Prof. V.S. Gavali, et al. For the continuous welding problem of multi-T-tube radiators' intersecting line, a new type of two-welding torch automatic welding machine isdesigned. The design scheme of the welding machine is described, and its main mechanisms are designed. Using three-dimensional software, its model is built. Motion simulation and interference checking are carried out based on interpolation. The fact welding test shows: the intersecting line is accurately welded and the production efficiency and welding quality is 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

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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.

Fu-sen Ren Xiao-zehad, MaskeDikshant, et al. Developed a new type of special welding robot, which mixed design method of series and parallel and realized the integrated design of organization for robot and anchor. The robot kinematics is build and realized the real time control of welding torch position, orientation and welding speed during welding process. A.M.Vaidya and P.M.Padole had calculated the flexibility of the links and joint stiffness.

N.R. Nagare, Anil Kumar, et. al. Advances 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 I am going to present the scope of improvement in the manual Gas Tungsten Arc Welding (TIG) by replacing it with automated Gas Tungsten Arc Welding. For increasing productivity of the TIG welding machine the important factors are Current, Voltage, Arc Length, Gas Flow & welding speed. Thus, by doing the trail on SS304l work piece, optimum parameter to control the penetration within 1mm is found out. 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 so the scrap gets reduced & productivity improved.

Virendrakumar Mahajan, HaiyongJiong, et. al. Welding is a joining or fabrication or structural process that joins materials, usually metals or thermoplastics, by causing merging of base metal with filler material. Circular welding is one of the most critical welding processes carried out manually, to fulfill that requirement we have used automated torch rotary welding process. This process is opposite to that of soldering and brazing, which involve melting a lower-melting-point material between the work-pieces to form a bond between them, without melting the work pieces. The welding can be done in different manner, such as: Gas Tungsten Arc Welding, Shielded Metal Arc Welding, Tungsten Inert Gas and Metallic Inert Gas. Shrinivas D, Yogesh R, et. al. Using robots in industrial welding operations is common but far from being a streamlined technological process. The problems are with the robots, still in their early design stages and difficult to use and program by regular operators; the welding process, which is complex and not really well known and the human-machine interfaces, which are unnatural and not really working. In this article, these problems are discussed, and a system designed with the double objective of serving R&D efforts on welding applications and to assist industrial partners working with welding setups is presented. The use of object-oriented and distributed software to assist industrial robotic welding applications is discussed. This Article gives complete idea of design of a mechanism to automate TIG Welding of circular pipes and tubes.

Prof. ShendgeYogesh, R. Xiao et. al. The paper deals with the designing of mechanism, which can weld the circular as well as line component with accuracy, a linear motion with an improved degree of fineness and are relatively less cumbersome than traditional welding process. The technical constraint that has to be considered while designing and develop in the mechanical is was to achieve the stability, linear and uniform speed of welding torch and uniform weld thickness for quality product. The details of testing on various silencer shell give in paper. In near future variable frequency drive (VFD) can be installed for its full atomization. Now a days welding finds wide spread applications in almost all branches of engineering industry. It is extensively employed in the fabrication and erection of steel structure in industries and construction. It is also used in various industries like aircraft frame works, railway wagons, furniture, automobile bodies, ship buildings, nuclear industries etc. depending on the application.

III. DEFINATION

In our project given by " Yogeshwar Industries" , we have to weld two circular welding points in an automobile component. 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, we have to made a SPM which must carry an automate drive for uniform and precise welding.

IV. OBJECTIVE

1. Reduced errors.
2. Cost savings.
3. Greater productivity.
4. Simple and smooth process.

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5. Uniform and precise welding.
6. Reduction in inventory.
7. Reduced labour requirement.
8. Increased machine utilization.

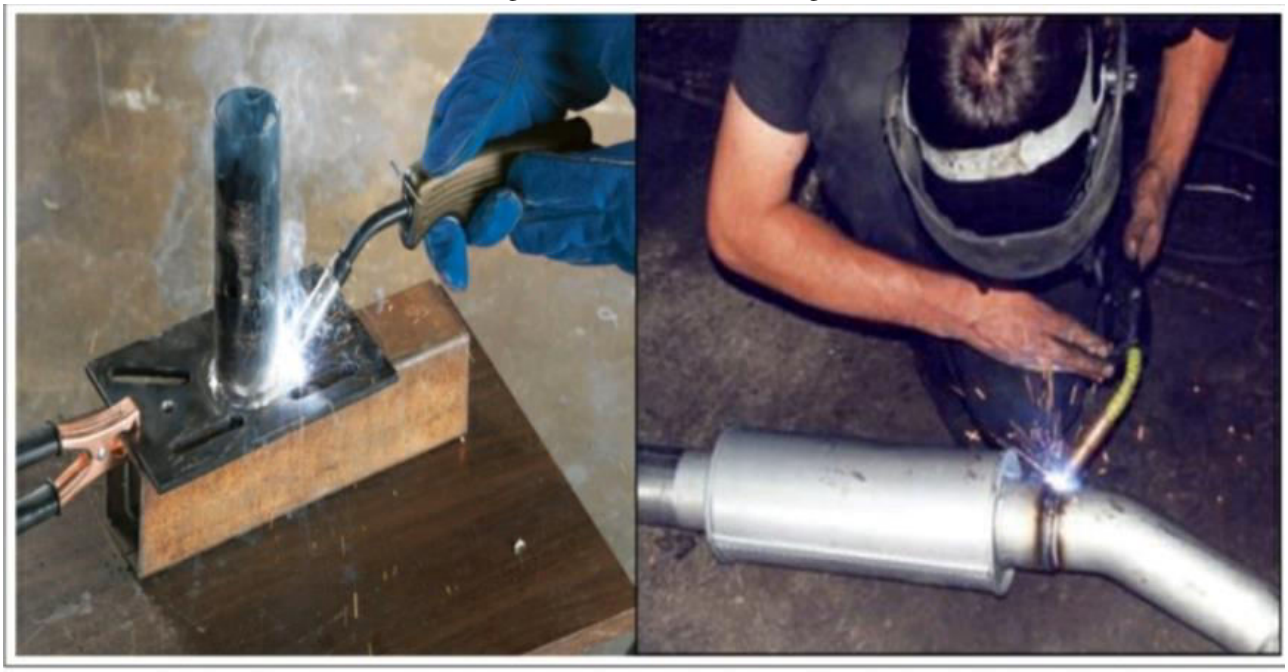
V. EXISTING METHOD

Previously, circular welding was considered as the most skillful and stressful job profile. This kind of welding was done manually by highly skilled workers. The steps were as follows:

1) Fixture and location:

First of all, the worker or his helper will put the muffler in the work-piece onto the fixture and locate it using different locators. There are two different locators which were used for bend pipe and straight pipe. After locating, using proper constraints, the worker fixes the muffler between upper jaws and base fixture plate.

Fig 1. Manual Muffler Welding.



2) Manual welding:

After fixture and location, the skilled worker starts welding the circular points with a welding torch. He has to do the welding very carefully which will result in uniform welding thickness. In this case, worker fatigue and personal temperaments affects the quality at that time.

3) Unclamping muffler:

Loosening all fixture components were carried out for the smooth removal of muffler out of the fixture. This will take some considerable time and increases the lead time in same manner.

- **Effects of manual welding:**

1. Time consumption (lead time).
2. Higher cost.
3. Increased worker fatigue.
4. Skilled worker required.
5. Lower welding strength.
6. Increased inventory due to slow and pending work.
7. Lack of customer satisfaction.
8. Lower production rate.

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9. Due to lack of skilled worker, production reliability decreases.
10. Less accuracy and precision as there are so many factors affecting these parameters.

VI. CONCLUSION AND FUTURE SCOPE

Project aims at automation of circular welding which is successfully achieved in the form of ' Torch Rotary Machine' with all desirable features a SPM carries.Designs and dimensions obtained in the design cycle came to their supposed results, which leads to error free welding cycle without susceptible failures. Quality improvement and decrease in time consumption followed the objectives. Productivity increases to a great extent through this project. Company enjoys benefits of improved lead time, quality, customer satisfaction and increase in the number of orders. Further, this SPM allots the benefits to the industry like economical benefits (cost savings), quality benefits and status improvement among the competitors .We gained unique experience of integrating and evaluating theory and practical aspects of design and manufacturing. This helped us to extract valuable knowledge and data. We came to know the reality of ground level working on the workshop floor. We are sure that, this valuable experience will be useful in our future in all aspects of life.

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INNO SPACE
SJIF Scientific Journal Impact Factor
Impact Factor: 7.542

doi cross ref

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

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