

Automatic Welding in Bus Body Frame

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ABSTRACT: Welding is a materials joining process which produces coalescence of materials by heating them to suitable temperatures with or without the application of pressure or by the application of pressure alone and with or without the use of filler material. Now a days in bus body construction (frame work) using manual Arc Welding to joining process, by using our project the welding process will worked in automated manner (Robotic Metal Inert Gas Welding). This work focused to increase the production rate, reducing the man power, weld quality will increase and weld defects will avoided.

KEYWORDS: Automatic welding, High strength bonding, Production rate increases.

I. INTRODUCTION

Welding is a materials joining process which produces coalescence of materials by heating them to suitable temperatures with or without the application of pressure or by the application of pressure alone, and with or without the use of filler material.

Welding is used for making permanent joints. It is used in the manufacture of automobile bodies, aircraft frames, railway wagons, machine frames, structural works, tanks, furniture, boilers, general repair work and ship building.

II. OBJECTIVES

In our project, we are using automated welding process instead of the manual arc welding process. In the automatic welding process, we using the robot arm for take place the linear motion. In the way of robot is controlled by PLC and FANUC program. In that system, we using MIG welding used for joining process.

III. AUTOMATIC WELDING

Robot welding is the use of mechanized programmable tools (robots), which completely automated, a welding process by both performing the weld and handling the part. Processes such as gas metal arc welding, while often automated, are not necessarily equivalent to robot welding, since a human operator sometimes prepares the materials to be welded. Robot welding is commonly used for resistance spot welding and arc welding in high production applications, such as the automotive industry.

Robotic Metal Inert Gas (MIG) welding, also known as Gas Metal Arc Welding (GMAW), is a commonly used, high deposition rate process that involves feeding a wire continuously toward the heated weld tip. It is considered a semi automatic welding process is shown in Figure.1.

MIG welding is one of the most popular forms of welding in industrial applications and is an easy process to integrate to a robot system. MIG welding provides a faster process than other forms of welding, especially when robots are incorporated.

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MIG welding robots are capable of all position, adding flexibility to the welding system. Safety from dangerous fumes, higher quality welds and more efficient processes are just some of the advantages that companies see following MIG welding automation.

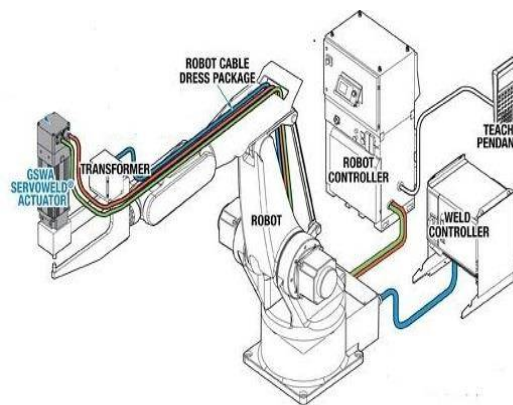


Figure.1: Automatic welding

IV. COMPONENTS USED

- Robotic arm
- Rack and pinion
- Servo motor
- Controller
- Pneumatic pump
- Welding gun
- Wire feed unit
- Manipulator
- DC power supply
- Helium gas (inert gas)
- Bus body frame

V. BUS BODY FRAME

The bus body structure must be balanced in order to obtain the safety when the bus is running; body must be sufficiently strong in both the situation of Supporting normal loads and accident loads is shown in Figure.2.

The body comprises of six main components; the left frame side, the right frame side, the front frame side, the back frame side, the top frame side and the bottom frame side. The left and the right side are similar but the left

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side is normally composed of passenger doors. On the other hand, the right side has two doors; the driver door and the emergency door. The sides are concerned to be critical parts and they must be strong. The static load response of simple structures, such as uniform beams, plates and cylindrical shells, may be obtained by solving their equations of motion. Design parameters are shown in Table.1.

Table.1: Design Parameters

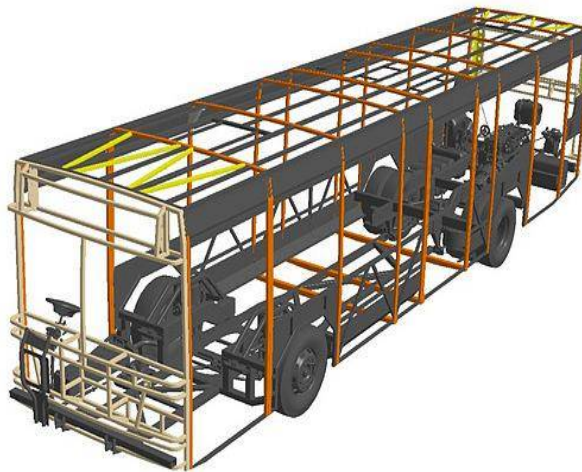


Figure.2: Bus body frame

VI. PROGRAM

In that robotic welding, we are using the PLC and FANUC program for welding the bus body frame. These program is used for takes place the (forward and backward) and (up and down) movement.

1. PLC PROGRAM

A Programmable logic controller(PLC) is an industrial digital computer which has been ruggedized and adapted for the control of manufacturing processes, such as assembly lines, or robotic devices, or any activity that requires high reliability control and ease of programming and process fault diagnosis.

In order to properly understand the operation of a PLC, it is necessary to spend considerable time programming, testing, and debugging PLC programs. PLC systems are inherently expensive, and down-time is often very costly. In addition, if a PLC is programmed incorrectly it can result in lost productivity and dangerous conditions. PLC simulation software such as PLC logics can save time in the design of automated control applications and can also increase the level of safety associated with equipment.

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2. FANUC CONTROLLER

Each generation of the FANUC numerical control system has different levels of device control capabilities and these are generally referred to by a model or series number.

Each controller model is typically available with several device control capabilities, depending on what software functions are licensed for use on that device. Some common control capabilities are:

- M - Milling
- T - Turning (lathe)
- TT - Twin Turret
- P - Punch press
- G – Grinding

Although offline programming has advanced hugely much of the programming is done using the teach pendant. This is a handheld device that allows the robot to be moved and allow the input of commands and instructions. Movements are sometimes controlled by a joystick (ABB robots) or often by buttons on the teach pendant.

VII. CONSTRUCTION

The manually joining process is used for weld the bus body frame is done by the arc welding process. In this arc welding process, the human power is more required. So the production rate is very slow and time consumption is very high. The welding strength is low in this manual arc welding process and the accuracy of welding is poor. So we are using the automatic MIG welding process for the joining in the bus body frame. Instead of labours, robots are used for working process to reduce the time and accuracy is maintained. The robot is placed near the bus body frame. It is moved with the help of a rack and pinion setup. The servo motor is connected with the rack and pinion setup. In the robotic arm we are fixing the MIG welding gun for the joining process. Wire feed unit is placed on the robotic arm and it is connected inside the welding gun. Inert gas (helium) is filled in the cylinder and it is contacted near the welding gun. The robotic arm is entirely connected with the controllers. The controller is used for feeding the program and operation purposes of the robotic arm. Bus body frame is made of the aluminium steel material. The welding gun is placed at a distance of 1.5mm from the bus body frame. A pneumatic pump works by using compressed gas inside a chamber between two pistons that have different diameters. The chamber is pressurized, and in turn, more force acts upon the smaller piston. Because of this pressure, liquid moves through the system. It is connected to the controller and it is used for the up and down movement of the welding gun for weld.

VIII. WORKING

To design a welding robotic system the first step is to identify the process related parameters, i.e., the parameters that should be controlled in a way to obtain the desired quality, also defined by a set of accepted characteristics.

Primary inputs: variables that can be modified on-line during the welding process. Taking as example the GMAW process, the primary welding parameters are the voltage, the wire feed rate and the torch speed. Technically, the voltage and the wire feed rate are the analog signals commanded to the welding power source, and generated from

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the robot controller or process PLC. The torch speed is the desired speed commanded to the robot TCP for coordinated motion.

Secondary inputs: variables defined when the process is selected and before any welding service. Using again as example the GMAW process those parameters include the type or composition of the shielding gas, the flow of gas during the process, the torch angle, and the type and size of the wire to use.

Fixed inputs: parameters are fixed and cannot be changed by the user. These parameters are usually an imposition of the selected welding process, of the current welding procedure or of the physical setup. Parameters of this type include the joint geometry, plate thickness, physical properties of the plate metal

In this automatic welding works, the DC power supply is switched ON. DC power supply is connected to the welding gun for the welding process. Helium gas is used for produce the shielding gas is to protect the weld from the atmospheric dust. Here the robot arm is take the movement by the controller by feeding the program.

The welding is produced by the copper wire feed unit is act with the welding gun and the inert gas is supplied at the time of welding process. The automatic welding process, the robotic arm is entirely controlled by the programming feed only once for joining process. Automatic welding is produced in the gap of 1.5mm from the welding gun and the bus body frame to produce the weld.

IX. CONCLUSION

The manual welding process is leads to the more man power required and it takes more time in production rate. These problems are reduced by the automated welding process.

Robotic MIG welding process has following benefits over manual welding.

- Safety
- Improved and consistent quality
- Increased productivity
- Reduction in consumables
- Significant rejection reduction
- Man power gaining
- MIG welding is largely used by most of MSME segment

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