Impact Factor (SJIF): 2.125

International Journal of Advance Research in Engineering, Science & Technology

e-ISSN: 2393-9877, p-ISSN: 2394-2444
Volume 3, Issue 1, January-2016

PREGUIDED MIG WELDING OF DIFFRENTIAL METAL RING

Kataria Mahendra B.[1] Khunt Hardik A.[2]

[1] *Assistant Professor, Mechanical Engineering Department, V.V.P Engineering College Rajkot, Gujarat, India*
[2] *Lecturers, Mechanical Engineering Department, V.V.P. Engineering College Rajkot, Gujarat, India*

Abstract

The motivation behind the idea was the need to decrease spatter and eliminate incomplete fusion defects. The pulsed arc process incorporated the benefits of axial spray transfer — clean, spatter-free welds having excellent fusion with lower heat input. The lower average current provided by GMAW-P allowed for out-of-position welding capability with improved weld quality, when compared with short-circuits transfer. The GMAW process is flexible in its ability to provide sound welds for a very wide base material type and thickness range. Central to the application of GMAW is a basic understanding of the interplay between several essential variables:
• The thickness range of the base material to be welded will dictate the electrode diameter, and the useable current range.
• The shielding gas selection will influence the selection of the mode of metal transfer, and will have a definite effect on the finished weld profile. Gas Metal Arc Welding (GMAW) process is leading in the development in arc welding process which is higher productivity and good in quality. In this study, the effects of different parameters on welding penetration measurement in mild steel that having the 6mm thickness of base metal by using the robotic gas metal arc welding are investigated. As a result, it obvious that increasing the parameters value of welding current increased the value of depth of penetration. Other than that, arc voltage and welding speed is another factor that influenced the value of depth of penetration.

Key Words: *Mig welding, Process, and design parameter etc…*

1. INTRODUCTION

1.1 MIG Welding.

The gas metal arc process is dominant today as a joining process among the world's welding fabricators. Research and development continue to provide improvements to this process, and the effort has been rewarded with high quality results.

1.2 Process Definition

Gas Metal Arc Welding (GMAW), by definition, is an arc welding process which produces the coalescence of metals by heating them with an arc between a continuously fed filler metal electrode and the work. The process uses shielding from an externally supplied gas to protect the molten weld pool. The application of GMAW generally requires DC+ (reverse) polarity to the electrode.
In either case, the GMAW process lends itself to weld a wide range of both solid carbon steel and tubular metal-cored electrodes. The alloy material range for GMAW includes: carbon steel, stainless steel, aluminum, magnesium, copper, and nickel, silicon bronze and tubular Metal-cored surfacing alloys.
The GMAW process lends itself to semi-automatic, robotic automation and hard automation welding.

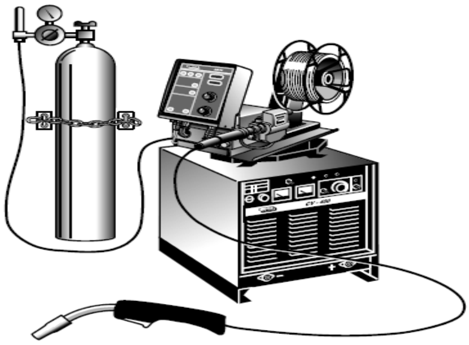

Figure 1.1: GMAW system

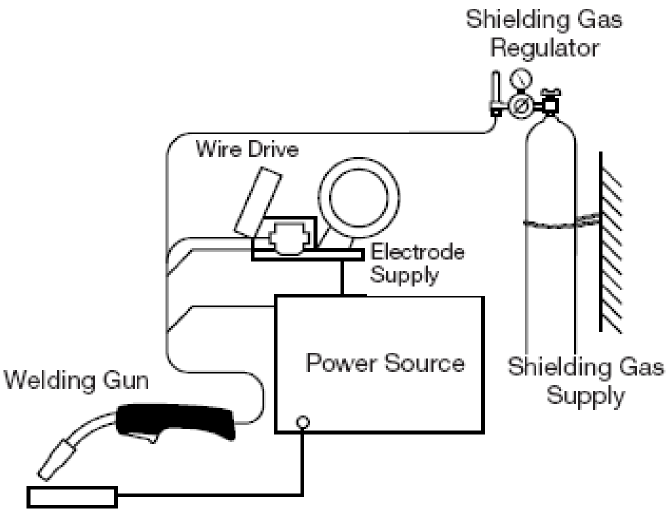

Figure1.2: Basic Construction of GMAW system

2. PROBLEM IDENTIFICATION

Adarsh Engineering Works the manufacturer of differentials of automobiles in which they assemble various parts viz. gears, wheel shafts, braking systems, crown wheel, etc. In this company we found a problem that they weld the circular plate of diameter 240 mm by MIG welding with use of hand. The problem is the quality of this welding is not so good and the time requirement is high approx.15~20 minute per job. For the listed reasons we have made a model which carries this circular plate and rotate uniformly this by use of motor. This model carries features like, Speed control, Forward and backward motion, Convenient for assembling, Ease to operate.

2.1 Defects

Defects usually encountered include incomplete penetration, incomplete fusion, undercutting, porosity, and longitudinal cracking. This section deals with the corrective action that should be taken.

2.1.1 Incomplete Penetration

This type of defect is found in any of three ways:

1) When the weld bead does not penetrate the entire thickness of the base plate.
2) When two opposing weld beads do not interpenetrate.
3) When the weld bead does not penetrate the toe of a fillet weld but only bridges across it.

Welding current has the greatest effect on penetration. Incomplete penetration is usually caused by the use of too low a welding current and can be eliminated by simply increasing the amperage. Other causes can be the use of too slow a travel speed and an incorrect torch angle. Both will allow the molten weld metal to roll in front of the arc, acting as a cushion to prevent penetration. The arc must be kept with some distance allowing not rolling with molten metal.

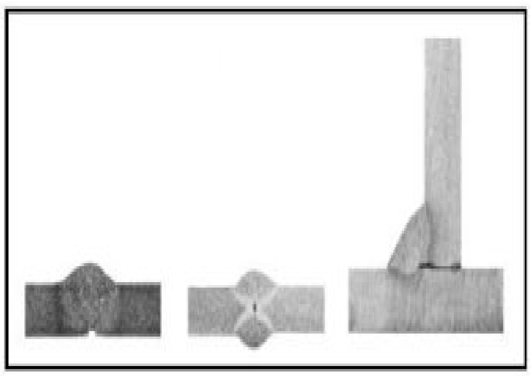

Figure 1.3 (a) incomplete penetration

Figure 1.3 (b) Incomplete Penetrations

2.1.2 Lack of Fusion

Lack of fusion, also called cold lapping or cold shuts, occurs when there is no fusion between the weld metal and the surfaces of the base plate.

The most common cause of lack of fusion is a poor welding technique. The weld metal has been permitted to roll in front of the arc. Again, the arc must be kept on the leading edge of the puddle. When this is done, the weld puddle will not get too large and cannot cushion the arc. Another cause is the use of a very wide weld joint. If the arc is directed down the center of the joint, the molten weld metal will only flow and cast against the side walls of the base plate without melting them. The heat of the arc must be used to melt the base plate.

This is accomplished by making the joint narrower or by directing the arc towards the side wall of the base plate. Large weld beads bridging the entire gap must be avoided. Lack of fusion can also occur in the form of a rolled over bead crown. Again, it is generally caused by a very low travel speed and attempting to make too large a weld in a single pass. However, it is also very often caused by too low a welding voltage. As a result, the wetting of the bead will be poor.

Arc welding uses concentrated high-temperature electric arc to melt both base metal and welding electrode. These melted base metal and electrode mix and fuse together into weld pool which subsequently bonds adjoining base metals. If the welding current is set too low, ideal melting temperature cannot be achieved and base metal doesn't melt completely. Furthermore, weld pool material is not adequate and gap between adjoining base metals is not properly filled. This will leave empty holes inside or outside weld joints.

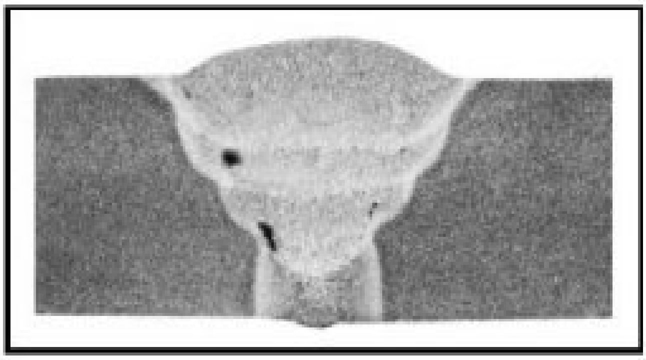

Figure 2.1 Incomplete Fusion

It may be decreased when,

- Remove all grease, oil, moisture, rust, paint, coatings, and dirt from work surface before welding.
- Select higher voltage range and/or adjust wire feed speed.
- Place stringer bead in proper location(s) at joint during welding.
- Adjust work angle or widen groove to access bottom during welding.
- Momentarily hold arc on groove side walls when using weaving technique.
- Keep arc on leading edge of weld puddle.

Use correct gun angle of 0 to 15 degrees

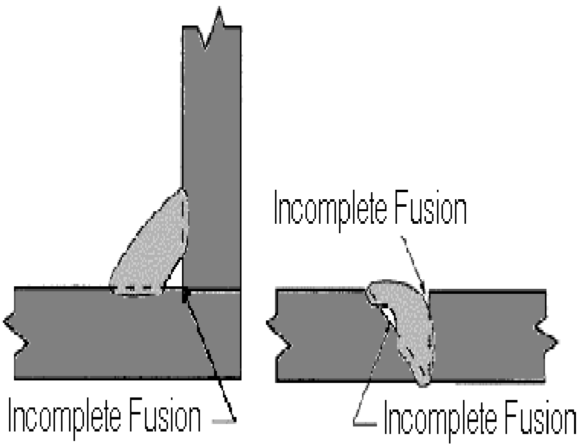

Figure 2.2 Incomplete Fusion

2.1.3 Undercutting

Undercut is usually due to overcurrent in electric arc welding. Overcurrent causes wide melting zone in base metal but not enough weld fusion metal to replace the gap. High lapping speed also leaves the gap poorly filled with weld fusion metal and produces undercut.

Undercutting is a defect that appears as a groove in the parent metal directly along the edges of the weld. It is most common in lap fillet welds, but can also be encountered in fillet and corner joints. This type of defect is most commonly caused by improper welding parameters; particularly the travel speed and arc voltage.

To avoid undercut, welder and welding inspector must observe initial weld lap to see whether the current setting is appropriate. Post welding inspection can be tricky since welder can cover undercut by running another lap using lower grade welding electrode and low current.

Undercut is dangerous because it amplifies the stress flow due to reduction in section area and stress concentration of the notch form.

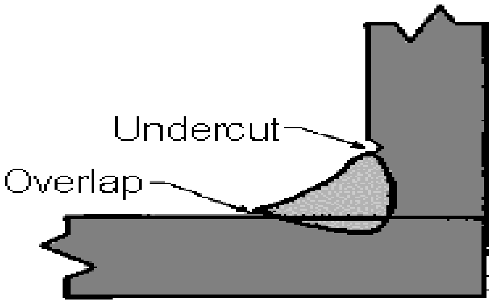

Figure 2.3(a) Undercut

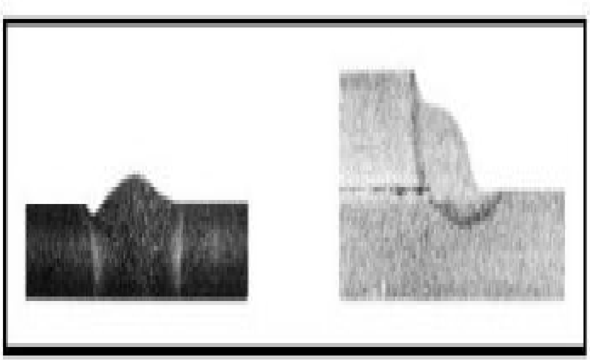

Figure 2.3(b) Undercut

2.1.4 Porosity

Porosity is gas pores found in the solidified weld bead. As seen in Figure, these pores may vary in size and are generally distributed in a random manner. However, it is possible that porosity can only be found at the weld center. Pores can occur either under or on the weld surface. The most common causes of porosity are atmosphere contamination, excessively oxidized work piece surfaces, inadequate deoxidizing alloys in the wire and the presence of foreign matter. Atmospheric contamination can be caused by:

1) Inadequate shielding gas flow.
2) Excessive shielding gas flow. This can cause aspiration of air into the gas stream.
3) Severely clogged gas nozzle or damaged gas supply system (leaking hoses, fittings)
4) An excessive wind in the welding area. This can blow away the gas shield

Figure 2.4 Porosity

2.2Corrective Actions

- Check for proper gas flow rate.
- Remove spatter from gun nozzle.
- Check gas hoses for leaks.
- Eliminate drafts near welding arc.
- Place nozzle 1/4 to 1/2 in. (6-13 mm) from work piece.
- Hold gun near bead at end of weld until molten metal solidifies.
- Use welding grade shielding gas; change to different gas.
- Use clean, dry welding wire.
- Eliminate pick up of oil or lubricant on welding wire from feeder or liner.
- Remove all grease, oil, moisture, rust, paint, coatings, and dirt from work surface before welding.
- Use a more highly deoxidizing welding wire (contact supplier).
- Be sure welding wire extends not more than 1/2 in. (13 mm) beyond nozzle.

2.2.1 Distortion

Welding involves highly localized heating of the metal being joined together. The temperature distribution in the weldment is therefore no uniform. Normally, the weld metal and the heat affected zone (HAZ) are at temperatures substantially above that of the unaffected base metal. Upon cooling, the weld pool solidifies and shrinks, exerting stresses on the surrounding weld metal and HAZ.

If the stresses produced from thermal expansion and contraction exceed the yield strength of the parent metal, localized plastic deformation of the metal occurs. Plastic deformation results in lasting change in the component dimensions and distorts the structure. This causes distortion of weldments.

2.2.2 Actions:

- Do not over weld.
- Weld alternately on either side of the joint when possible with multiple-pass welds.
- Use minimal number of weld passes.
- Use low heat input procedures. This generally means high deposition rates and higher travel speeds.
- Use clamps, fixtures, and strong backs to maintain fit-up and alignment.
- Use welding petitioners to achieve the maximum amount of flat-position welding. The flat position permits the use of large-diameter electrodes and high- deposition-rate welding procedures.

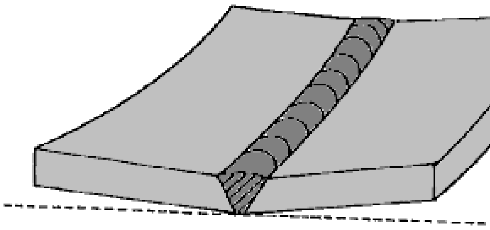

Figure2.5 Distortion

2.2.3 Wire Feed Speed/Amperage Too High

Setting the wire feed speed or amperage too high (depending on what type of machine you're using) can cause poor arc starts and lead to an excessively wide weld bead, burn-through and distortion.

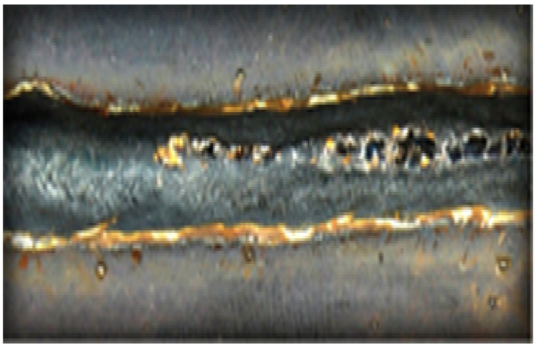

Figure 2.6 Wire Feed Speed/Amperage Too High

2.2.4Travel Speed Too Fast

When the travel speed is too fast may produce a low weld with law heat input resulting in Uneven welding. It may possible when welding is done by hand and unskilled labor.

Figure 2.7 Travel Speed Too Fast

3. SOLUTION

Above the all problem company make a one model for solving the all these are problems. The graphical representation of the model is given below.

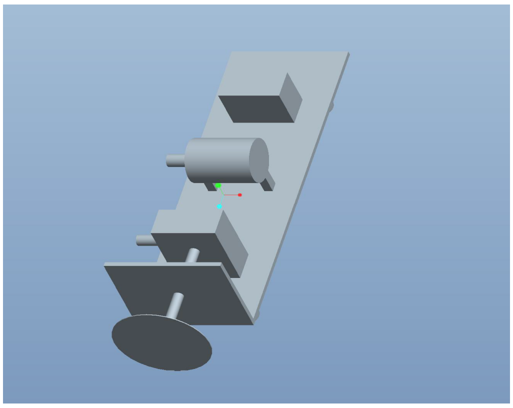

Figure 3.1: Graphical Representation

4. WORKING MODEL

Use of the graphical model company make a working model for solving problem and company achieve the solution of the problem with reduces the cost.

Figure 4.1 Actual Picture

The aim of pre-guided MIG welding positioner is to weld the differential metal rings. It works on the principle of joining of two differential rings without any need of human afford.
Working can be broadly classified in a manner: The power is to be to the drive which converts single phase AC supply to three phase AC supply. By this the motor is run and control with three phase AC supply. Another function of drive it to control the rpm of motor.

There is connected to gear box through V-belt pulley, which generate the rotating motion. In the gear box the worm and worm-wheel gear is used. The ratio of gears in gear box is 30:1, it classify that when one shaft of the gear box revolves 30 times than another shaft completes its one revolution.
The vice is to be joint to the shaft of gear box, on metal rings are attached.
The notch of MIG welding is attached to the vice so the notch remains in the steady position. So when the shaft starts rotating the notch mounted on the vice starts welding the two rings.

4.1. PARAMETER

Here, give the all of the parameter which are used for make a working model.
1 Size

Table 1: list of the Size

Length, l	:	610 mm
Height, h	:	270 mm
Width, b	:	310 mm
Weight, w	:	40 kg

2 Costs

Table 2: List of cost

No.	Name of component	Unit cost
1	Electric Drive	12,450 ₹
2	Electric Motor	4,325 ₹
3	Worm Gearbox	2,700 ₹
4	Other costs like fabrication,wiring,machining,material,etc.	1,000 ₹
5	Overall cost	20,475 ₹

5. CONCLUSION

From this project we conclude that, the various parameter affect on the welding are, speed of the welding, contact distance between work to tip should be maintained, torch should remain steady ,etc. should be maintain for proper and quality welding.

REFERENCES

[1]. Welding and Joining of Advanced High Strength Steels (AHSS), 2015, Pages 137-165 M. Shome
[2]. Transactions of Nonferrous Metals Society of China, Volume 20, Issue 12, December 2010, Pages 2234-2239Yan BAI, Hong-ming GAO, Ling QIU
[3]. Materials Characterization, Volume 86, December 2013, Pages 127-138 A.A. Sorour, R.R. Chromik, R. Gauvin, I.-H. Jung, M. Brochu

BIOGRAPHIES

Kataria MahendraB.1
ME Mech. (Machine Design)
BVM Engg. College VV Nagar
Asst.Prof. In VVP Engg. College
Rajkot

Khunt Hardik A.2
M.Tech Mech. (CAD/CAM)
Nirma University Ahmedabad
Lecturer In VVP Engg. College
Rajkot