International Journal of Advance Research in Science and Engineering
Volume No.07, Special Issue No.04, April 2018
www.ijarse.com
IJARSE
ISSN: 2319-8354

Indexing Machine for Automation of Circular Welding

Prof. Pisotre M.[1], panhalkar R.[2], Lonkar A.[3], Kopnar S.[4]

[1]*Assistant Professor, Mechanical Department, PGMCOE, Wagholi, Pune*

[2]*B.E Student, Mechanical Department, PGMCOE, Wagholi, Pune*

[3]*B.E Student, Mechanical Department, PGMCOE, Wagholi, Pune*

[4] *B.E Student, Mechanical Department, PGMCOE, Wagholi, Pune*

ABSTRACT

This project describes about Design, Analysis & Manufacturing for automation of circular part welding with uniform weld structure for mass production. This project contents designing & manufacturing of the turntable which is rotating at required specific speed depending upon the requirement of fillet material to be added. Further the electrode nozzle is kept stationary, which is in contact with the surface of component to be welded. Hence in this project, a detailed design for converting the conventional MIG welding ARC machine into an automated circular component welding machine has been proposed. Along with this main modification of the existing MIG welding machine a stationary downward arc – head which has provisions for horizontal and upward movements is to be modified into portable welding machine.

The principle of this process is that the welding wire is fed into the electrode nozzle with eccentricity at the contact tip.

Key Words: Indexing Plate With Required Speed, Angle, Gas Welding.

I INTRODUCTION

In now days it is often required in mass production to select the required data to automate the manufacturing process which were conventionally done manually. In present various welding technique is used for welding processes such as CO_2 welding or electric arc welding, in that various fixture is used for various welding, but in some applications we use different techniques which does not work efficiently and accurately. Shifting the electrode with the welding line is a skill full work and it is difficult for the electrode to move along the circular components. Welding rotator is implemented to avoid the error or weld defects. To ensure good profile and homogenous welding there is a need of specified rotating device which can rotate the job at a fixed rate to assist the welding process. A gas flame, an electric arc, a laser, an electron beam, friction and ultrasound are the different energy sources can be used for welding. In industrial process, welding is done in many different environments including open air, under water and outer space.

II PROBLEM DEFINATION

For circular Shape components there is always an occurrence of CO_2 welding or sometimes electric arc welding, where the welding is carried out on the entire periphery or partial arc length of the job. The electrode is thus moved along this circular path in conventional method. But movement of the electrode is difficult in uniform circular weld and then it becomes easy to index the job.

III DESIGN CALCULATION

3.1 MOTOR SELECTION:

Thus selecting a motor of the following specifications -

- Rated RPM -30 (at 12V)
- Nominal voltage – 12V
- No-load current – 200mA
- Full load current- 7A
- Full load torque – 18 kgcm (max)
- Torque – 25 kgcm

3.2 DESIGN OF SHAFT:

Material selection: -Designation: EN 24

3.2.1 ASME CODE FOR DESIGN OF SHAFT:

Designation	Ultimate tensile Strength N/mm^2	Yield strength N/mm^2
EN24	800	680

Table No. 1

According to ASME code permissible values of shear stress may be calculated from various relations

= 0.18 x 800= 144 N/mm2

OR

fs_{max} = 0.3 fyt

= 0.3 x 680

=204 N/mm2

Considering minimum value of the above values,

fs_{max} = 144 N/mm2

Shaft is provided with key way, this will reduce its strength.

Hence reducing above value of allowable stress by 25, fs_{max} = 108 N/mm2

This is the allowable value of shear stress that can be induced in the shaft material for safe operation.

To calculate worm shaft torque:

Motor is run at 9000 rpm, connected to worm shaft by belt pulley arrangement with reduction ratio 1:4. Hence input to spur gear box = 2250 rpm..The worm gear box is the reduction gear box with 1:80 ratio. Hence input speed at the input shaft = 2250/80 = 28.125 =30 rpm (approx.)

$T = (60*P) / (2\pi*N)$

$= (60*120) / (2\pi*30)$

T = 38.197 N-m

3.2.2 Check For Tensional Shear Failure of Shaft

Designation	Ultimate tensile Strength N/mm^2	Yield strength N/mm^2
20Mn Cr5	800	680

Table No. 2

ASME Code For Design of Shaft Since the loads on most shafts in connected machinery are not constant, it is necessary to make proper allowance for the harmful effects of load fluctuations.

According to ASME code Assuming minimum section diameter on input shaft = 16 mm

$Td = \pi/16 * fs_{act} * d3$

$Fs_{act} = (16*Td) / (\pi*d^3)$

$= (16*38.197) / (\pi * 16^3)$

$Fs_{act} = 47.49 N/mm^2$

As $fs_{act} < fs_{all}$

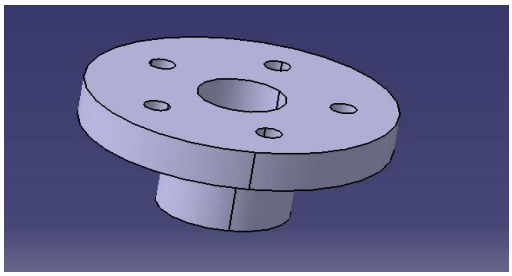
= I/P shaft is safe under torsional load.

3.3 DC MOTOR PWM SPEED REGULATOR :

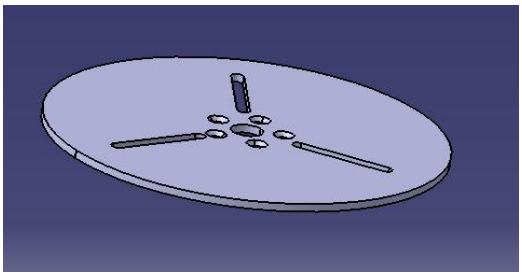
- Input supply voltage :1.8V – 15 V
- Max. Output Power : 30 W
- With resettable fuse
- Equipped with LED indicator
- Dimension : 32 x 50 x 15 m
- Weight : 16 gm

- Potentiometer with switch function for PWM adjustment.

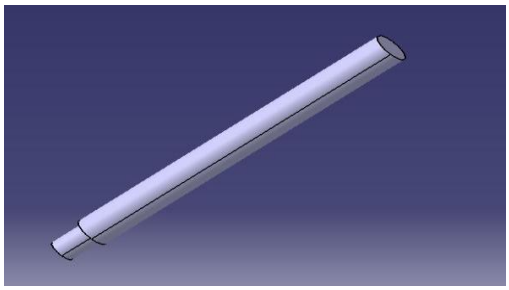
IV CATIA PART DESIGN FOR AUTOMATION OF CIRCULAR WELDING :



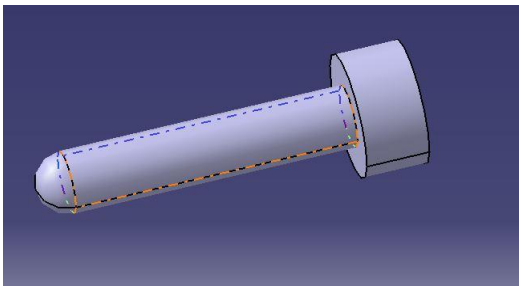
Flange



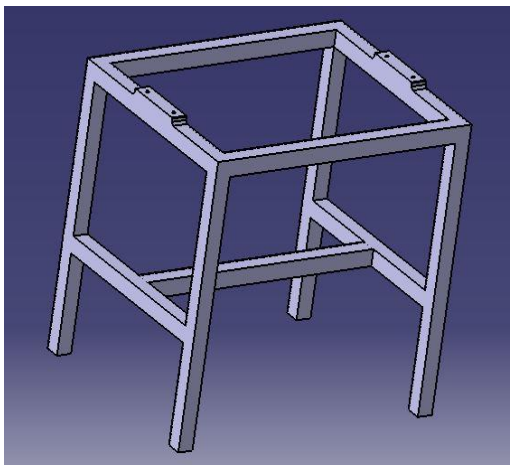
Indexing Plate



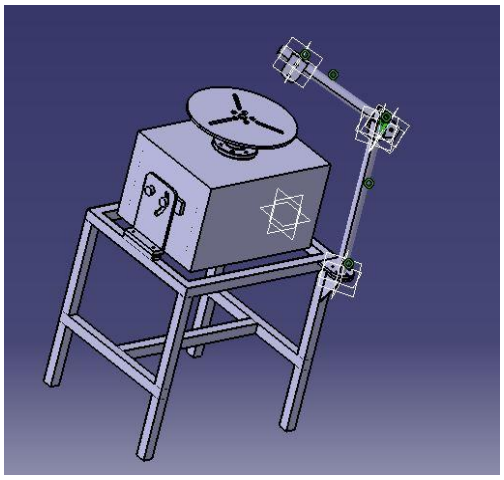
Shaft



Dovel Pin



Base Frame



Welding Setup

International Journal of Advance Research in Science and Engineering
Volume No.07, Special Issue No.04, April 2018
www.ijarse.com
IJARSE
ISSN: 2319-8354

V. STATIC STRUCTURAL ANALYSIS OF CIRCULAR WELDING

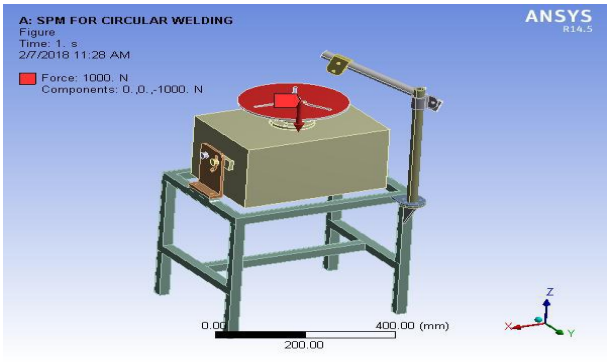


Fig. 5.1 Model (A4) > Static Structural (A5) > Force

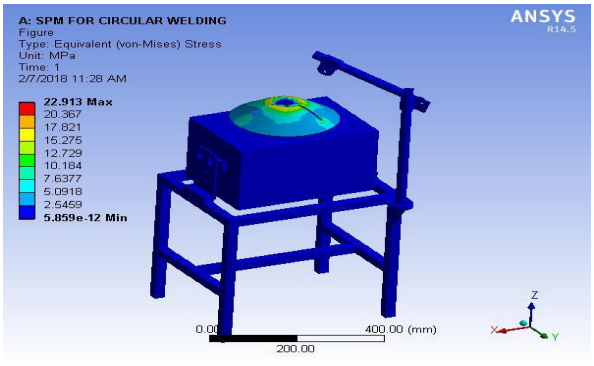


Fig. 5.2 Model (A4) > Solution (A6) > Equivalent Stress

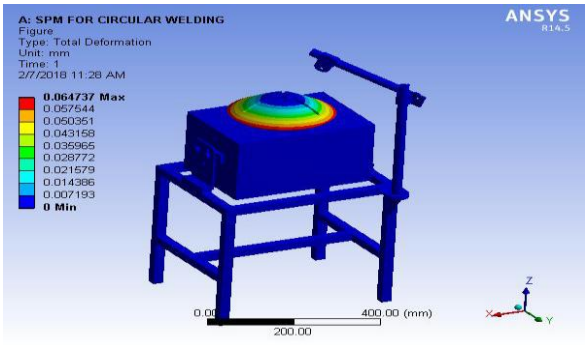


Fig. 5.3 Model (A4) > Total Deformation

VI AUTOMATION OF CIRCULAR WELDING SETUP :

Fig 6.1 Setup of circular welding

Fig 6.2 Indexing Plate

Fig 6.3 Gear Mechanism

VII PERFORMANCE ,ANALYSIS COMPLETE AUTOMATION OF CIRCULAR WELDING

On the indexer table the job to be welded is placed taking into consideration welding process and electrode size and the speed regulator is adjusted to give desired table speed. The indexer button as per no. of welds is carried on table. Table is index to the first stop position. The inching switch is operated simultaneously as the welding process is started. The job rotates as welding operation is done.

As the second index button terms in front of the proximity switch its stop the welding process and table movement. The next position of welding is operated by the inching switch and the process is repeated till the last stop. This is the end of process as the job welded is unloaded and new job is loaded.

VIII CONCLUSION

Welding positioned totally satisfies the requirements of the job. It considerably reduces the operators fatigue and time required for the process. Precise and the noiseless operation is generated, less skilled worker is required. Compact assembly in its self and the controls are fitted below the table and controls are placed on the front side at ergonomic position.

We conclude that for the complete circular welding in required angle with perfectly and efficiently in industries for mass production.

FUTURE SCOPE

It has a major role in mass production industries and in various process like, Painting, any geometrical shape welding, CO_2 welding of circular or staggered welded joints. Plastic moulding etc.

REFRENCES

[1.] Mandal, N. R. (2004), Welding and Distortion Control, Narosa.

[2.] Needham, J.C., (1978), (Tech. Dir) Advances in welding process, 4th Int. Conf. Herrogate, IW Cambridge, London.

[3.] Nikolaev, G., and N. Olshansky, (1977), advanced welding processes, mir pub., Moscow.

[4.] Automated welding systems, All-in solutions from a one-stop supplier, FRONIUS USA LLC, sales@fronius.com, www.froni us.com

[5.] A comparative study on electron beam welding and rigid restraint thermal self-compressing bonding for Ti Yunhua Deng, Qiao Guan, Bing Wu, Jun Tao, 25 March 2015.Copyright@ elsevier.com