Special Purpose Machine (SPM) For Automatic Welding

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ABSTRACT

The paper deals with :

(1) the need for welding automation in general.

and

(2) a few examples of such successful applications.

INTRODUCTION

Today everything we need to do in welding fabrication has to be fast, accurate and fault free in service. Even a few years back, the welding quality was largely dependent on the performance of the conventional machines be it Manual Metal Arc Welding or MIG/CO2 welding etc. and the skill of the welder. But the scenario has changed to take care of the demand of the production volume, use of higher grade steel and its alloys and the technique used for joining of metals.

Today's welding world demands high quality fabrication with lesser time ensuring maximum possible precision. Since time management is very important it has also become necessary not only to mechanise the process of welding but also to redesign the flow pattern of the components movement in the shop floor to meet the automated welding stations. In other words, the welding machine remains stationary at one location and the components are moved physically through conveyor systems, etc to meet this machine. It will not be out of place to say that a few decades ago, it was every engineers' dream to achieve this objective.

Welding mechanization in its simple form as has been described in this article has now become a reality. Such customized applications are seen in many companies in the country using SPM (Special Purpose Machine) solutions for fabrication. Some examples are given in this article.

SPM FOR VALVE MANUFACTURING INDUSTRY

This SPM is meant for valve seat edge rebuilding. This machine comprises of :

a) Adjustable and complete 360° swivel based Column and adjustable Boom head for accurate welding. Column height can be up to 3 meters or may be more. Boom length can be of 3 meters and may be more depending on requirements

b) 2 nos. manipulators capable of holding and rotating jobs weighing upto 2000 Kg. and diameter up to 1200 mm. Manipulators can rotate infinite times with a programmable digital counter and suitable for desired auto stop based on angle of rotation.

c) Individual speed control for both the manipulators with variable D.C. drive and rapid rotational movement to achieve job positioning.

d) Variable width and variable speed oscillator function for SAW head with Micro processor based timing and variable speed D.C. drive.

e) Motorised boom movement with specific height adjustment for the jobs giving flexibility to user to use the machine for different job length.

f) User friendly control pendant with 360° rotation facility for easy operation.

g) Long reach MIG welding torch head and SAW shank used for critical application & hard to reach areas.

Here MIG/ CO_2 welding up to 800 A @ 60% duty cycle and SAW up to 800 A @ 60 % duty cycle can be done with a single Power Source one at a time. This is one of the best features of this SPM.

SPM FOR FLANGE WELDING/ DIFFERENT BOX IN AUTOMOBILE INDUSTRY

Flange welding SPM that the Automobile Industries are currently using has the following features:

a) Variable Voltage Variable frequency speed control of drive motor with 3 Φ output from 1 Φ AC input supply.

b) Programmable Digital rotation counter with Auto stop facility based on rotational angle.

c) Digital rpm meter to precise sensing of speed.

d) Selectable no weld zone, i.e. rotation of job with a defined degree depending on the requirements.

e) Simultaneous operation of any number of Power Sources for simultaneous welding on a job at a time with one defined rotation according to the requirement.

f) Pneumatic loading and unloading of jobs at SPM for easy and accurate job alignment.

g) Adjustable torch position with pneumatic movement during job handling.

User can use MIG/ CO_2 or MAG process up to 600 A @ 60% duty cycle according to their requirements.

DIFFERENTIAL BOX WELDING FOR LIVE AXLE WITH SPM

The features are shown in the photographs below :

a) Pneumatic movement of two torches with horizontal and vertical slide with prevention of welding in no welding zone.

b) Single Power Source operation up to 600A.

c) Selection of torch through control pendant. User can use both the torch simultaneously if the rotational speed / Diameter of the job are same at two positions for a job, Or can use one by one with a differentspeed and torch settings for different diameter at both ends on a particular job.

End Cover welding of Differential Box SPM has the same features that of Live Axle welding with a programmable auto shut off facility through digital counter.

Such types of welding mechanization are of immense benefit to the user industry. Three factors govern a) Increased 'Arc on Time' during production shift , b) Increased welding speed and maintaining welding quality with reduced fatigue of the welder (reduced demand on the skill of the welder) & c) Substantial reduction of cycle time. Manufacturers will be able to produce more with lesser time and lesser man without sacrificing accuracy and speed. Now a- days, welding quality is not skill dependent or man dependent. We can avoid manufacturing defects generated due to wrong welding by simply switching to suitable automation where parameters & process as are established beforehand.

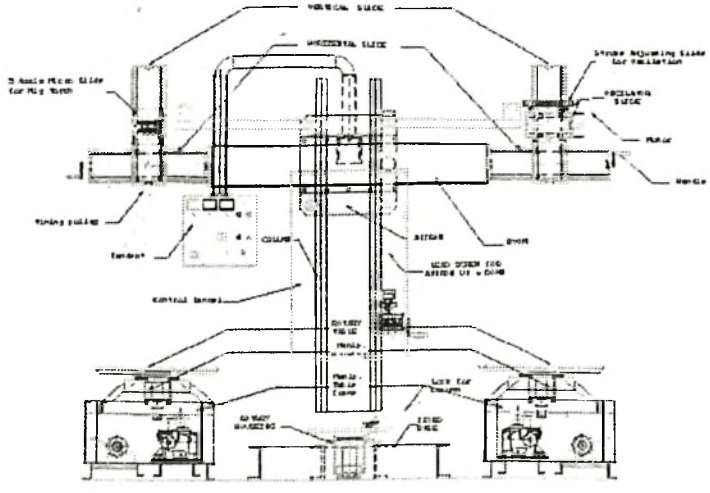

Figure 1

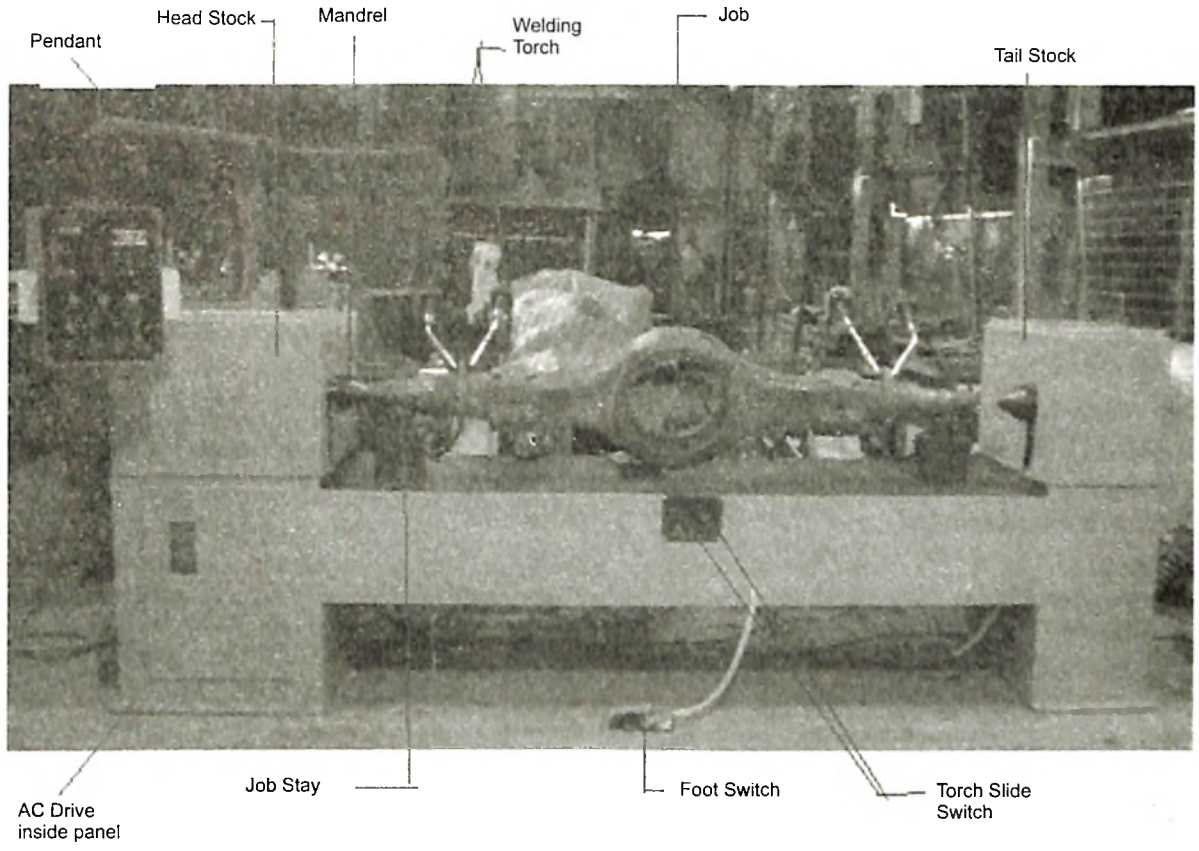

Figure 2 Welding for truck Live Axle / End Cover Welding on reinforcement plate of Differential Box.

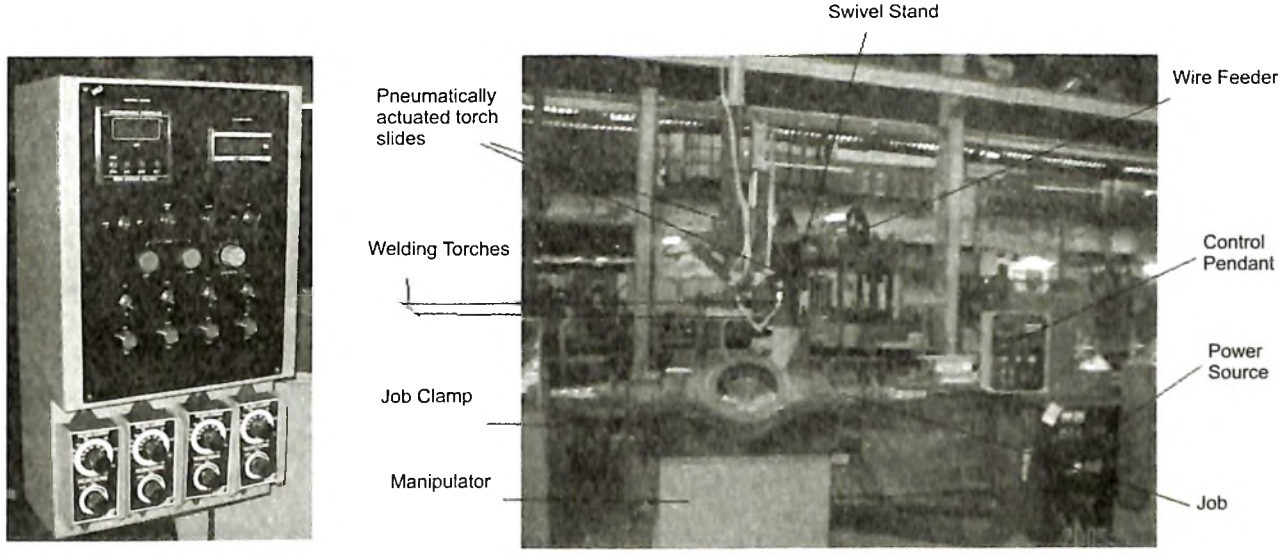

Figure 3