Design and Fabrication of Automatic Windmill Door Frame Welding Machine

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Abstract *Wind mill power generation is the lowest cost, promising, eco friendly power generation. In India especially in Tamilnadu, huge amount power generation of (7652.6MW) is through wind power. Lot of wind mills are installed in Tamilnadu, and more wind mills manufacturing plants are in Tamilnadu. Vel Murugan Industries is one of the prime wind mill accessories manufacturer in Tamilnadu, making wind mill columns to Gamesha, Vestas, Suzlon, in wind mill column manufacturing, the door frame welding is the prime one. Currently the wind mill door frames are welded to the wind mill column through manual Arc welding process. In manual welding of door frame lot of difficulties are faced like Joining defects, reworks and experienced welder dependency, higher time consumption, delivery commitment delays. The above said difficulties are to be overcome by automation of door frame welding. The aim of this project is to automate the current manual process through automatic process of door frame welding.*

Keywords – *Automation, windmill door frame, Welding Machine***,**

1. INTRODUCTION

India has the 4th highest wind installations in the world wind power generation capacity has crossed 32 GW so far and there should be at least 6 GW of capacity addition every year to meet the target of having 60 GW by 2022, Competition of China (168,732 MW), US (82,184 MW) and Germany (50,018 MW). All the government aims to see 60,000 MW by 2022.India added a record 7652.6 MW of wind power capacity in 2016-17 Source GWEC, Tower is one of the key and critical components in wind turbine generators. It is not only load carrying member but also load transferring member which helps the designer to optimize nacelle components. This carries the nacelle, rotor and hub at its top. These towers are to position the turbines in the best possible position to take advantage of the wind. Since rotor diameter and hub height are two parameters in human control, which influence energy cultivation depends on wind shear (variation of wind speed with respect to height), increase in energy, safety of turbine and people and finally economic factor decide the height and type of tower. There are many different types of towers available in market namely steel tubular/conical tower which is predominantly used in India, lattice tower, concrete steel hybrid tower, split bottom Section tower, concrete tower, vertical bolt joint tower, polygonal section tower, etc. they are manufactured with steel sheets cut, rolled and welded. They are constructed from rolled steel plates welded together with flanges top and bottom, being sprayed with several coats of gray weatherproof paint at the construction yard. They have doors top and bottom allowing entrance to the vertical ladders inside used to access the power cables and the yaw mechanism. There are also a set of vertical ladders on the outside of the tower accessing the nacelle for maintenance and other checks. The door opening is weak point of the tower on structural aspect. The main reason is the stress around door opening for the load cases that create highest stress that influence of different material thickness at the tower lower parts Stress Concentration near the Door Opening for Tubular Tower by using of manual door frame welding process. A Manual welding process in door frame is one that is completely performed by hands. The welder controls all of the manipulation rate of travel, joint tracking and in some cases the rate at which filler metal is added to the weld. The manipulation of the electrodes in torch in a straight line are oscillating pattern affects the size and shape of the weld. The presently the wind mill door frame were welded to the windmill column by Manual Arc Welding process. The door frame was an elliptical cross section it's initially welded to the column by tag cum stitch welding for proper alignment and exact dimensional fix up. Then Continuous welding will be made by number of further passes. The continuous pass welding will be made by 2 positions of the door frame. One set of complete passes on the top side of

door frame and bottom side of door frame. The Bottom side welding is comparatively more difficult than the Top side door frame welding. The elliptical profile welding was most critical one in the manual welding process only experienced welders were engaged for this work while manual welding so many difficulties are faced like, rework, time delay and rejections, weld joint quality and productivity. Defects on this manual process are spatters, porosity, incomplete penetration, poor weld profile. The above said difficulties are to be overcome by automation of door frame welding.

Find out the Problems:

- Skilled & experienced welders were engaged for this work.
- Rework, Time delay and rejections.
- Rate of travel, Joint tracking,
- Pattern affects the size and shape of the weld.
- Poor weld joint quality and productivity.
- Spatters, porosity, incomplete penetration, poor weld profile,

EXPERIMENTAL METHODS

The aim of this project is to automate the current manual process through automatic process of door frame welding.

This automatic welding machine used for the Submerged Arc welding, with the mechanical structure designed, and the working process of the automatic welding machine. The Human Machine Interface (HMI) of the system is also designed. The roller's welding is very important in the manufacturing process of development machine used in Windmill Tower Column. They are hand-welded by the workers in the traditional process, which is big labor intensity, welding inefficient and difficult to guarantee the quality of the welding. Automatic welding machine can improve welding quality and efficiency, reduce labor intensity and bring huge economic benefits. In order to reduce the labor intensity, we designed a new automatic welding machine based on easily adapted or changed to produce a wide variety of high quality welds.

Solution of Problems:

- Automatic welding machine used for the Submerged Arc welding.
- Everyone can handle this machine.
- Reduce manpower consumption.
- Reduce worker cost.
- Improve Productivity.
- Good finishing.
- Reduce time duration.

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