International Journal of Advance Research in Science and Engineering
Volume No.07, Special Issue No.03, February 2018
www.ijarse.com
IJARSE
ISSN: 2319-8354

DEVELOPMENT OF SET UP FOR SPECIAL PURPOSE MACHINE FOR FLANGE MANUFACTURING OF PVC PIPE

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ABSTRACT

Bolted flange joints are widely used in chemical plants, power plants and water transmission system to connect equipment to pipes or pipes together. This type of joints is used frequently. This are mostly preferred to establish a mechanical connection between two members, keeping in mind that the connection can be easily disassembled for maintenance or any purpose. The structure of bolted joints consist of a pair of stiff plates called "flanges" are attached to the pipe or equipment nozzles.

There are so many types and designs of flanges are available which depends on their application. PVC Flange fittings are coupling devices used for joining plastic piping systems, where frequent disassembly may be required, and can be used as a transitional fitting for joining plastic to plastic or plastic to metal piping systems. The above all operations are done manually with using highly skilled labor. The mechanism is to be selected for developing special purpose machine for flange manufacturing of PVC pipe.

Keywords: Special Purpose Machine, PVC pipe.

I. INTRODUCTION

The main objective of this project is to use an engineering knowledge and concept for the local and small scale industries which are doing an engineering job but are not able to do Research and development in their unit due to their limitations of knowledge, capital and traditional thinking. PVC Flange fittings are coupling devices used for joining plastic piping systems, where frequent disassembly may be required, and can be used as a transitional fitting for joining plastic to plastic or plastic to metal piping systems. Suitability of application is at the discretion of the user and widely used in agriculture sector for the purpose of feeding water to crops. Due to various reasons like for making this assembly only skilled labor is required so production strictly depend on labor, also as the procedure is complicated it takes too much time and rejection is one of the major problem of the company. So design and develop semi-automated machine which will avoid the dependency of skilled labor.

Produce product in less time from current procedure. And maintain high quality of product and low running cost of machine [1].

II. LITERATURE REVIEW

Sarkawt Rostam et. al. [1] tested the samples under different conditions including the room temperature environment, cooling in a refrigerator, and heating at different heating temperatures. It is observed that the strength of the tested samples decreases with the increasing of heating temperature and accordingly the material becomes softer. Meanwhile the cooling environments give a clear increasing to the strength of the material. From the result author concluded that the heating conditions for PVC samples make both the force and the strength smaller than the normal temperature condition.

K. Mulder and M. Knot [2] investigated the developments of PVC applying a system oriented approach and a network approach to find explanations. The case of PVC is used to illustrate the models, but both models may be used to research other technological systems.

P. Kurkcu et. al. [3] conducted scratch tests by a microscratch tester were examined in relation to their intrinsic rate-dependent mechanical properties. Scratch hardness, which is considered as a measure of the scratch performance, was assessed using a recently proposed scratch model. The adequacy of the model to explain deformation recovery and pile-up characteristics of the material in the scratch test was questioned by comparing the predictions of the model with residual profile measurements.

III. EXPERIMENTAL PROCEDURE

3.1 Design of product

Fig. 3.1 shows the design of final product.

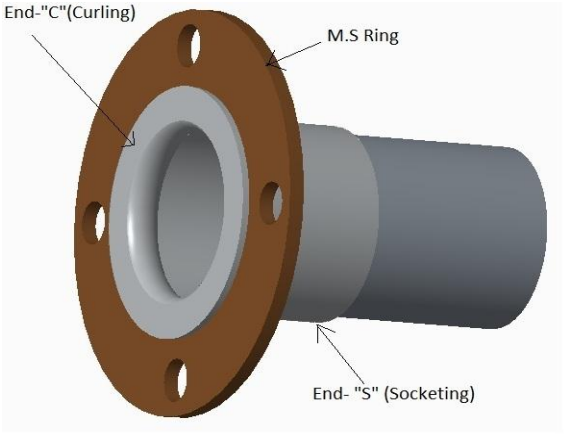

Fig. 3.1 Design of final product

3.2 Cutting of pipe

M.S ring PVC flange is manufacture by deforming PVC pipe piece. PVC pipe piece is act as preform for PVC flange. This pre form must of specific length. After that only by application of heat and pressure it can be deform to required form. Length of the perform is varies with PVC flange diameter. If diameter of flange is consider 63mm then length of perform must be taken as 67mm. This length essential to control socket and curled length. Preform is obtain by cutting required length of pipe from original long pipe (10 ft). Cutting is done by using circular saw machine. Geometrical parameters need to control in this operation is that pipe must be cut in a plan which should be perpendicular to the pipe length [4].

3.3 Heating

In normal room temp. PVC is in solid state and it is hard and tough so that it is not possible to change its shape or mold it in required shape. But it can be soften by heating. If PVC is heated upto 110°C-130°C it become soft and it is possible to plastically deform it with little application of force.

While manufacturing the flange in curling and socketing step. It is required to change the shape of PVC pipe (Curling- bending pipe over the M.S ring, Socketing- Increasing diameter). Essential thing to be control in this is that heating must be apply only to the region which need to be deform and temperature of pipe must be same through that region. If it is not so cracks may develop during deformation and rejection increased [5].

3.4 Curling

Curling is the procedure to bend the pipe end- "C" in 90°. This bend act as a lock for M.S ring. This bend must need to be done in 90° else while joining the flange may give leakages. Bend at end- "C" is done in such a way that it will cover the uniform length over M.S ring and should not cover holes which are provided for bolts. Normally 12mm length is taken for curling for 63mm flange and it increases with increasing diameter of flange [6]

3.5 Socketing

Socketing includes increasing diameter of pipe End-"S" in such a way that original pipe can be press fitted in it. Increased diameter should be such that there will be no leakage. Original pipe is having diameter 58mm and it is increased up to 63mm. Also this socket act as a lock for M.S Ring, it help holds the ring in between curled surface and socket. As M.S Ring remains in between curled face and socket region it is essential to place M.S Ring in its position before performing socketing operation. Otherwise it is not possible to place ring in its desired position [7].

IV. EXPERIMENTAL SET UP

Fig. 4.1 shows the block diagram of setup used for Special purpose machine for flange manufacturing.

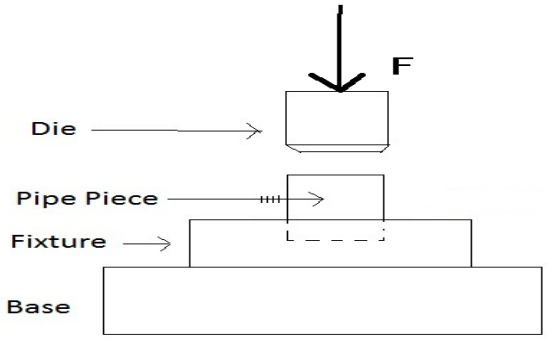

Fig. 4.1 block diagram of setup for Special purpose machine for flange manufacturing

The components and principle used for machine is shown in table 4.1.

Table 4.1 Components and principle used for SPM.

Sr. No	Operation	Tool	Technique
1	Cutting pipe of required length	Circular saw	Manual
2	Heating	Induction heating	Manual
3	Curling pipe one end	Die	Manual
4	Inserting M.S ring	-	Manual
5	Socketing pipe other end	Socketing die	Manual

4.1 Mechanism used for SPM

A lead screw also known as a power screw or translation screw is a screw used as a linkage in a machine, to translate turning motion into linear motion. Because of the large area of sliding contact between their male and female members, screw threads have larger frictional energy losses compared to other linkages. They are not

typically used to carry high power, but more for intermittent use in low power actuator and position near mechanisms. Common applications are linear actuators.

A lead screw is sometimes used with a split nut which allows the nut to be disengaged from the threads and moved axially, independently of the screw's rotation, when needed. Also lead screw provides more accuracy and stability.

By considering all above factors lead screw is selected as a best mechanism for SPM.

V. CONCLUSION

It is concluded that, skill labor requirement eliminate for doing such product. The quality of that product is better as compared to traditional manufacturing process.

The SPM is flexible. It can move from place to another is easy. SPM is of semi automatic; therefore it can be handle by unskilled worker. The time for curling and socketing is more in traditional, hence it can be reduced by SPM. By making use of the machine the time loss can be subsequently reduced. The most important advantage of this SPM is it can be operated by single person. There is beneficial for the industry to increase their productivity and to supply the products there customers.

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