Automatic Pot Making Machine

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***Abstract*—Nowadays, Earthenware products finds an increasing demand. They are used for decorative products, for setting up gardens, in nurseries, as utensils, etc. Traditional method of making earthenware products consumes more time and energy of the potter. Moreover, Profit is also less for the potter. Hence they are seeking a modern engineering solution for this problem. In order to tackle this problem automation can be done. Automation is the process of reducing human involvement with mechanical devices. In order to automate the earthenware production several assumptions were made and the solution was kept as simple as possible. We have proposed a simple and quick automatic machine for earthenware production. The proposed system uses only simple and cheap components and hence it was a feasible one.**

***Keywords*—Pottery, Earthenware, Kneading, cutting, pressing, microcontroller, pneumatic cylinder and conveyor.**

I. INTRODUCTION

Pottery is an ancient art of making earthenware's from clay and it originated during Neolithic period. The word 'pottery' also refers to the place where they are made. In this modern scenario, there is an increasing demand for these products. One of those promising products is pot. There are many steps involved in pot making such as kneading, shaping, drying, firing and glazing. A good pot must undergo all these process effectively. But this takes more time for making a single pot since all the processes must be handled by manual efforts. To overcome the above grievances, Ns-Ceramics made an automatic pot making machine. But it is a large machine which stands up to a height of 5 ft. and length 6 ft. and occupies large floor space. Moreover it is also not affordable for the potters to meet their economic status as it requires high investment and maintenance. In order to overcome the above issues, an automatic pot making machine has been proposed. It uses simple components like pneumatic cylinders, microcontroller, conveyors, etc. It is also a compact and cost effective system. Since it is an automatic system, it needs only little manual efforts.

II. EXISTING SYSTEM

Earthenware's are made from clay products by shaping clay to the required shape and then firing, glazing and decorating. The first step in pot making is kneading the clay. Kneading is the process of mixing the clay with water. During this step we must ensure even spreading of moisture. Next step is removing the air bubbles from it by de-airing. Since presence of air bubbles are undesirable. Next is the main step where the required objects are shaped. One of the traditional methods of shaping is by using wheel commonly called as potter's wheel as shown in Fig. 1. The kneaded clay is placed on the turn table, which is rotating at moderate speed. Using hand movement desired shapes are made since clay is flexible at this stage. The next step is firing where the shaped objects are heated to give them permanent shape and strength. Next is glazing where finishing is done for giving better look for the pot. Then other processes like painting or decorating can be done if required. It almost takes 20 – 30 minutes for making a single pot. And the shapes are not identical. It also consumes more manual efforts.

Fig. 1. Clay shaping using Potter's wheel

A. *Drawbacks*

The drawbacks for the existing pot making system are

- Manual work involved in the process is high.
- Labour cost is also high.
- Labours must have knowledge of making vessels from the clay effectively. Especially shaping process requires more pottery skills and also requires routine work.
- Low rate of production.
- Profit gained by the potters is less.

III. PROPOSED SYSTEM

The proposed system consists of three main parts. First one is clay conveyor with cutting system, which carries the clay to mould. Next one is moulding section where the clay is moulded to the desired shape. Final one is the air drying conveyor where the moulded shapes are air dried before firing. With all these three systems working together, the proposed machine can able to convert fed clay into a desired earthenware product. It uses only simple components and hence it is compact which few inches in height and length. It is also easy to operate the system and only, knowledge of

switching ON/OFF the main switch is required. It also consumes less time and money hence it will be profitable for the potters. The proposed model is shown in fig. 2.

Fig. 2. Proposed model

A. Advantages

The advantages of the proposed system are

- The machine is cheap and maintenance cost is also low.
- It is also compact and occupies less floor space.
- Less time consuming and hence increased rate of productivity.
- Easy to operate.
- Less manual efforts are needed.
- Number of labours required is reduced.
- Profit gained by potter is high when compared to the traditional system.

IV. FEASIBILITY STUDY

Feasibility study is an important process in development of any product which helps to discover the strength and weakness of the proposed model, opportunities and threats to it by the environment and resources required for making the product successfully. Implementing the proposed machine is more economic and useful for the potters. As it involves only cheap components it costs around Rs.18, 000. It also reduces the labour cost for the potters. Hence the proposed system proves it to be economically feasible. Operating the machine also very easy since only turning the main switch ON/OFF is enough to run the entire machine. Hence it is also operationally feasible. The system uses simple components which are readily available in the market. And also it is easy to work with them. Hence the system also finds to be technically feasible.

V. TECHNIQUE USED AND METHODOLOGY

The proposed model was designed and simulated using the following software before building its prototype.

A. Solid Works (Mechanical Cad Software)

Solid works software offers flexible 3D mechanical design, product stimulation and high–end real time rendering and animation. The mechanical structure of the proposed model has been designed using this software. The Solid Works model of the proposed model is shown in fig. 3.

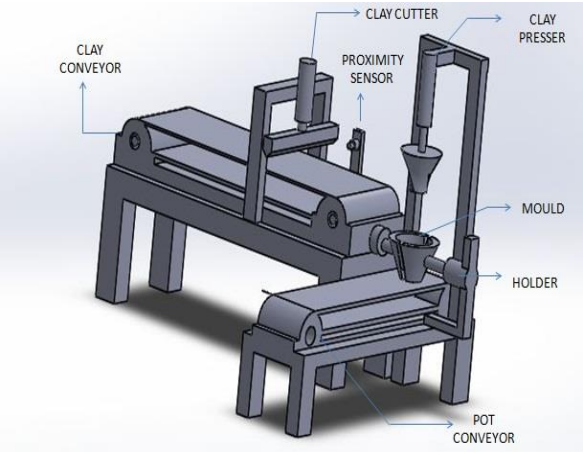

Fig. 3. Solid works model of the proposed model

B. Proteus (Electrical Design Software)

Proteus is software used for microprocessor simulation, schematic capture, and printed circuit board (PCB) design. The system components of this software are ISIS Schematic capture, PROSPICE Mixed mode SPICE simulation, ARES PCB Layout, VSM and System Benefits. In this project ISIS Schematic capture has been used for microcontroller simulation. The Proteus simulation of the electrical circuit of the given model was done as shown in Fig. 4.

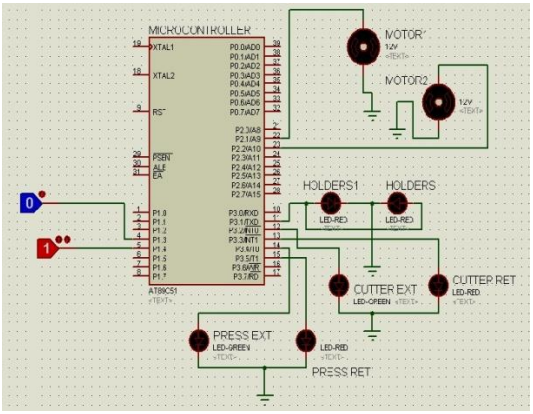

Fig. 4. Proteus stimulation for the proposed model

The main components used in the proposed model are shown in table 1.

TABLE1. MAJOR COMPONENTS INVOLVED IN THE MODEL

S. No	Component.	Quantity
01.	Pneumatic double acting cylinder	4
02.	Direction control valve	3
03.	Sheet metal	2
04.	Microcontroller	1
05.	Relay	5
06.	Wiper motor	1
07	AC motor	1
08.	Proximity sensor	1

VI. WORKING PRINCIPLE

The required quantity of clay is predetermined. The die can be changed to various shapes based on our requirement. Initially the kneaded clay is placed on the clay conveyor. When the main switch is ON, the clay is conveyed by the conveyor. When it comes across the proximity sensor, It senses the presence of clay and sends signal to the microcontroller for actuating the cutting pneumatic cylinder. The cutter attached with the cylinder cuts the clay and the clay falls into the die. For easy removal of the final moulded shape split type die used. Initially both the halves of die are in contact. After clay falls into the die the pressing cylinder is actuated after some delay. About 120 Kg pressure is given on the clay. After Pressing, The die is separated and the moulded shape is kept on the conveyor. The conveyor runs after little delay and air drying of the shape takes place during this time. Later the shape is taken from the conveyor and firing and glazing is done. These steps repeat in a cycle with few delay in between for feeding the clay. It takes around 2 – 3 minutes for making each pot. The schematic representation of the above process is shown in Fig. 5. All the cylinders are actuated by pneumatic supply.

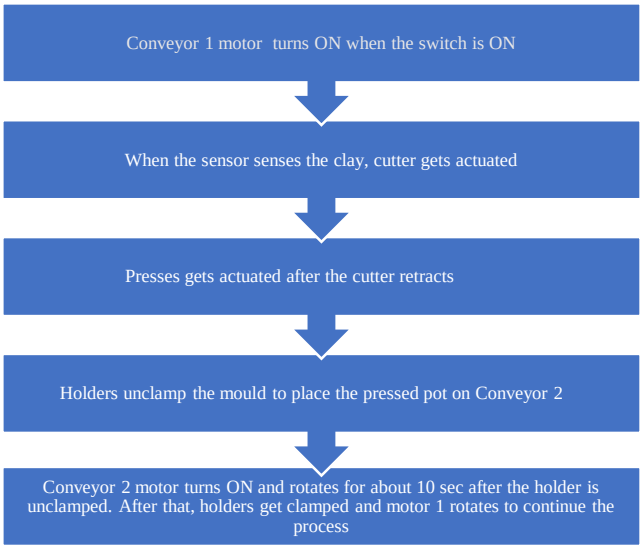

Fig. 5. Flowchart of Working

VII. RESULTS AND DISCUSSIONS

The proposed model has been made successfully and its functioning is tested. The graph shown in Fig. 6 gives the comparison of number of pots made by manual and proposed method. This shows that the proposed method is more efficient and advantageous that manual method.

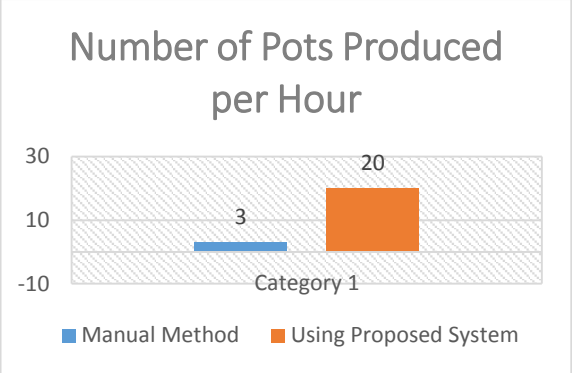

Fig. 6. Comparison of Existing & Proposed Method

A. *Practical Implementation*

Implementing this system in pottery is easy and also it proves to be economical and efficient one. Since simple components are used, it can be easily operated. It can be installed at all places as it is compact. It can also modifiable to different locations and environmental conditions.

B. *Conclusion*

Thus the traditional method of pot making is easily automated at low cost. By this machine, potters can be benefited by using the machine just by knowing to turn ON/OFF the machine and can produce two pots for every 6 minute. Hence it can give better results.

VIII. FUTURE SCOPE

The firing and glazing process can also be added with the proposed system. Moreover, Designs can be carved on the pots made by using pots carving tools. Pots can also be painted using painting tools for better finish of the pots made. The mould can be changed according to customers need.

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