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REAL TIME PLC BASED AUTOMATIC BLOW MOLDING MACHINE Versus TIMER BASED AUTOMATIC MACHINE – A COMPARATIVE STUDY

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Abstract: This paper pertains to performance, productivity, ruggedness and other parameter wise comparison between manually operated, hardware timer based version of extrusion blow Molding machine used for casting of hollow plastic toys with same machine provided with PLC for process automation through the project done at Disha Industries, MIDC Amravati. The result shows improvement in overall machine performance and reduced hardware troubleshooting complexity due to programmable process sequence and editing environment of PLC. This paper deals with the comparison between timer based automatic machine and PLC based automatic Blow Molding machine.

Key words: PLC, blow Molding machine, Touch panel

I INTRODUCTION

The inherent advantages of automation have been used for the performance and productivity enhancement of process. Advantages of using PLC are that it is digital high speed sequential device and has low installation cost relative to hardware timer used in previous version of machine. It also reduces excessive wiring and thus troubleshooting complexity. Blow Molding machines require initial testing of plastic mould to set it at proper temperature for particular product which very time consuming with manual machine. This process is simplified with HMI providing direct interface to process outputs. **We** proceed for feature wise point by point comparison between the two versions of blow Molding machines.[2,4]

II SPEED

In case of manual Blow Molding Machine, the speed of operation is about 2-3 minutes because of some delay in hardware timer, process lag due to complex hardware, etc.But with use of PLC, this time can be reduced greatly as the scan time of PLC is very high and the output given by the PLC is very fast.[1]

III ACCURACY

The accuracy in case of Manual Blow Molding machine is low as compared to that in Automatic Blow Molding Machine using PLC. As in case of Manual machine, all the operations are done by the machine after the command is given by the human i.e. when human will operate the machine using buttons, etc. The accuracy of a human is less than machine. There are some human errors which cannot be ignored. These errors are eliminated with the use of PLC which will provide accurate timing. Thus, accuracy of the blow Molding machine is increased with the use of PLC.[2]

IV PRODUCTIVITY

Productivity means producing number of items per unit specific time. As the speed of operation is increased with the use of PLC, correspondingly productivity also increased. Earlier, with use of manual blow Molding machine the productivity was 200 jobs which got increased to 300 jobs with use of PLC based Blow Molding Machine. Thus not only productivity of machine but also quality of the product is improved with the help of PLC. The productivity comparison is shown in Table 1.

Table 1. Production Comparison

Product	Per 10hrs production for timer based machine	Per 10 hrs production for plc based machine
Balls	1800	2500
Bottles	1000	1200
Bats	1000	1200
Saving Tanks	1200	1500

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V COST

Timer based automatic version of this machine requires 8 timers costing Rs.2500/- per unit amounting to a total of Rs.20,000/- , limiting their use and also they are not efficient as the vibrations cause the contacts to short accidently and occasionally, leading to malfunctioning of machine and affecting production. The modular PLC with I/O expansion module costs Rs.7, 000/- wherein the timers are inbuilt in the programming software and thus can be used in any no. thereby costing much lesser than timers

VI RELIABILITY

The timers used in Manual Blow Molding Machine were prone to vibration hazards. The circuits used in the timers eventually used to get braked by the vibrations. Repairing the circuits was very time consuming. But the PLC is rugged in construction. PLC can work in dusty as well as noisy environment. Thus there are less problems in case of Automatic Blow Molding machine using PLC.

VII CALIBRATION

The timers in the Manual Blow Molding Machine need to be calibrated every time with change of product. The calibration process consumes the whole day. This drawback was also overcome by PLC based Blow Molding machine. PLC is a programmable device. It can also store programs in it's memory. So, whenever the user wants to change the product, he just has to load the program to the PLC. So no need of calibrating the machine each time. Thus it saves the time.

VIII GRAPHIC INTERFACE

It is possible to give Graphic Interface to the PLC based Automatic Blow Molding Machine with the help of SCADA software. Graphic interface enables the user to visualize complete process on the computer screen. This facility was not available in case of Manual Blow Molding machine.[3]

Thus, with the help of Graphic Interface it is easy to understand the complete process and user can monitor the continuous data of various parameters during running process. SCADA software also provides facility to store the data which will be useful in future. So, it helps in improving the quality of the product and the overall efficiency of the machine. The graphical interface DELTA Text Panel TP04G-AS is shown in figure 1.

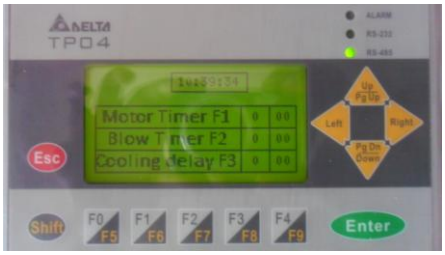

Figure1. TP04G-AS2

IX REMOTE CONTROL

Remote controlling of the manual blow Molding machine was not possible. But, with SCADA system remote controlling of the machine is also possible. The user is able to switch on-off the machine or can change the set point from other location also.

X EASE OF TROUBLESHOOTING

Elimination of hardware timers results into simplification of circuit troubleshooting due to elimination of hardware timer wiring. This also reduces the wiring cost which was necessary initially.

XI CONCLUSION

Thus, the PLC based automatic blow Molding machine has many advantages over conventional timer based blow Molding machine.

PLC based automatic blow Molding machine has greater efficiency, higher productivity, faster speed of response, and low cost compared to that of hardware timer based automatic blow Molding machine.

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