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Review on Paper Cup Manufacturing Process for Industry Automation

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Abstract: ***The market of disposable products has increased manifolds leading to small scale industry based setups for different products. Papercup is one such widely used disposable product. It has a huge demand in the market and although a very small product but it still requires proper designing machines and manufacturing process to make quality based end product. Paper cups basically need paper, lining as raw material. From earliest time many human assisted machines have been designed for manufacturing process which varies from one another in terms of models or features. This paper reviews various existing technologies in the manufacturing process of papercups as well as analyse the drawbacks of manual mode and need of Automation to reduce wastage and increase quality of production***

Keywords: Papercups, manual, automatic, controllers

I. INTRODUCTION

Paper cups are widely used and to stop the passage of liquid from a Paper cup, it's typically coated with plastic or wax. Paper cups are factory-made from recycled paper and have varied uses round the world. in an exceedingly astronomically immense cull of customs and gregarious categories their main use is to serve beverages or water.[3] Paper cups have different distinctive appearances, sizes {and styles/ and styles} with every style of design having Associate in Nursing supposed purport looking on the scarcely liquid they hold and on occasions they're utilized. Some ornamental patterns on paper cups are utilized at special events or celebrations to accommodate alcoholic beverages like cocktail, liquor and wine. In things wherever crockery is out of stock or it's a time constrain, it leads to use of paper cups in restaurants. Image exhibiting the variants of designs of paper cups is shown in figure.[7] In the Paper cup engendering trade, Paper cups are composed of a series of assorted processes looking on the sort and additionally the supposed utilization of the paper cup[8]. Initially all disposable cups that embrace Paper cups are composed of a Paper cup engendering machine by alimenting an oversized roll of paper that is inscribed so withdraw minuscule items that are fixed into the machine and bear a series of processes to supply a paper cup as the final product which can be employed in consummately different places.

Fig i: Papercups in varied sizes and shapes

Low-density polyethylene (LDPE) is a thermoplastic made from the monomer of ethylene and it is used for linings of paper cups which help them to retain the original shape irrespective of temperature of liquids they hold. Once these paper cups are made they have an expensive process of recycling to separate Ldpe and paper hence it is necessary to analyse the waste that can be generated during the manufacturing process and use techniques to reduce it substantially. Generally paper which is the basic raw material for manufacturing paper cups is pre-coated with the lining and does not require an additional machinery to coat the paper with these linings.[1]

Fig ii: Paper coated with LDPE

A. Manufacturing Process

The Automatic Paper Cup Composing Machine manufactures paper cups in following manner [4]

The general structure of paper cup composing machine is composed of three stages.

1) The first stage: mainly culminates transmission of the paper cup's side-wall paper, shaping side-wall and transferring them to second stage shaped.

2) The second stage: transmission of the cup-bottom paper, cup bottom, joining the shape side wall and cup bottom, automatic transmission and discharging of the shaped and curling the shaped cup's edge.

3) The third stage: mainly includes 45 degree angle disuniting, preheating, curling bottom, rouletting, curling rim and so on mechanisms, are the paramount components in culminating paper.[9]

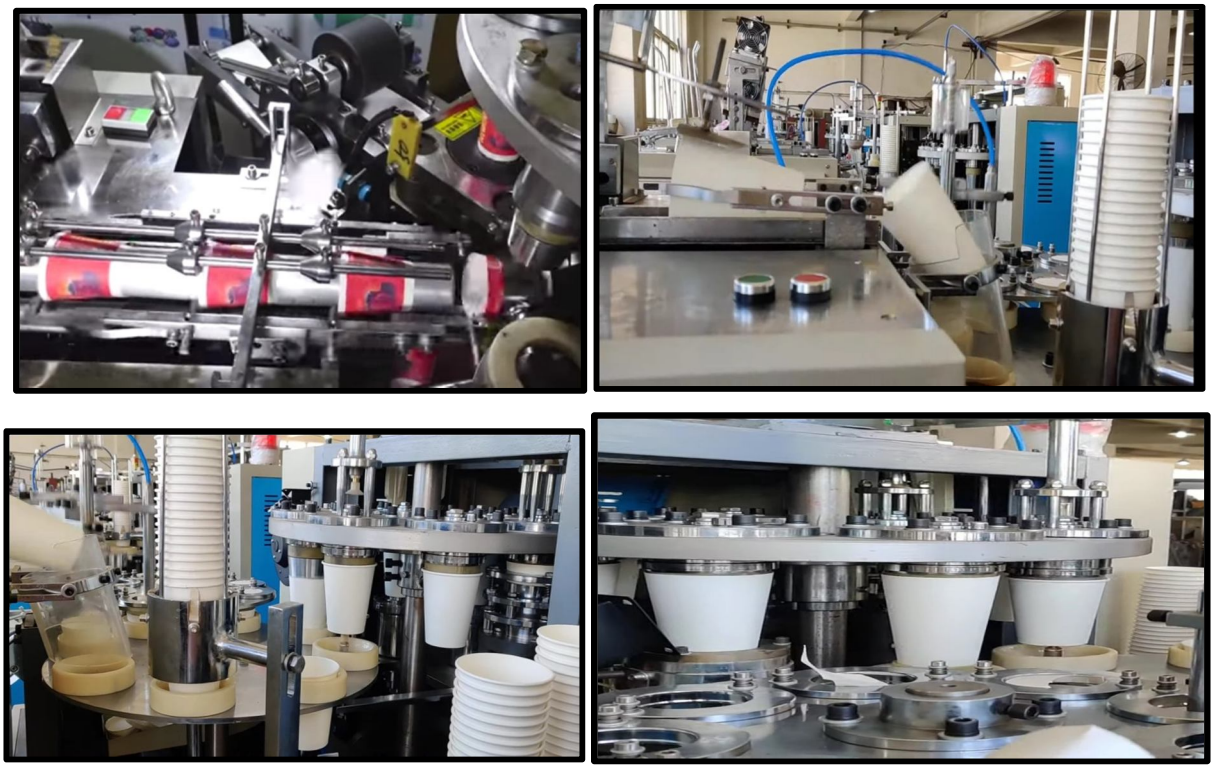


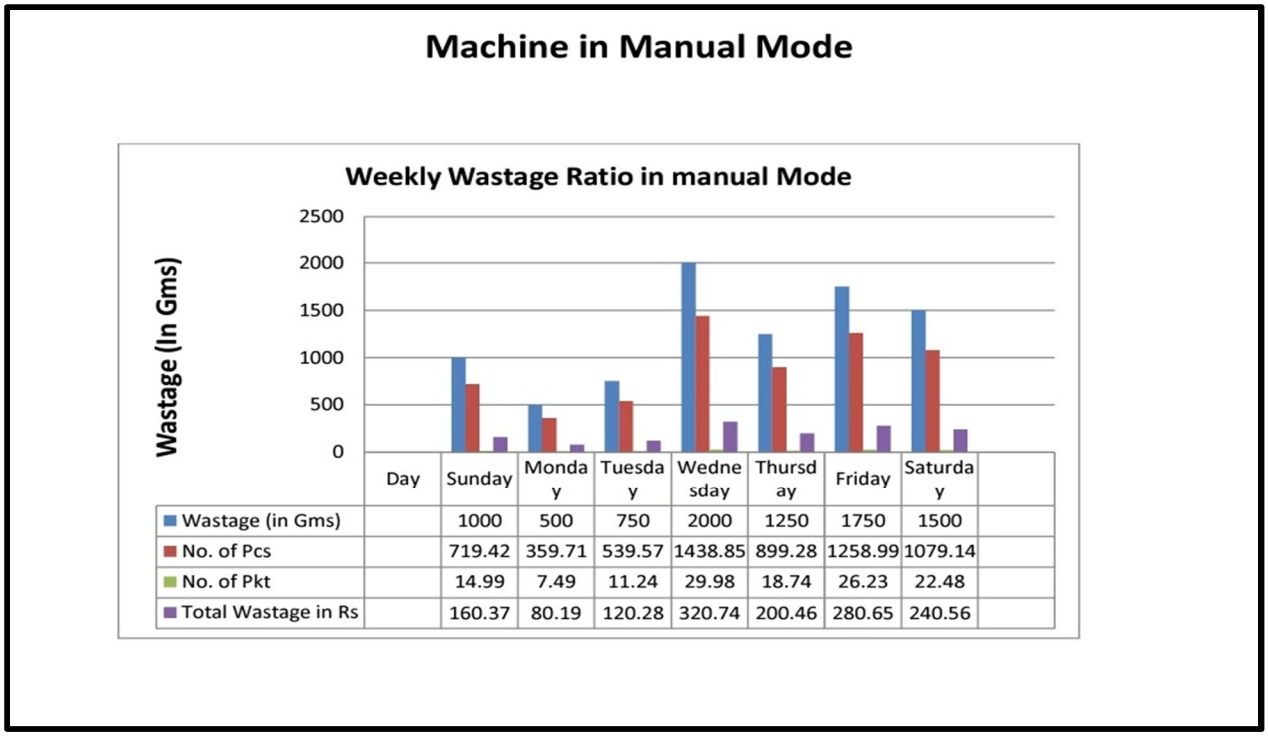
Fig iii-a, b, c, d: Stages of manufacturing paper cups

B. PLC (Programmable Logic Controllers)

The paper cup machine works with the help of a PLC which is programmed according to the production requirements. All the stages are controlled for speed , production per hour and number of units required. Depending on the size and functionality requirements the controller for machine is chosen. [5]

II. MANUAL MODE

In manual mode , although the process of paper cup manufacturing is undertaken by the machine , lack of Automation in counting process and lack of coordination due to absence of sensors for detecting presence of paper cups and only then allowing the machine to work leads to a lot of wastage in terms of raw material as well as power used. [11]



Day	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Wastage (in Gms)	1000	500	750	2000	1250	1750	1500
No. of Pcs	719.42	359.71	539.57	1438.85	899.28	1258.99	1079.14
No. of Pkt	14.99	7.49	11.24	29.98	18.74	26.23	22.48
Total Wastage in Rs	160.37	80.19	120.28	320.74	200.46	280.65	240.56

Fig iv: Average waste generated in manual mode

III. AUTOMATED MODE

In this mode additional sensors are installed on the machine and supervision of parameters like presence or absence of paper cups during manufacturing stage is monitored as well as counting operation can be performed using the sensors. When there is no raw material or absence of cups , the system should turn off and should not work at all to decrease power wastage and increase overall efficiency of the system.[10]

IV. CONCLUSION

This paper reviews the basic manufacturing process and stages of paper cups to evaluate shortcomings of the existing system and analyse the need to employ sensor based additional circuitry to further automate the machine and reduce the existing form of average wastage being generated on a daily basis which leads to monetary losses as well as power wastage. If this wastage is reduced or eliminated by employing sensors and control circuitry, it will increase quality control statistics as well as production quantity with an efficient power utility.

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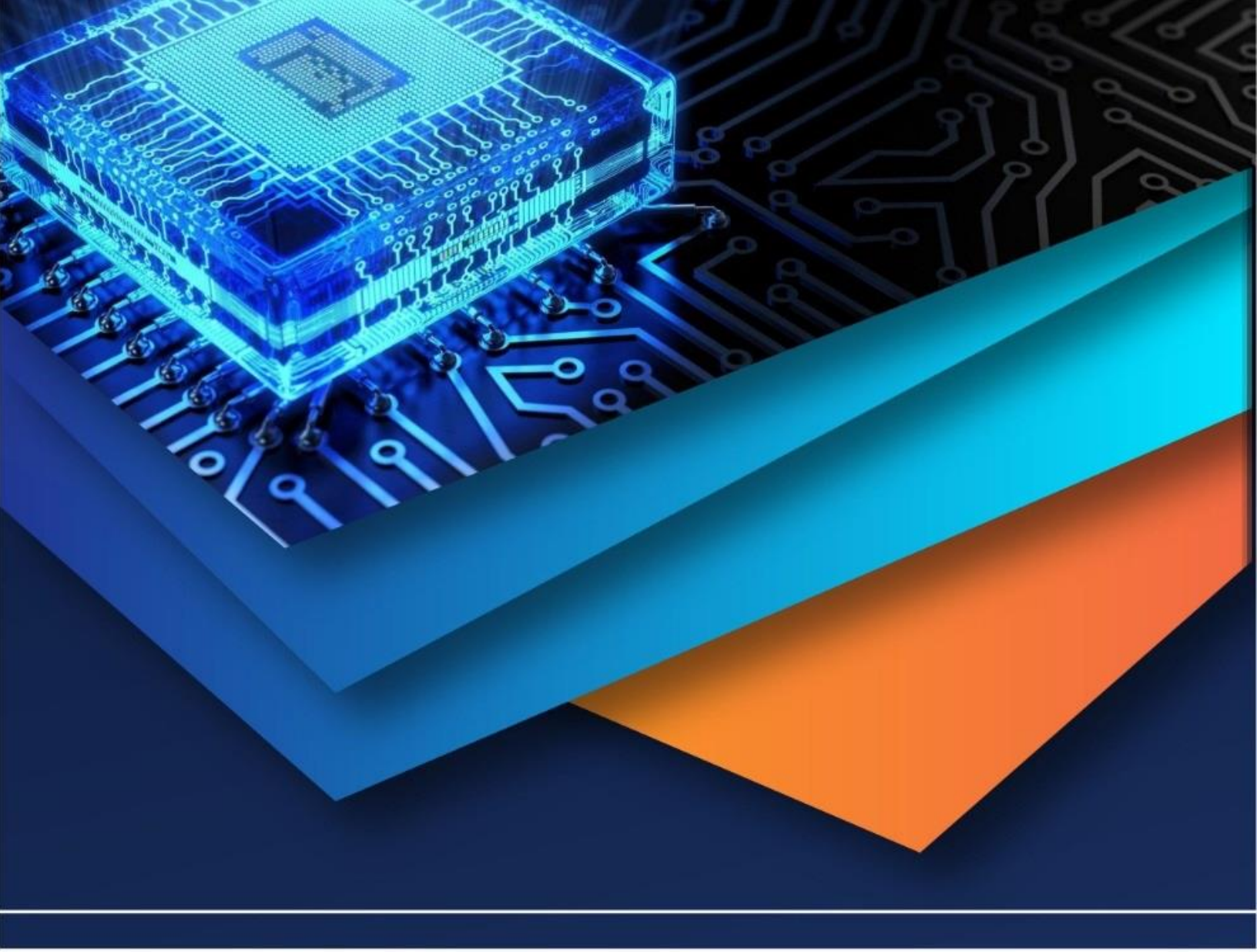

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