PARAMETRIC ANALYSIS AND OPTIMISATION OF INJECTION PLASTIC MOULDING AND MOULDING MATERIAL

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Abstract : This study present the how to optimize the injection molding parameters and how to analysis them. Injection molding is important now days in industries. In this process, material is injected into a mold and after that it gets desired shape. To increase the productivity we analyze the parameter and optimize them. In today life quality of product plays an important role by this customer satisfied. Each company wants to expand so that they have to focus on their customer. In this work we found that sink mark or shrinkageare main problems which affect the product quality. Also we are work on how to reduce cycle time as well so that we increase productivity.In this project experiment done on 10 kw injection molding machine and material chosen was polyethylene material. In this project we take three different thickness materials which are 0.5 mm, 1.5mm and 4 mm thickness. After choosing the material we did experiment on selective parameters which are to be optimized. With the help of RSM and taguchi method optimization had done. Data is collected by the many experiments in all conditions. After that data is optimized using taguchi and RSM technique. Hence we found that at 226ºc 0.5 mm thickness material gives best result with this material we found that shrinkage and cycle time reduces and gives best production.

***Keyword* –R&D, Quality,Design, *RSM technique* , Matrix., ignition ,insert.**

I. INTRODUCTION

The injection moulding has become popular after 1800's. This is used to prepare daily life used tools like plastic mugs, bottles, plastic hollow parts. The invention of an injection moulding machine was by John Wesley. Growth of this industry is very rapid because it helps in daily life. The industry becomes popular near World War-2 because peoples want inexpensive things. American inventor James Watson Hendry built the first screw injectionmoulding machine, which gives more efficiency and control to the operator. In this machine material is mixed before injection so that color would be mixed thoroughly before injection.

There are many types of moulding process which are used in industries and they are:-

1. **1**blow moulding
2. Injection moulding
3. rotational moulding
4. Compression moulding.

1) Blow molding – with the help of blow molding we can produce hollow parts and these hollow parts are joined together to form a new product. Blow molding is used to make daily life products like bottles, mugs and etc.
2) Injection moulding– with the help of injection molding we produce product in bulk in less time in this process wechoose a material which been melt with specific temp. this molten material goes into mold and after cooling down desired product is ready. In this process we used different types of material according to our need in our experiment we polyethylene material.
3) Rotational Molding – in this process we used a mold which is in heated form after that we fill this mold with the selected material after that we slowly rotate it after some time it cool down and we get desired product as our need. In this process soft material is stick with the mold wall that is why we get our product.
4) Compression Moulding- in this process we heated up the mold after that we put our material in it after this a external force applied on it .when we apply force on the mold then the material stick with the wall and get its shape.we maintain pressure till that time when our product is ready.

.Researcher Erzurumlu [19] works on how to min. the warpage and S.I on different plastic oarts of different cross-section area by various process parameters and also work on rib layout angle using Taguchi method. During this project optimal level of process parameters are analysis with the help of taguchi method.

Researcher Jianga [20] works on I.C.V by using finite method to simulation of injection moulding, in this experiment he works on flow and thermal simulation.

Hassan [21] works on the effect of the gate location on the cooling of thematerialin injection moulding arecalculated by the three dimensional time-dependent analysis for a mouldwhich is having two different thicknesses. In this process we analysis the cooling of the material.

Researcher Chen [22] suggested that, production engineers have to usedone of the method which are trial-and-error method or Taguchi's method which are used for optimization.

Researcher Rajalingam [23] saw that some of parameters which affects the shrinkage defect on a plastic materialthey are M.T, I.P and rotation speed. His Experiment was used to find out the parameters setting.

2. OBJECTIVES

1. To increase the productivity
2. To find problem in moulding material and short it out
3. To determine the parameters which effects the process
4. To determine the parameters which causes shrinkage and other problems

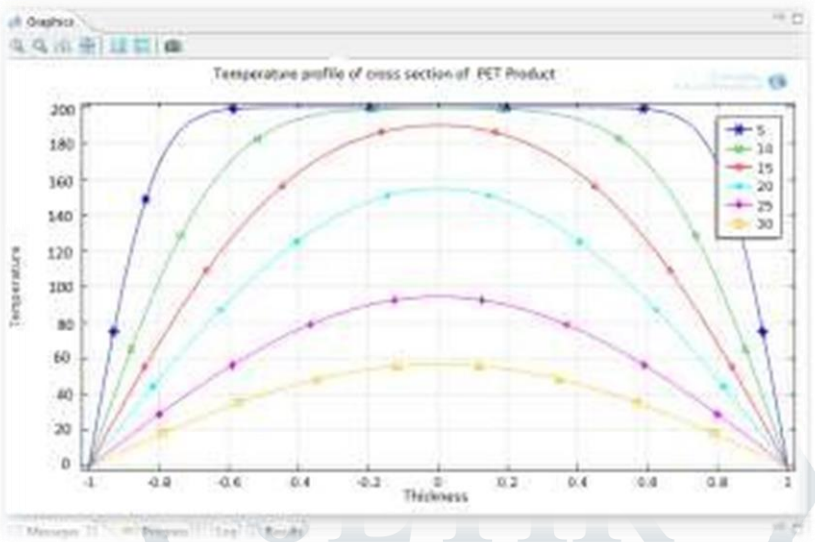


Fig: Temperature disparity athwart of the breadth, x, mm of PET

3. MATERIAL USED

Weight is important part of this study because it helps to find out variation in output. We use polyethylene because it has capability to deal with flow and has required strength. It is good material for making plastic product that is use many industries and for making daily use houseware.

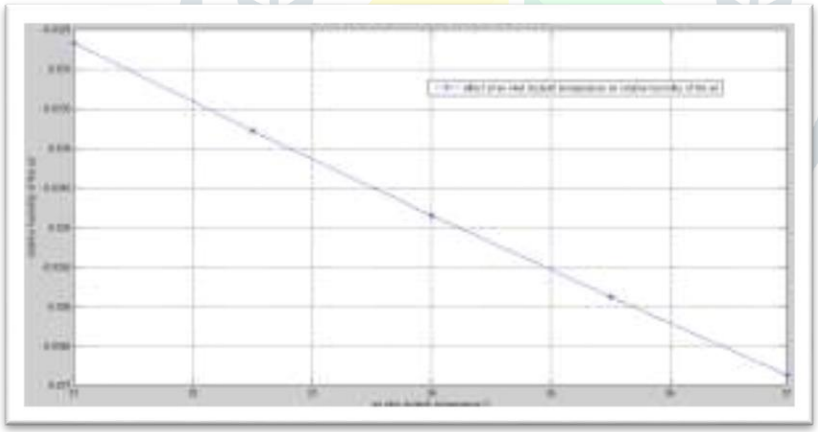


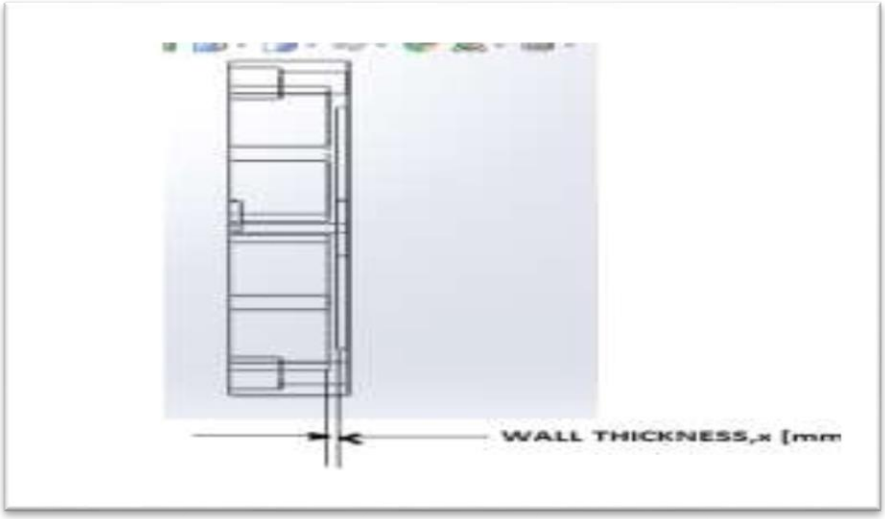
Fig-: Effect of air inlet drybuld temperature on relative humidity

4. RESULTS AND DISCUSSION

Input Factors are:-

1) Barrel Temperature - [B_T]
2) Injection pressure - [I_P]
3) Injection speed - [I_S]
4) Coolant flow rate - [D]
5) Holding pressure - [H_P]
6) Holding time - [T]
7) Cooling time - [C_T]

Heat analysis



Sr. no.	Factors	Levels		
		1	2	3
1	Barrel Temperature $[B_T]^0$c	216	226	236
2	Injection Pressure $[I_P]$Mpa	17	1819	
3	Injection Speed $[I_S]$ mm/s	41	46	51
4	Coolant Flow Rate [D] l/m	5	8	12
5	Holding Pressure $[H_P]$Mpa	20 21	22	
6	Holding Time $[H_T]$ sec	1.6	1.76	2.1
7	Cooling Time [CT] sec	8	8.76	9.1

IT IS found that 0.5 mm thickness polyethylene material give best production at 226°c temp out of 1.5 and 4 mm thickness material .1.5 mm thickness material give 1000 piece in 12 hrs 4mm thickness material give 860 piece in 12 hrs whereas 0.5 mm give 1250 piece in 12 hrs with minimum defects

5. CONCLUSIONS

I found minimum cycle time with 0.5 mm thickness which is 34 sec and with 1.5 mm and 4 mm is 51sec,3min. it is shown that best production come out on 226°c .at this temperature and with 0.5 mm thickness shrinkage, voids and other problems are minimum as compare to 1.5 and 4 mm thickness material.

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