Design And Analysis Of Water Bottle Flip Cover

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Abstract- *This paper represents a novel design and control architecture of the continuous stirred tank reactor (CSTR) based on its mathematical equivalent modeling of the physical system. The plant is formed analytically for the normal operating condition of CSTR. Then the transfer function model is obtained from the process. The analysis is made for the given process for the design of controller with Convectional PID (trial and error method), Ziegler Nichols method, Fuzzy logic method and Model Reference Adaptive method. The simulation is done using MATLAB software and the output of above four different methods was compared so that the Model Reference Adaptive Controller has given better result. This thesis also compares the various time domain specifications of different controllers.*

Keywords- Moulds, multithread, solidwork, bottle flip, etc

I. INTRODUCTION

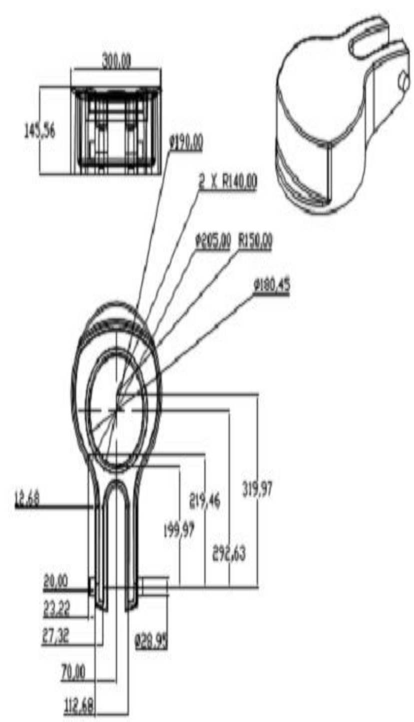
The injection moulding has seen steady growth since its beginnings in the late 1800's. The technique has evolved from the production of the simple things like combs and buttons to major consumer, industrial, medical, and aerospace products. In 1946, American inventor James Watson Hendry built the first screw injection moulding machine, which allowed much more precise control over the speed of injection and the quality of articles produced. This machine also allowed material to be mixed before injection, so that colored or recycled plastic could be added to virgin material and mixed thoroughly before being injected. The main concept of plastic moulding is placing a polymer in a molten state into the mould cavity So that the polymer can take the required shape with the help of varying temperature and pressure. There are different ways of moulding a plastic some of them are blow moulding, Injection moulding, rotational moulding and compression moulding. Each technique has their own advantages in the manufacturing of specific item.

II. LITERATURE REVIEW

P.Ravinder Reddy, Hemendra Kr. Srivastava, S.S.Hebbal in their paper named as, “Design and Analysis of Injection Moulding of Mineral Water Bottle Cap”, Injection moulding is the most important process in the manufacturing of plastic parts by forcing melted plastic in to a mould cavity until it cools and forms a specific plastic shape. Plastic injection moulding is very useful when the plastic parts that need to be produced are too complex or expensive to do by machine. The plastic used is the thermo-plastic (HDPE) as these materials soften when heated and re-harden when cooled. No chemical changes take place when the material is heated or cooled, the change being entirely physical. For this reason, the softening and re-hardening cycle is repeated any number of times. In this work, the stress analysis of cap cavity plate under the pressure is considered, in addition to this thermal analysis is carried out at injection temperature 220^0C and mould temperature 20^0C. Cap is modeled in proengineer software and the meshing is carried in Hyper mesh 7.0 and analysis is carried out in Ansys11.0.The deformations and stresses induced due to structural and thermal loading is illustrated and discussed.

III. MODEL STUDY AND MODELLING OF COMPONENT

3.1 Design of both component



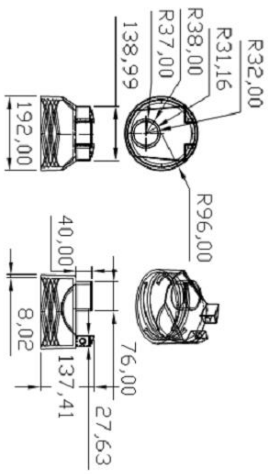


Figure 1: Design of both component

3.2 Core and Cavity for making bottle flip cap

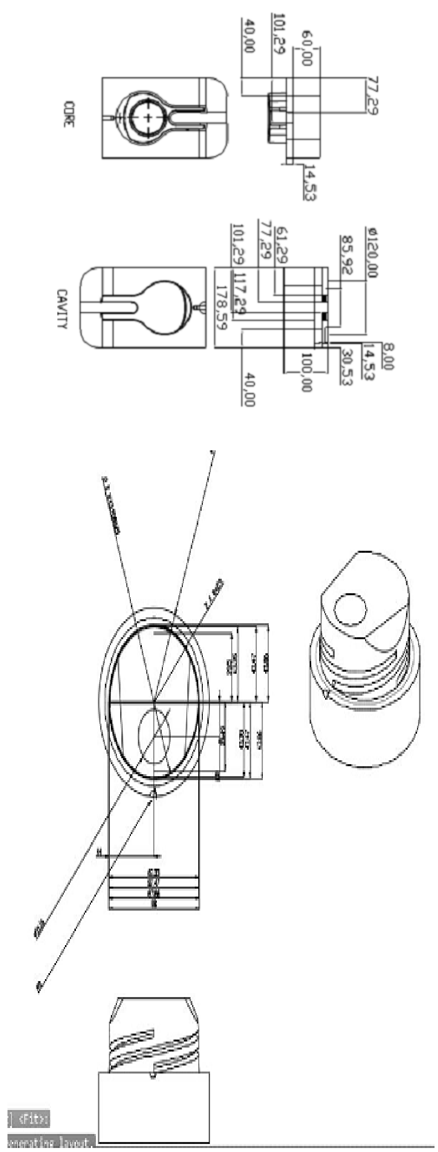


Figure 2: Core and Cavity for making both Component

3.3 Model of component

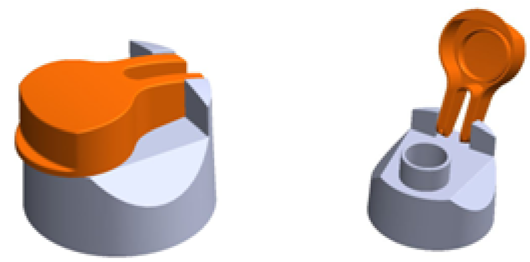


Figure 3: Model of component

IV. DESIGN CALCULATION

Component 1

Surface area = 6197 Sq. mm
Material = Polypropylene
Mass = 3.20 grams
Q_B = 546 KJ/Kg
Density = 0.9 kg/dm^3
Moulding Temp = 20 – 80 D.C.

Shot Capacity

$$Ns = \frac{0.85 \times W}{M}$$

W=S_v x Density x C
Sv= 100 cm^2
W = 100 x 0.9 x 93
W = 83.7gm.

$$Ns = \frac{0.85 \times W}{7.16}$$

Ns =9.93 = 10

Plasticizing Capacity

$$Np = \frac{0.85 \times P \times Tc}{3600 \times M}$$

Tc = cycle time

$$Tc = = \frac{M \times 3600}{Ps}$$

M = Mass = 3.20
Plasticizing Capacity of Machine = 40 kg/hr

$$Tc = \frac{7.16 \times 3600}{17.53 x 3600}$$

Tc = 1.47 SEC (assuming tc =15 sec)

$$P = = \frac{M \times 3600}{Ps}$$

$$P = \frac{40 \times 239.4}{546}$$

P = 17.538 Kg/Hr

$$Np = \frac{0.85 \times P \times Tc}{3600 \times M}$$

$$\frac{0.85x17.52x15x10^3}{3600 \times 17.16}$$

Np = 8.16 = 8

Clamping Capacity

$$Nc = \frac{c}{Pc \times Am}$$

C = Rated Clamping Capacity = 800 KN

Am = Projected area of moulding including runner and sprue

Pc = Cavity Pressure Approx. = 63 Mpa

Nc = 800x(63x10^3x11632.56x10^{-6})

Nc = 1.09 = 2 Assume.

Component 2

Surface area = 11408.55 Sq. mm

Material = Polypropylene

Mass = 9.46 grams

Q_B = 546 KJ/Kg

Density = 0.9 kg/dm^3

Moulding Temp = 250 D C

Shot Capacity

$$Ns = \frac{0.85 \times W}{M}$$

W=S_vxDensityxC

Sv= 100 cm^2

W = 100 x 0.9 x 0.93

W = 83.7 gm.

$$Ns = \frac{0.85 \times 83.7}{9.46}$$

Ns =7 = 8

Plasticizing Capacity

$$Np = \frac{0.85 \times P \times Tc}{3600 \times M}$$

Tc = cycle time

$$Tc = \frac{M \times 3600}{Ps}$$

M = Mass = 9.46 gm

Plasticizing Capacity of Machine = 40 kg/hr

Tc = 1.94 SEC(Tc>tc then Tc = 5 sec)

$$P = \frac{M \times 3600}{Ps}$$

P = 40x(239.4 / 546)

P = 17.538 Kg/Hr

$$Np = \frac{0.85 \times P \times Tc}{3600 \times M}$$

Np =2.18 = 2

Clamping Capacity

$$Nc = \frac{c}{Pc \times Am}$$

C = Rated Clamping Capacity = 800 KN

Am = Projected area of moulding including runner and sprue

Pc = Cavity Pressure Approx. = 63 Mpa

Nc = 800x(63x10^3x11408.35x10^{-6})

Nc = 1.563 = 2 Assume

V. MOULD FLOW ANALYSIS

It is required to do the mould flow analysis for the particular component to know the proper filling of material into the component. We also know that if any other defects are coming during the filling process of the component by analysis we can remove the defect from the component. Following are the analysis of componenet

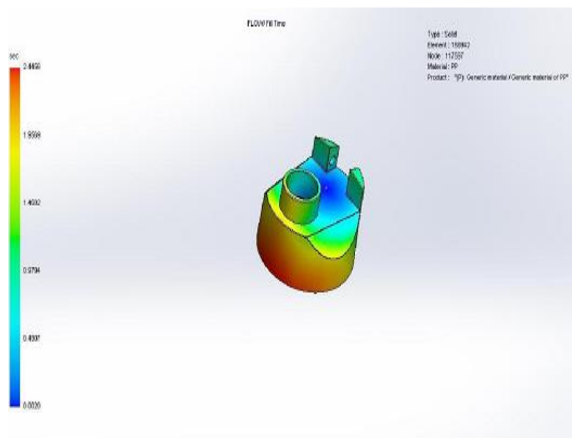


Figure 4. Filling of material in both component

VI. RESULT

In this project design of Bottle Flip Cover is carried out to make it feasible to manufacture as well as to improve its aesthetic view. The complete injection tool is designed for fabricating Bottle flip cover by considering all parameters which are required for the fabrication of component using solidwork. A modal analysis determines the parameter and some of them are Surface area, Filling Time, Cycle Time, etc.Surface Area =6197.05 sq.mm,Filling Time = 3.26 sec,Cycle Time = 65.55 sec,Multi start thread

VII. ACKNOWLEDGEMENTS

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