Design of AC Outdoor Capacitor Cap/wiring cap

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Abstract **- Injection Moulding is the process where raw material (thermoplastic) of plastic is given a specific shape and size by forcing the plastic raw material(thermoplastic) in mould. While producing plastic components using normal/standard multi-cavity mould, we are facing the problems of side core wear frequently, also the repair and maintenance cost will be high each time, it also results in breakdown in production. Thus, I am redesigning the supply cover by doing some modification in and this will be beneficial for our using purpose. I am making design of the component, mould of the component using CATIA and Solidworks18 software.**

I.INTRODUCTION

Injection Moulding is the process where raw material (thermoplastic) of plastic is given a specific shape and size by forcing the plastic raw material (thermoplastic) in mould. The product which manufactures by this method has many variety. You can design any plastic product it can be manufacture in the moulding machine It is a very simple process, but very complex science is used to design it.

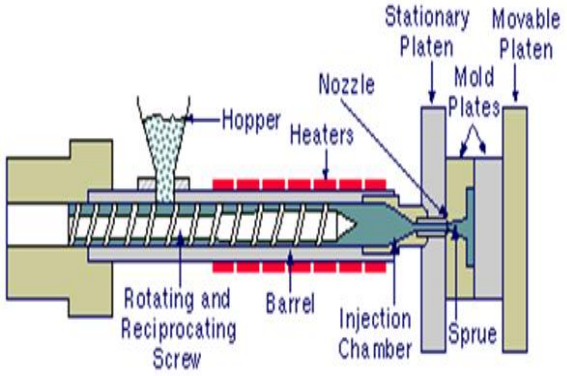

Fig 01: A single screw injection molding machine.

Basic Parts of Injection Moulding Machine

- The hopper
- The barrel
- The reciprocating screw
- The nozzle
- Mold system
- Cooling channels (circuits)
- Hydraulic system
- Control system
- Clamping system
- Molded system
- The delivery system

II. OBJECTIVE

- Reduction of Mould cost by removing side core from design.
- Elimination of repair cost and time of side core.
- Achieving break free production.

III. MODEL STUDY AND MODELLING OF COMPONENT

Component is modeled using the software SOLIDWORK
Component name: capacitor cap
Component material: PP (polypropylene)
Shrinkage: 1.5
Moulding type: single Cavity injection mould tool
Surface area = 47642.77 Sq. mm
Material = Polypropylene
Mass = 63.24 grams
QB = 546 KJ/Kg
Density = 0.9 kg/dm3
Melt Temperature = 230.00 °C
Mold Temperature = 50.00 °C
Ejection Temperature = 95.00 °C
Glass Transition Temperature = 135.00 °C

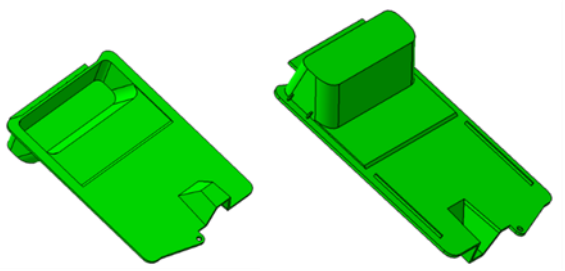

Fig 02: 3D model of Component

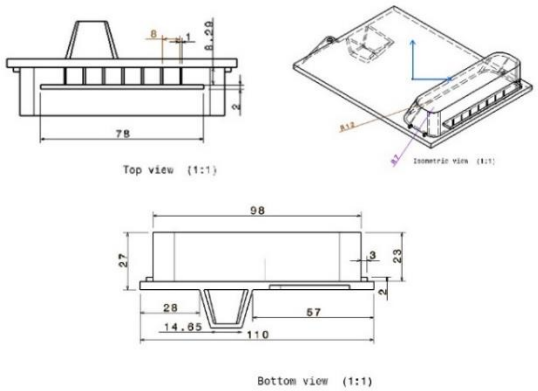

Fig 03: Drafting of Component

IV. DESIGN OF MOULD

We have designed the mould by using the Two-plate mould having one parting line with single cavity without gating system.

Design calculation

Many calculation to be made to predict the weight of the component, Shot Capacity, Plasticizing Capacity, Clamping Capacity, on which machine mold to be loaded, plasticizing and shot capacity of the machine, etc. The result are tally with simulation result.

Surface area = 47642.77 Sq. mm
Material = Polypropylene
Mass = 63.24 grams
Q_B = 546 KJ/Kg
Density = 0.9 kg/dm^3
Moulding Temp = 250 D C

1. Shot Capacity

Ns = (0.85 x W) / M
W=S_v xDensity x C
Sv= 100 cm^2
W = 100 x 0.9 x 0.95
W = 85.5 gm.

Ns = (0.85 x W)/63.24
Ns =1.14 = 1

2. Plasticizing Capacity

Np = (0.85 x P x Tc) / (3600 x M)
Tc = cycle time
Tc = (M x 3600) / P
M = Mass = 63.24
Plasticizing Capacity of Machine = 40 kg/hr
Tc =(63.24 x 3600) / (40 x 3600)
Tc = 1.58 SEC
P = Ps x (Q_A / Q_B)
P = 40 x (239.4 / 546)
P = 17.538 Kg/Hr
Np = (0.85 x P x Tc) / (3600 x 63.24)
=(0.85 x 17.528 x 15.8 x 10^3) / (3600 x 63.24)
Np = 1.03 =1

3. Clamping Capacity

Nc = C/ (Pc x Am)
C = Rated capacity of clamping = 800KN
Am = Projected area including runner and sprue for moulding
Pc = Cavity Pressure Approx. = 63 Mpa
Nc = 800/(63 x10^3 x 47642.77 x 10^{-6})
Nc = 0.27 = 1 Assume.

Select the minimum number of cavities possible = 1 cavity
Determination of number of cavity From the above calculation shows single mould cavity.

Runner Diameter

D = (√M x ^{4}√L) / 3.7
D = dia. Of runner (mm)
M = mass of moulding (g)
L= length of runner (mm)
D = (√63.24 x ^{4}√38) / 3.7
D = 5.33 mm

Gate calculation

H = N x T
H = depth of gate (mm)
T = wall thickness (mm)
N = material constant.
H = 0.9 x 3
H = 2.7mm

W = (N x √A) / 30

W = width of gate (mm)
A = surface area of cavity (mm^2)
W = (0.9 x √854147.79) / 30
W = 27.72mm

V TOOL ASSEMBLY

Tool assembly is done in modeling software, includes the fixing of upper plate and lower plate into the mould base. After this the 3D model is converted into 2D for manufacturing purpose.

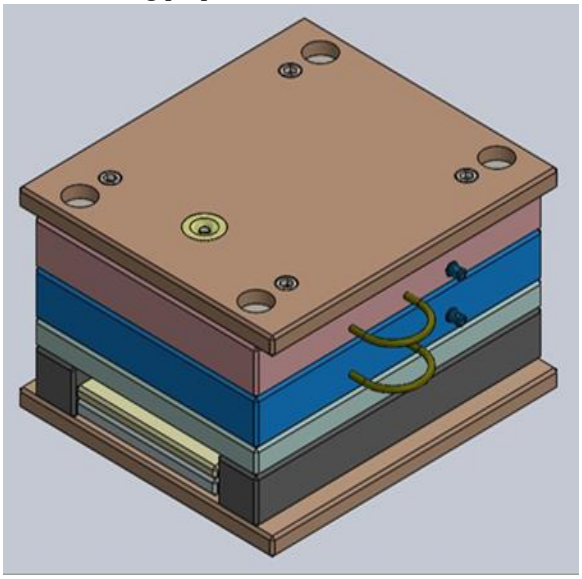

Fig 04: 3D view of Tool Assembly.

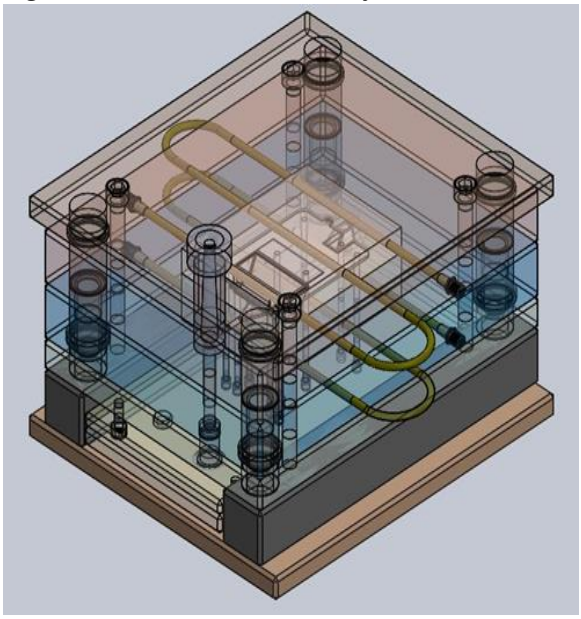

Fig 05: 3D Wire Frame View of Assembly of Tool.

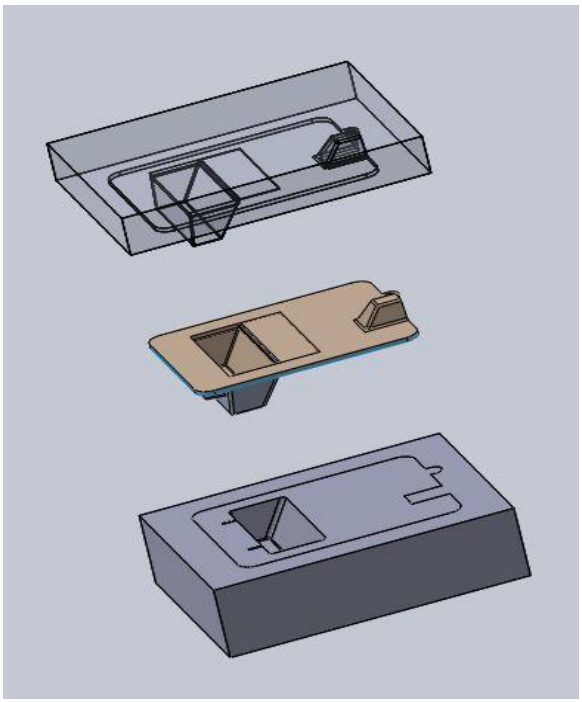

Fig 06: Exploded view of upper die plate, component and lower plate.

VI. CONCLUSIONS

In this project, we carried out the Design of Ac Outdoor Capacitor Cap / wiring cap. The complete injection mould tool is designed for fabricating AC Outdoor Capacitor Cap / wiring cap by using solidwork. The analysis for plastic flow is carried out using solidwork. All the results viz. fill time, temperature at the end of fill, weld lines, air traps, Ease of fill prediction are analyzed and also we have design the mould tool assembly for AC Outdoor Capacitor Cap / wiring cap by considering standard design consideration and it has not shown any error in the mould flow analysis.

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