RESEARCH WORK ON DESIGN AND ANALYSIS OF AC OUTDOOR CAPACITOR CAP/ WIRING CAP

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Abstract

Injection moulds are divided into two types based on runner design (i.e.) Cold runner moulds and Runner less moulds (i.e.) hot runner moulds. In cold runner moulds, for multi-cavity and multi-point injection moulds, there is wastage of material in runner area. Sometimes wastage of material is more than component weight. For avoiding the above problem, the technique used is hot Runner moulds. Hot runner mould is one of the advanced manufacturing methods for multi-cavity type moulds. These types of moulds are commonly used for large production rate. 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 and mould flow analysis using CATIA and Solidworks18 softwares.

KeyWords: Analysis, Processing Plan,calculation,Result

1. INTRODUCTION

Injection moulding is a method of forming a plastic product from thermoplastics by feeding the material through the machine component called the hopper to a heated chamber in order to melt it and force the material into the mould by the use of the screw. In this whole process, clamping force should be constant till the material is solidified and is ready to be ejected from the mould. This is the most common and preferable way of producing plastic products with any complexity and size. The runner system accommodates the molten plastic material coming from the barrel and guides it into the mould cavity. Its configuration, dimensions, and connection with the moulded part affect the mould filling process and, therefore, largely the quality of the product. In other words, the runner system dictates part quality and productivity. Runner systems in conventional moulds have the same temperature level as the rest of the mould because they are in the same mould block. The ideal injection moulding system delivers moulded parts of uniform density, and free from all runners, flash, and gate stubs. To achieve this, a hot runner system, in contrast to a cold runner system, is employed. The material in the hot runners is maintained in a molten state and is not ejected with the moulded part. Unlike an ordinary cold runner, the hot runners are heated, so the plastic melt in the hot runners never solidified.

2. METHODOLOGY AND PROCESS PLANNING

2.1 Processing Plan

The complete study of Design and analysis of Capacitor Cap will be done through the CAD Software Solid Works 18 & Auto CAD software

1. Study of component.
2. Design Parameters consideration
3. Component material selection.
4. Geometrical dimensional consideration.
5. Modelling using CATIA software.
6. Mould flow analysis for proper filling of component using Solid Works 18

3. Analysis

PROCESS CONDITION

FLOW/PACK

Filling Time = 3.44 se

Main Material Melt Temperature = 230 °C

Mold Wall Temperature = 50 °C

Injection Pressure Limit = 100 MPa

Flow Rate Limit = 194 cc/s

Flow/Pack Switch Point (% Filled Volume) = 100 %

Pressure Holding Time = 5.36 sec

Total Time in Pack Stage = 34.4 sec

Auto Filling Time (1: Yes, 0: No) = 1

Auto Packing Time (1: Yes, 0: No) = 1

Venting Analysis (1: Yes, 0: No) = 0

Cavity Initial Air Pressure = 0.1 MPa

Cavity Initial Air Temperature = 25 °C

Cooling Channel Calculation

Melt Temperature = 230 °C

Min. Coolant Temperature = 25 °C

Air Temperature = 30 °C

Mold Open Time = 5 sec

Average Coolant Flow Rate = 150 cc/s

Control type(1:Eject temp., 2:Cooling time) = 1

Eject Temperature(if control type is "1") = 95 °C

Cooling Time(if control type is "2") = 34.4 sec

Flow Result

X-dir. Clamping Force= 3.1800 Tonne (3.5100 Ton U.S)

Y-dir. Clamping Force= 7.4900 Tonne (8.2600 Ton U.S)

Z-dir. Clamping Force= 1.3800 Tonne (1.5200 Ton U.S)

Required injection pressure= 9.3000 Mpa (1349.3300 psi)

Max. central temperature= 230.4300~C (446.7800~F)

Max. average temperature= 209.0000~C (408.2000~F)

Max. bulk temperature= 230.6000~C (447.0900~F)

Max. shear stress= 0.1400 Mpa (20.5100 psi)

Max. shear rate= 2172.0900 1/sec

Averaged perfect cooling time= 21.0800 sec

CPU Time= 253.46 sec

Cycle Time =3.44 sec

├ 1. Filling Time =3.44 sec

4. Calculation

Surface area = 47642.77Sq. mm

Material = Polypropylene

Mass = 63.24 grams

QB = 546 KJ/Kg

Density = 0.9 kg/dm3

Moulding Temp = 250 D C

1. Shot Capacity

Ns = (0.85 x W) / M

W=SvxDensity x C

Sv= 100 cm2

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 (QA / QB)

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 103) / (3600 x63.24)

Np = 1.03 =1

3. Clamping Capacity

Nc = C/(Pc x Am)

C = Rated Clamping Capacity = 800 KN

Am = Projected area of moulding including runner and sprue

Pc = Cavity Pressure Approx. = 63 Mpa

Nc = 800/(63 x103 x 47642.77 x 10-6)

Nc = 0.27 = 1 Assume.

Select the minimum number of cavities possible = 1 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.

$H = 0.9 \times 3$

$H = 2.7mm$

$W = (N \times \sqrt{A}) / 30$

W = width of gate (mm)

A = surface area of cavity (mm2)

$W = (0.9 \times \sqrt{854147.79}) / 30$

$W = 27.72mm$

5. FIGURES : FLOW

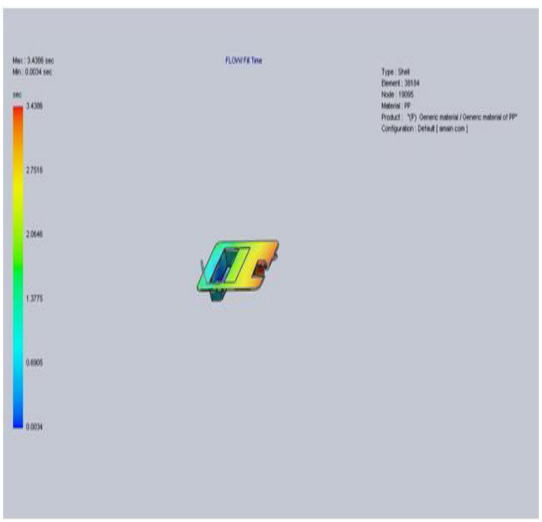

Fig.5.1 Fill Time

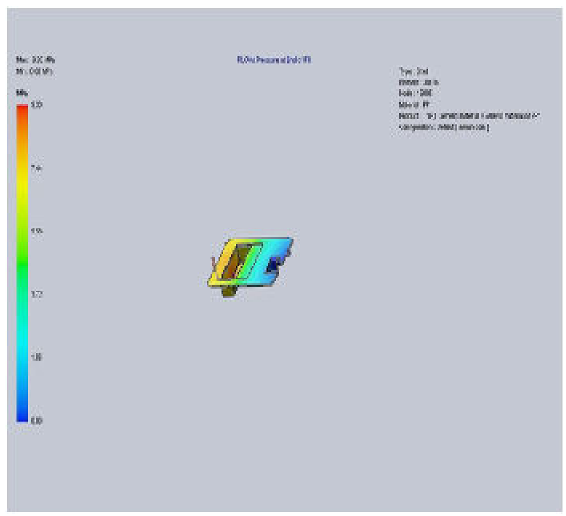

Fig.5.2 Pressure at End of Fill

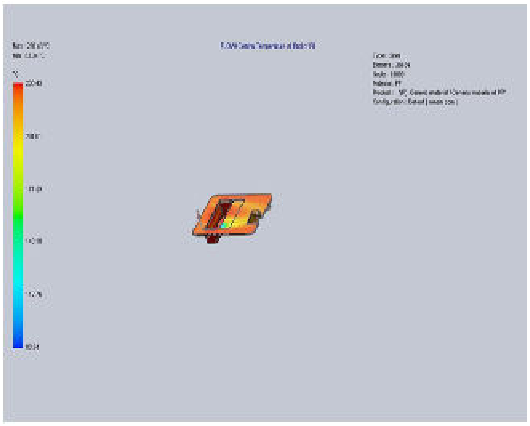

Fig.5.3 Central Temperature at End of Fill

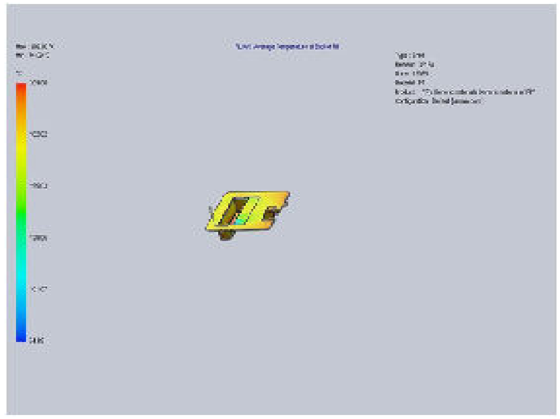

Fig.5.4 Average Temperature at End of Fill

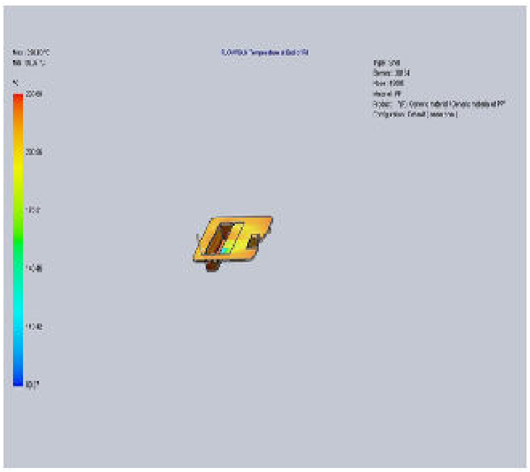

Fig. 5.5 Bulk Temperature at End of Fill

Fig.5.6 Temperature Growth at End of Fill

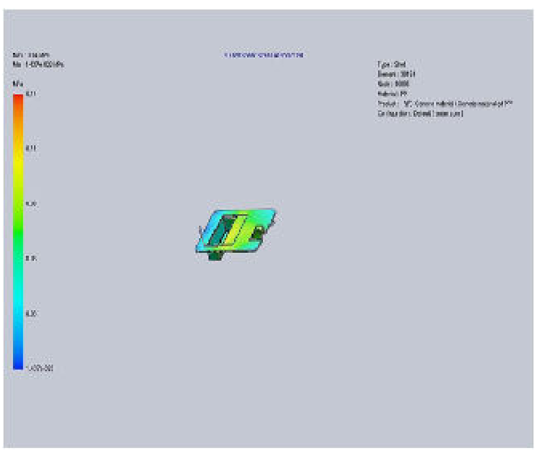

Fig.5.7 Shear Stress at End of Fill

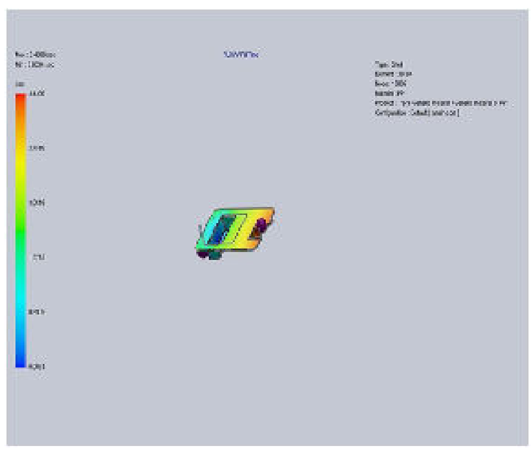

Fig.5.8 Air Traps

6. BILL OF MATERIAL

SR.NO.	DESCRIPTION	FINISH DIMENSION	QTY.	MATERIAL
1	ALLEN SCREW	M10X25	04	STD.
2	ALLEN SCREW	M16X55	04	STD.
3	ALLEN SCREW	M16X150	04	STD.
4	TUBULAR DOWEL	ø42X80	04	EN-31
5	GUIDE BUSH	ø47X79	04	EN-31
6	GUIDE PILLAR	ø47X115	04	EN-31
7	TOP PLATE	446X396X27	01	EN-8/M.S
8	CAVITY PLATE	446X346X66	01	EN-8/M.S
9	CORE PLATE	446X346X66	01	EN-8/M.S
10	CORE BACK PLATE	446X346X36	01	EN-8/M.S
11	EJECTOR BACK PLATE	446X216X22	01	EN-8/M.S
12	EJECTOR PLATE	446X216X17	01	EN-8/M.S
13	SPACER	446X8X62	01	EN-8/M.S
14	BOTTOM PLATE	446X396X27	01	EN-8/M.S
15	SPRUE PULLER	ø12x216	01	STD.
16	TIE ROD BUSH	ø28x25	01	OHNS
17	REST PAD	ø14x28	04	EN-8/M.S
18	TIE ROD	ø22x93	01	EN-8/M.S

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