WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Influence of Sprue System for Electric Enclosure Component by Simulation Flow Analysis using NX-Easy Fill Advanced Software

Hemanthkumar N.[a*], L. G. Sannamani[b], Dr.S.N.Ravi Shankar[c]

[a]*Student, M.Tech in ToolEngineering, GT&TC, Mysuru-16, Karnataka, INDIA*
[b]*HOD, Post Graduate Studies, GT&TC, Mysuru-16, Karanatka, INDIA*
[c]*Principal, Post Graduate Studies, GT&TC, Mysuru-16, Karanatka, INDIA*

A B S T R A C T

Plastic products are in high demand in today's world due to their various beneficial properties. Injection moulding is a common way of making plastic products. To get the desired shape, a moulding tool is required. This work is centered on the moulding of electrical housing connector. The material used to make the component is ABS FR AN450M. Standard moulding techniques can be used to create this component. The primary component study and design are finished for a better understanding. While manufacturing requires designs and drawings for reference, a conceptual design is created prior to tool manufacture. Mold flow analysis, which takes into consideration the material's physical and thermal qualities, offers a better understanding of the needed tool design. The tool design process begins with moulding process that uses a screw and an external heating device to melt the material and then injects it into a mould to make the appropriate product.

Keywords: *Plastic injection mould., nx easy- fill advanced, abs fr an450m, housing connector*.

1.INTRODUCTION

Plastic components are in high demand in today's world due to their numerous useful characteristics. Injection molding is one of the most used methods of producing plastic items. A molding tool is required to create the appropriate mold. This study focuses on the molding of the electric enclosure. In this case, a 3D model was designed with NX -11.0 software and then loaded into an IGS file to assess mold flow insight. All of the procedures were completed in the first phase, which included meshing the model, assigning the material, and finding the optimum sprue location. The traditional trial - and - error technique is used to set the processing criteria, which is often insufficient and impractical for complicated parts. As a result, three iterations will give appropriate sprue position to obtain the best result, and one of the outputs was seen satisfactory for all parameters, encouraging the designer to proceed with the design and manufacturing process and procedures.

2. OBJECTIVES

- Component research and development.
- One whole shot was designed and analyzed.
- Injection mould calculation and conceptual design.
- To manufacture a component without any defect.

3.METHODOLOGY

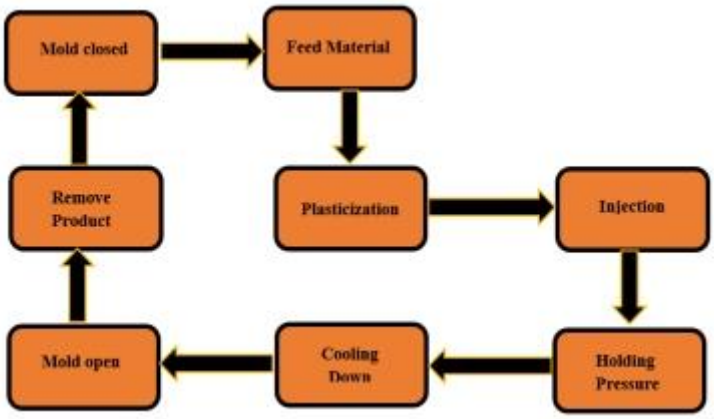

Fig.1- Methodology

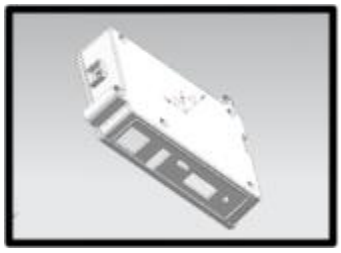

Fig.2 - Component

4. COMPONENT STUDY

Table.1:Component details

SL. NO.	PARAMETERS	VALUES
1	Volume of the component	41 cm^3
2	Density of the material	1.05 g/cc
3	Wall thickness	1.66 mm
4	Shrinkage percentage	1.8 - 2.5 %

5. DESIGN OF FEED SYSTEM

$D2 = D1 + 2L\tan A$ ……(1)

Where,

D1 = Diameter of sprue at upper end = 6 mm

D2 = Diameter of sprue at lower end

L = Length of sprue selected by the designer = 60 mm

A = Tapered angle (2 - 5 ˚) = 2 ˚

D2 = D1+ 2Ltan A

D2 = 6+2(60) × tan (2 ˚)

D2 = 10 mm.

6. MOULD FLOW ANALYSIS

Mould flow analysis is a study of the flow of plastic material that aids in the evaluation of the component, parameters, and mold design in order to manufacture high-quality parts. NX Easy-Fill Analysis is controlled by the Moldex3D application. It is a mould flow simulation tool that allows designers to test the mouldability of plastic part designs early in the product development process. Developers can also make changes in advance to optimize sprue number/locations, component design, process conditions, or material selection.

Table.2: Input data for analysis

Material selected	ABS FR AN450M
Supplier	Bhansali Enterprises
Density	1.06 g/cc
Melt Temperature	270 °C
Max. Pressure	24.69 MPa

7. NX EASY FILL ADVANCED RESULT

Moldflow study was carried out using NX Easy fill advance. Based on sprue and material parameters like Fill time, Melt front temperature, Mouldability, Pressure, Average temperature, Sprue pressure, Weld lines and Air traps.

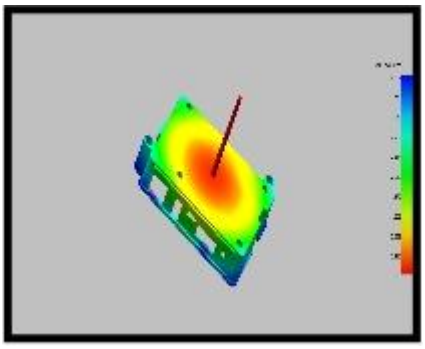

Fig.3(a) - Fill time

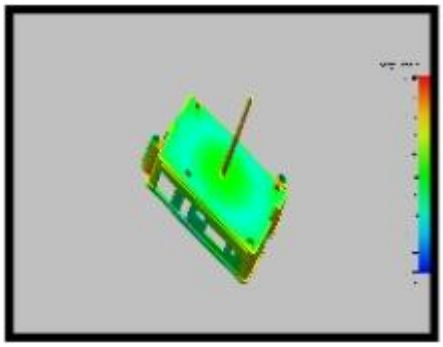

Fig.3(b) - Melt front temperature

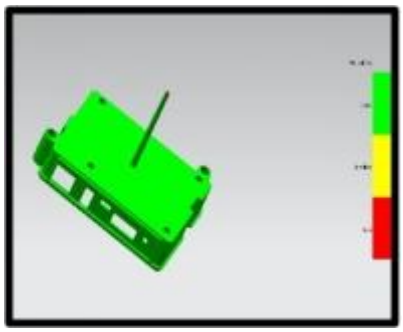

Fig.3(c) – Mouldability

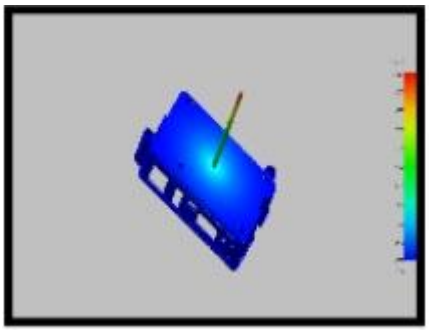

Fig.3(d) - Pressure

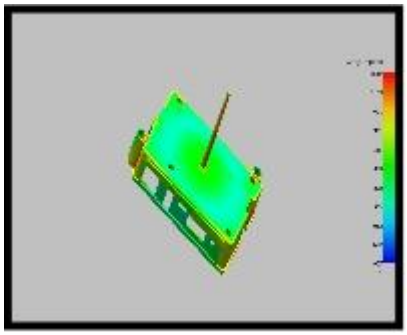

Fig.3(e) - Average temperature

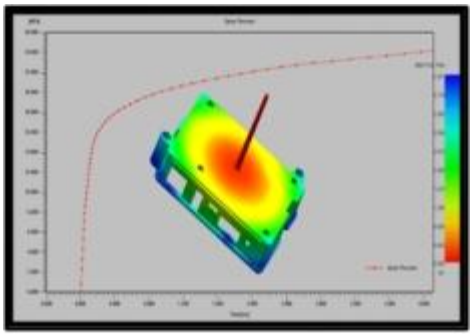

Fig.3(f) - Sprue pressure

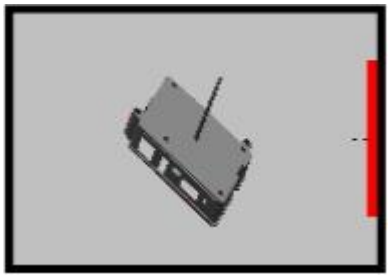

Fig.3(g) - Weld lines

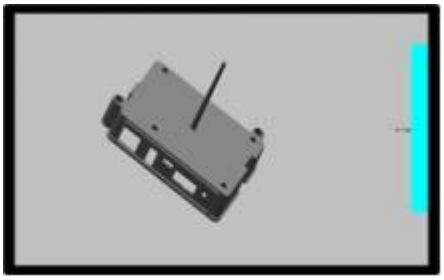

Fig.3(h) - Air traps

Table.3: Result of analysis

SL. NO.	PARAMETERS	RESULTS
1	Sprue contribution	Balanced flow
2	Melt front time	4.97 s
3	Pressure	24.69 MPa
4	Temperature	226.69 °C
5	Air traps	Acceptable
6	Weld lines	Acceptable
7	Ejection	Easy

8. CONCLUSION

By comparing the above result, the analysis for sprue position was determined. As the defects are observed in the analysis, air traps can be reduced by providing air vents in the appropriate position and location. Weld lines can be controlled by monitoring injection parameters. The result from table 2 has been accepted for manufacturing the component.

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