Design of LAN Socket Box

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Abstract - Hot runner mould is one of the ultra-modern manufacturing techniques for multi-cavity type moulds. These types of moulds are over and over used for substantial production rate. While producing the existing plastic components using normal/standard multi-cavity mould, we are fronting the difficulty like partial filling, cavities in components, under product grade, injection pressure and temperature rest age and warpage etc. Thus we are redesigning the LAN socket box by doing some reorganizing in and this will be beneficial for our using purpose. We are redesigning the component and its mould flow analysis using software Solidworks18.

Key Words: mould, core-cavity, warpage.

1. INTRODUCTION

Injection moulding is method used for forming a plastic product from thermoplastics by fortify the material through the utensil called the hopper to a heated chamber in order to melt it and crack in the material into the mould by operating the screw. In this whole process, clamping force should be constant till the material is solidified and is prepared to be ejected from the mould. This is the foremost common and preferable way of manufacturing plastic products with any complexity and size.

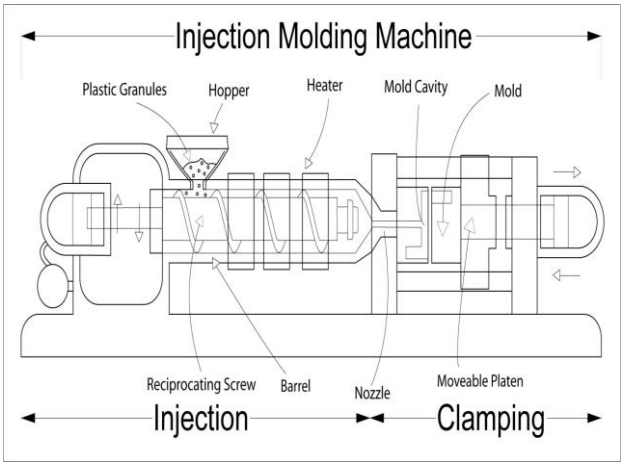

Fig 01: Injection Molding Machine

2. PROBLEM IDENTIFICATIONS AND OBJECTIVES

The following points shows the problem in the existing component as shown in the fig 2 & fig 3.

- Extra material wastage due to its size and shape.
- Warpage occurs due to absence of supporting ribs, which leads to Mismatch of gang box and face plate.
- Size is a big issue when used for small office or home. Gang Box & Face Plate.

The following is the objective to achieve in this project

- Design and modelling of component. (Gang Box & Face Plate)
- Design and analysis of holder base.
- To improve the aesthetic view and reduce material wastage.

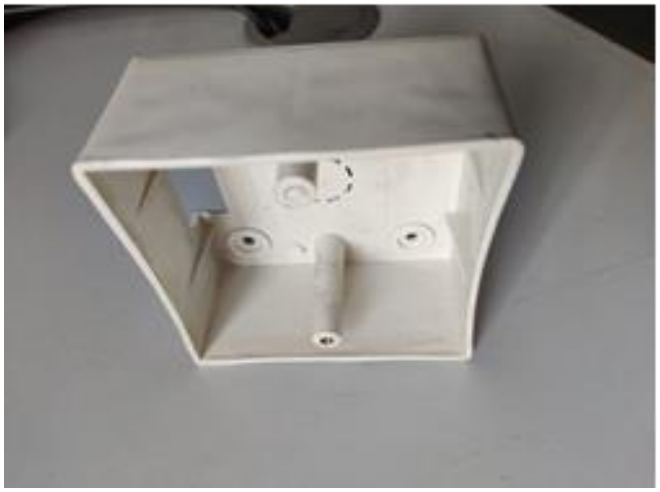

Fig 02: Gang Box Existing component

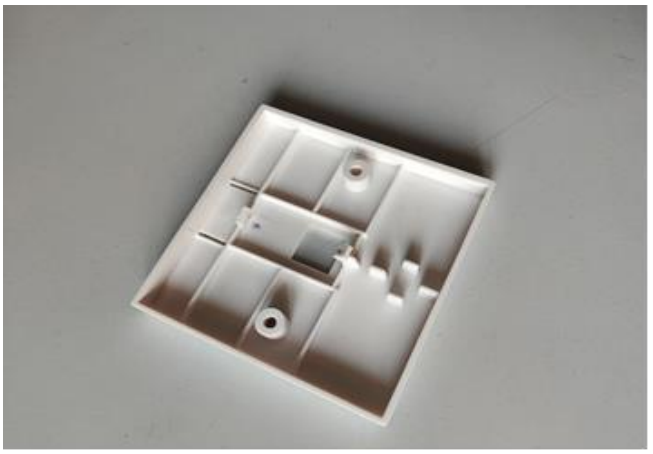

Fig 03: Face Plate Existing component

3. MODEL STUDY

A local-area network (LAN) join the computer hardware in a provincial areas. Usually, LANs use wired connections to link the computers to each other and to different types of peripheral devices such as printers. Devices joined to a LAN makes to access data from any computer that's connected to the network. LAN users can interface with each other by chat or email. It either used of twisted wires or optical fibers. Generally, set of twisted wire is used as it is cheaper than optical fibers. This wires are connected network keystone jack, which is connected face plate and gang box.

In this project we have made face plate and gang box used for placing keystone jack. The previous model used were bulky and big in size which was unnecessary. So, in our project we have reduced its size so that its weight and volume was hence decreased.
Below is comparison between previous model and modified one.

Previous Model

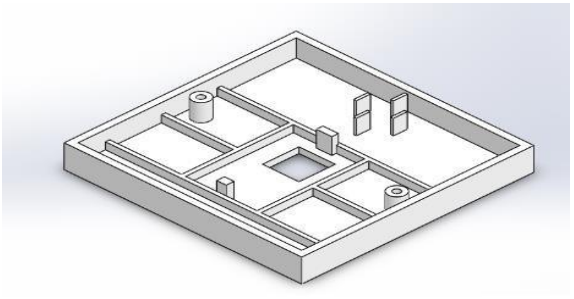

Fig 04: Face Plate Existing component

1. Face Plate
Material = ABS Mass = 25.73 grams
Volume = 25228.26 cubic millimeters
Surface area = 22167.79 square millimeters
Centre of mass: (millimeters)
X = -0.00
Y = -7.28
Z = 0.32

2. Gang Box

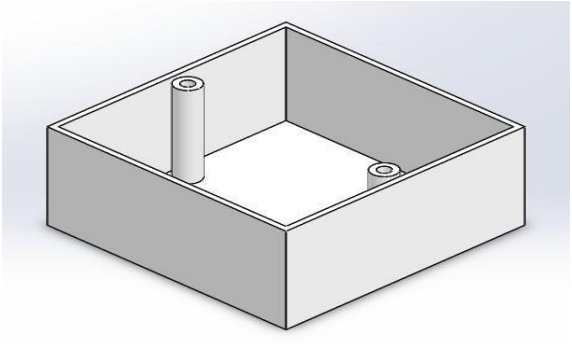

Fig 05: Gang box Existing component

Material = PVC
Mass = 53.05 grams
Volume = 41125.79 cubic millimeters
Surface area = 42066.24 square millimeters
Center of mass: (millimeters)
X = 0.00
Y = 14.06
Z = 0.0

Modified Model

1. Face Plate

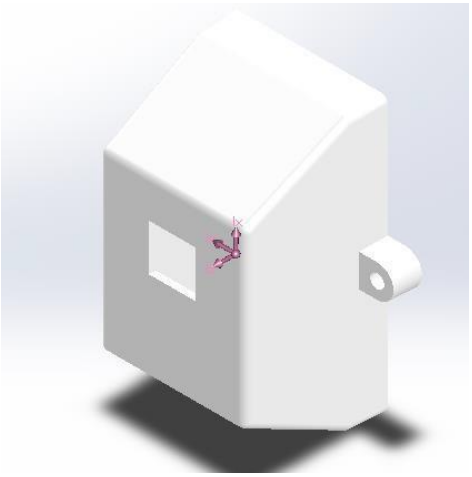

Fig 06: Face Plate of modified component

Material = ABS Mass = 22.73 grams
Volume = 22285.37 cubic millimeters
Surface area = 22923.01 square millimeters
Centre of mass: (millimeters)
X = 0.00
Y = -0.12
Z = -18.50

2. Gang Box

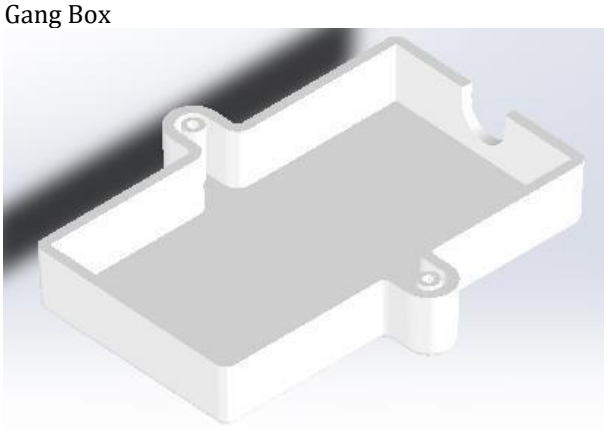

Fig 07: Gang box of modified component

Material = PVC Mass = 16.87 grams
Volume = 13074.72 cubic millimeters
Surface area = 13881.84 square millimeters
Centre of mass: (millimeters)
X = -0.41
Y = 0.00

Z = 9.03
Hence total weight of previous model was 78.78 grams and weight of modified model is 39.6 gram. As the weight of modified model is less than previous one, the cost of product will be reduced.

4. Drafting and Assembly of Product

All the dimension mention in below figure no. 8 &10 are in mm.

4.1 Drafting of Face Plate

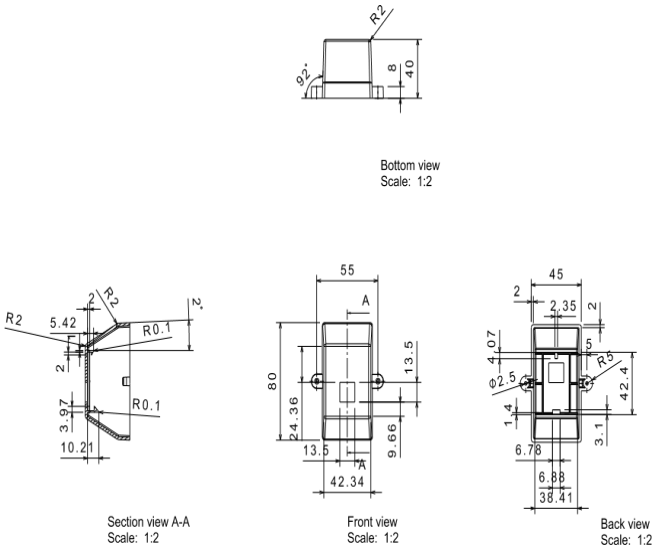

Fig 08: Drafting of face plate of modified component

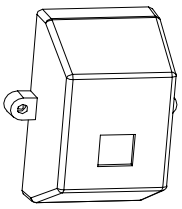

Fig 09: Isometric view of face plate of modified component

4.2 Drafting of Gang Box

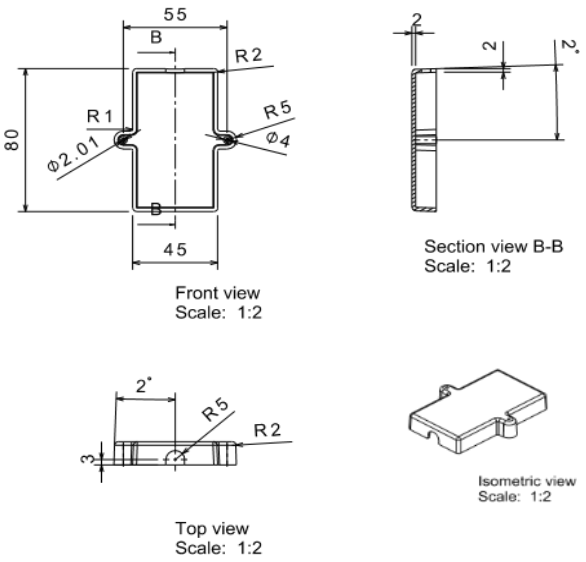

Fig 10: Drafting and Isometric view of gang box of modified component

4.3 Assembly of modified product

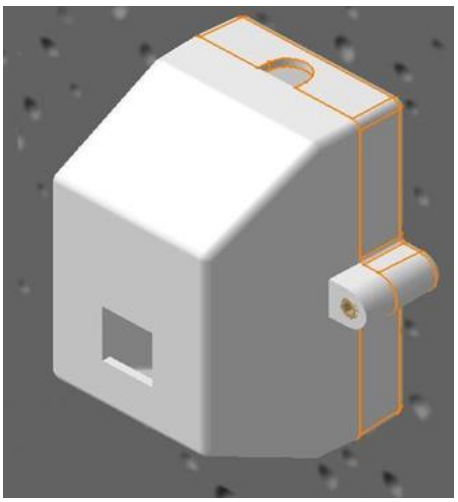

Fig 11: Assembly of modified component

5. CALCULATION OF INJECTION MOULD

5.1 Calculations Injection Mould for Face Plate

No. of Cavities for front part
Mass of component = 27 grams
Plasticizing rate of PS = 40 kg/h
Specific heat of material A = 239.4 KJ/kg
Specific heat of material B = 302.4 KJ/kg

Plasticizing Capacity P = $\frac{\text{Plasticizing Rate of PS x QA}}{\text{QB}}$

$= \frac{40 \times 239.4}{302.4}$

= 31.667 kg/h

T(time for filling) = m x 3600 / P
= 27 X 3600 / 31667
= 3 sec

No. of Cavities = 0.85 x P x 10 / 3600 x 27
= 2

Therefore No. of Cavity for Front Part = 2

Depth of Gate = n X t

t = thickness of part

n= constant (0.9)

Depth of Gate = 0.9 x 2
= 1.8 mm
≈ 2 mm

Runner Diameter
$D = \frac{\sqrt{m} \times \sqrt[4]{L}}{3.7}$

Where,
D = Diameter of Runner (mm) M= Mass of Mould (g)
L= Length of Mould (mm)

$D = \frac{\sqrt{25} \times \sqrt[4]{27}}{3.7}$
D = 3.363 mm

D≈ 4mm

5.2 Calculations Injection Mould for Gang Box

No. of Cavities for front part
Mass of component = 18 gram
Projected area Am = 4400 mm^2
Clamping Capacity C = 800 KN
Cavity Pressure Pc = 63 MPA

No. of Cavities = C / P x A

No. of Cavities = 8 x 100 / 63 x 1000 x 4400 x 10^{-6}
= 2.886
~ 2

No. of Cavity = 2

Depth of gate Depth of Gate = n x t

t = thickness of part

n= constant (0.9)

Depth of Gate = 0.9 x 2
= 1.8 mm

Runner Diameter

$D = \frac{\sqrt{m} \times \sqrt[4]{L}}{3.7}$
D = Diameter of Runner (mm) M= Mass of Mould (g)
L= Length of Mould (mm)

$D = \frac{\sqrt{18} \times \sqrt[4]{27}}{3.7}$

D = 2.61 mm

D (Runner Diameter) = 3mm.

6. CONCLUSION

In this project, we carried out the Design of LAN socket Box. The complete injection mould tool is designed for fabricating LAN socket Box by using solid work. The plastic flow analysis is carried out using solid work. If we compare the existing component and the modified component by weight we have saved around 39 gram of material for each socket.

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