# Thin Wall Moulding

## Thin Wall Moulding and Hot Runner System Selection

Thin wall injection moulding is becoming more and more important due mainly to the growth in telecommunications and portable electronic devices that require thinner and lighter plastic housings. These thin walled parts present many challenges to any Hot Runner supplier. The extreme moulding conditions (high pressure and shear rates) require the Hot Runner design and components to be specified correctly.

## What is Thin Wall?

Thin wall parts are classed as such based on their flow length to wall thickness (or L/t) ratio. Each plastic material has different flow properties so each family of resins has different maximum L/t ratios. The table below shows maximum L/t ratios for some common materials – figures that approach these high values would be considered thin walled. These values are based on a 2.0mm wall section, maximum L/t ratios reduce as the wall thickness gets thinner.

| Material | Maximum L/t Ratio |
|---|---|
| ABS | 170-1 |
| SAN | 120-1 |
| PA | 150-1 |
| PC | 100-1 |
| HDPE | 225-1 |
| LDPE | 275-1 |
| PP | 250-1 |
| PMMA | 130-1 |
| POM | 150-1 |
| PS | 200-1 |

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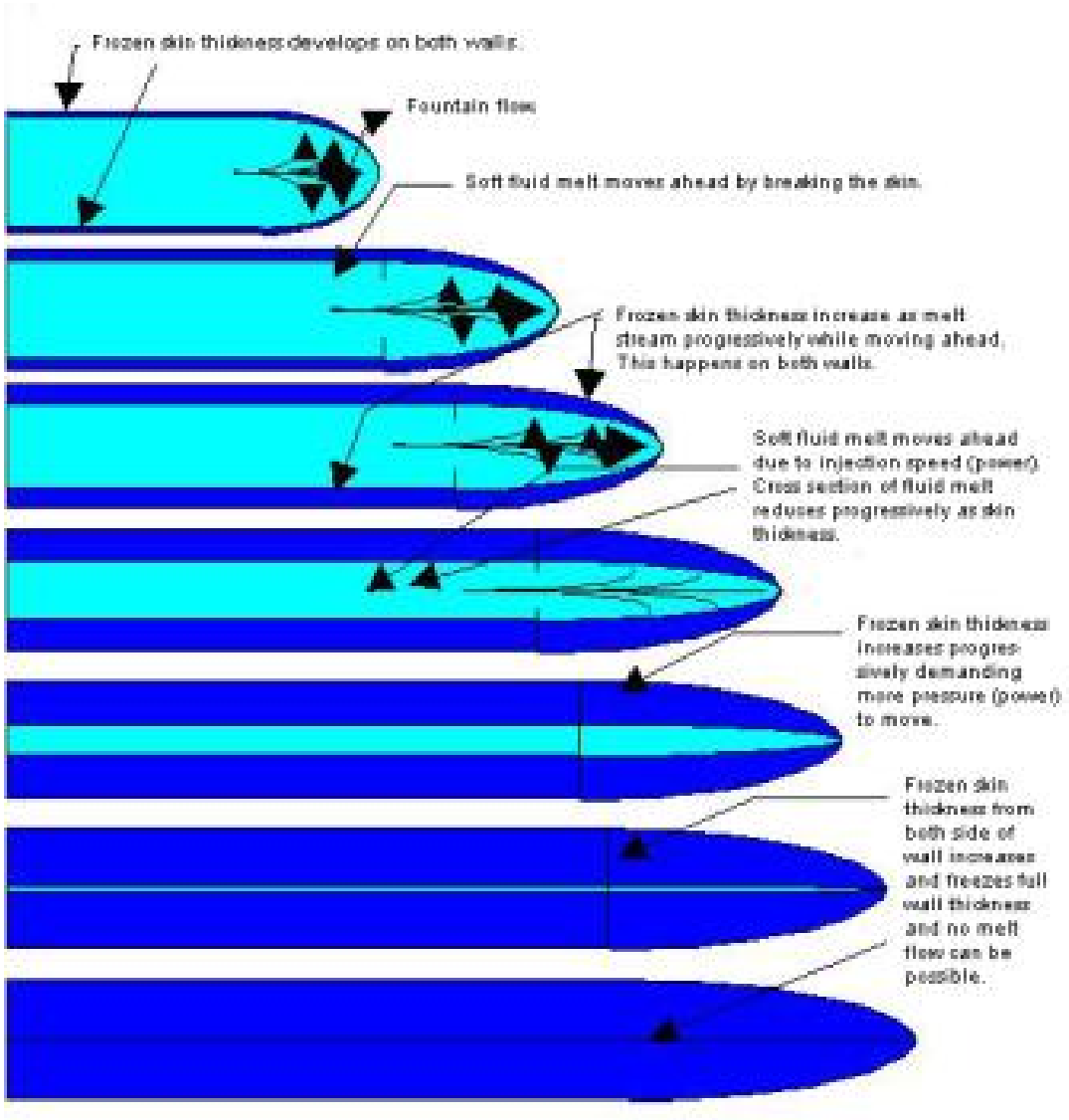
## Thin Wall Injection Flow

Thin wall parts require higher injection pressure because the distance that the material can flow is dependent on the thickness of the part. As the following illustration shows, the material forms a frozen skin on the outside walls of the cavity first and then starts to solidify towards the centre. The centre of the flow is the last to solidify. If your wall section is very thin then this solidification occurs very quickly.




- Melt streams should reach all the boundaries of mould before melt freezes.
- Freezing time is proportional to cube of wall thickness. Therefore, for thinner wall, melt should flow fast enough to ensure that melt fills fully before it freezes. Hence, max injection rate of machine is important specification of machine to determine spread of melt through longest flow ration.
- Partally frozen melt due to slow filling demands more pressure (power) to fill the mould. Such moulded part may have moulded in stress which is not desirable on account of stress cracking and different shrinkage.

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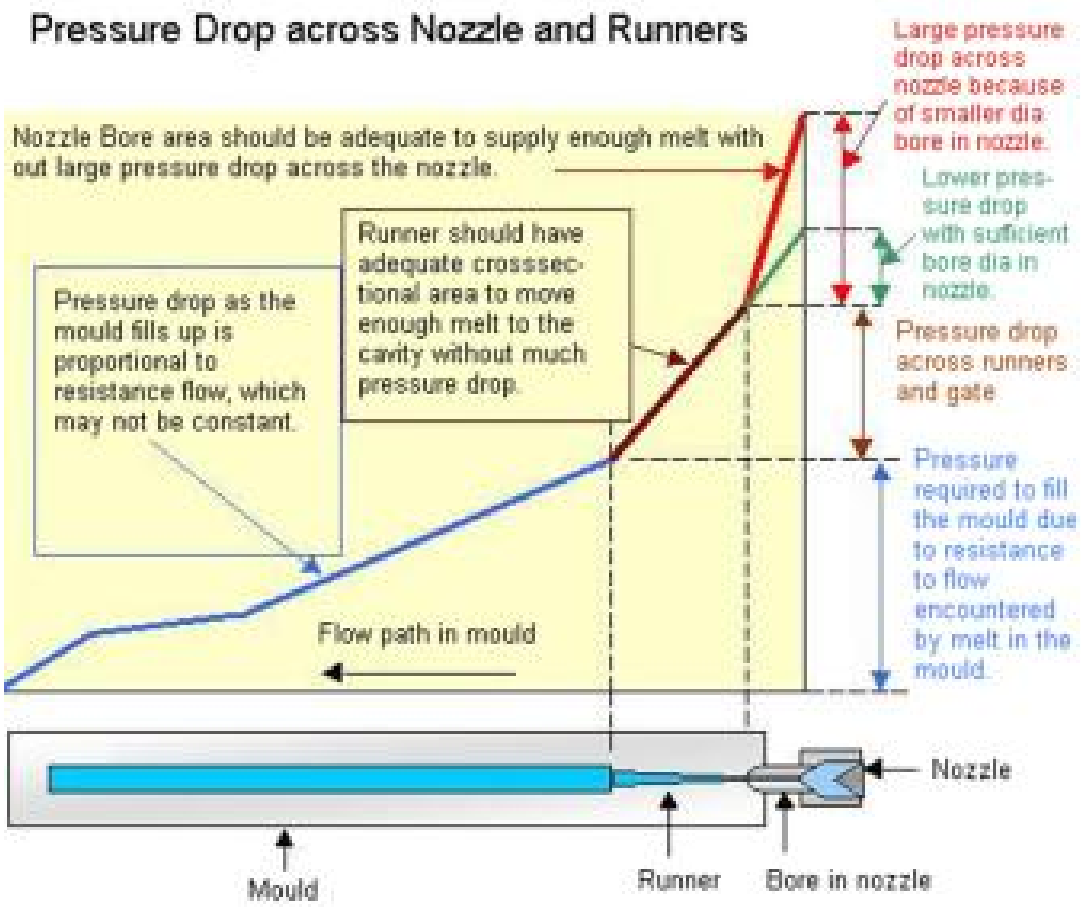
## How Does This Affect Hot Runner System Selection?

Due to the high pressures, Mastip will typically recommend the BX nozzle in thin wall applications. This is due to the better rigidity and strength of the BX nozzle body.

In many thin wall applications, valve gate selection may be the best option. This is due to the fast injection speeds required – a valve gate allows much higher throughput of material into the cavity without adding as much shear heat to the material or pressure drop across the gate as in a thermal gate system.

Mastip may also recommend a larger series nozzle than would be necessary for a part of the same weight that is not thin wall. This is because the required gram/second of the material into the cavity is high.

The illustration below shows the pressure drop that is introduced when using a Hot Runner System in any injection mould tooling. It is important for the nozzle, manifold and the moulding machine to be sized taking into account this expected loss in pressure.

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## What Can Mastip Offer?

Mastip can run Mold Flow analysis to confirm part filling, required injection times and fill pressures which assist with correct nozzle selection. A solid model of the part as one complete solid body in parasolid or step file format along with exact material and grade is required.

The table below shows, for each nozzle series, throughput limits based on the material classification and the valve gate comparisons. These figures are to be used as a guide only and can be found in the selection guide.

| | Material Class | Thermal Gate | | | | Valve Gate | | | |
|---|---|---|---|---|---|---|---|---|---|
| Nozzle Series | | 13 | 16 | 19 | 27 | 13 | 16 | 19 | 27 |
| Flow Rate (g/sec) | Easy | 30 | 125 | 300 | 600 | 40 | 160 | 380 | 780 |
| Flow Rate (g/sec) | Medium | 16 | 65 | 150 | 300 | 20 | 85 | 195 | 390 |
| Flow Rate (g/sec) | Difficult | 5 | 25 | 60 | 125 | 7 | 32 | 80 | 160 |
| Gate Ø Range (mm) | | 0.7-1.4 | 0.8-1.5 | 1.0-1.8 | 1.8-3.0 | 1.3 | 1.8 | 2.2 | 3.5 |

Note - Additives, flow length and thin wall sections all reduce the effective flow rate and shot weight.
To counter the reduced flow rate and shot weight select one nozzle series larger.

The selection of the correct Hot Runner System for the moulding of thin wall products requires careful consideration. It is important that Mastip are provided with all the key part and material information when asked to provide a Hot Runner System quotation for use in a thin wall application.

## Technical Advice & Case Studies

Mastip would like to continually offer improved technical advice and information to help with future sales and service requirements throughout the world. Your region can help us by supplying any relevant case studies that we can use and add to the support area of the Mastip website www.mastip.com.

If you have any thin wall projects that qualify then please email us with the details at: mastip@mastip.com, or forward them through your local support personal.

We can work with you to create the case study and make this available for all of our Distribution family to refer to and learn from.

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