

Injection moulding of PA6

Polyamide 6 is easy to mould material, with a very wide processing window. A few general guidelines are given here.

Pre-drying

Polyamide is hygroscopic and moisture sensitive, so pre-drying is recommended as a matter of rule. Material that is not pre-dried to a moisture level below 0.1% will degrade, causing surface defects, parts that are out of dimension and brittle parts. It is recommended to dry material for 4 hours at 80 °C to 85 °C in a desiccant dryer with more than one desiccant element.

A few tips to ensure proper operation of the dryer:

- Ensure the thermocouple that regulates the temperature is placed immediately before the entry of the air into the dryer. There can be a significant temperature drop in the air-conveyance system!
- The temperature of the air going out of the dryer silo should not be more than 30 °C lower than the air entering the system. If this is the case, you have insufficient air capacity.
- From time to time, monitor the dew point of the dry air to ensure the desiccant elements are functioning properly.
- Often, less air runs through the very bottom part of a dryer silo. Therefore, it is recommended that you take the material out of the bottom of the dryer and feed back into the top when you start up your process.

Moulding temperatures

Polyamide 6 can be processed between 225 and 310 °C, depending on the grade used.

The following barrel settings are recommended:

Material	Zone 1 (hopper)	Zone 2	Zone 3	Zone 4 (Nozzle)
Unfilled grades	220-260 °C	225-270 °C	225-270 °C	225-275 °C
FR Grades	225-260 °C	230-260 °C	235-265 °C	235-265 °C
Reinforced Grades	240-280 °C	240-290 °C	240-290 °C	240-295 °C
HI Grades	220-265 °C	225-260 °C	225-265 °C	230-275 °C

Tool temperature

Mould temperature is always a compromise. On the one hand, tool temperature should be as a high as possible to give optimum crystallization and dimensional, optimal surface finish and optimal mechanical performance. On the other hand, lower tool temperature can significantly cut cycle time. For Polyamide 6, 80 °C should be maintained as a minimum, for reinforced grades values of 90 to 110 °C are preferred.

Pressure and speed

Injection pressure should generally be around 70 to 100 Mpa; this results in a minimum clamping force of the moulding machine in tonnes of 0.7 times the projected surface area in cm2.

Holding pressure is generally in the area of 90 Mpa.

For glassfibre reinforced compounds, the screw speed should be kept low, a rough indication is as follows:

Screw Diameter (mm)	Maximum rpm
20	150
30	100
40	70
50	60
60	50
70	40
80	35
>80	30

Back pressure should be kept to a practical minimum

Use of regrind

Reground sprues and runners can be used on most materials. It is not recommended to use regrind on FR grades. When regrind is used, observe these simple rules:

- Use a constant ratio of regrind and virgin material. When a material has been processed once, its viscosity and fibre length have been decreased. Using varying ratios of regrind can lead to variations in dimensions, mechanical performance and processing characteristics.
- Either feed the regrind straight back into the machine, or pre-dry the regrind before usage.
- Store regrind in a dry, clean place to avoid contamination and excess moisture.
- Ensure sharp cutting blades to keep dust generation to a minimum; cut glass fibre reinforced material when it is still hot.
- Clean the grinder regularly to avoid build up of dust.
- Do not use splayed, discoloured or degraded parts and runners

For an injection moulding guide of a specific grade, look in the products section.

