ABS Resin “ TOYOLAC “

< Extrusion Grade >

Technical Guide

Toray Plastics (Malaysia) Sdn. Bhd.

Extrusion Grade

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1. Extrusion of Sheets

1.1. Sheet extrusion machines and their operation

TOYOLAC can be extruded into a quality sheet using an extruding machine similar to that used for high impact polystyrene. To obtain even higher grades of sheets, the following should be taken into consideration.

1.1.1 Extrusion machine

As TOYOLAC has a slightly higher melt viscosity than high impact polystyrene, a slightly larger driving force is needed. A screw with a 20- 22 L/D ratio is adequate, however, a 26-30 L/D ratio is recommended to achieve more uniform mixing and more constant output. Vent extrusion reduces the amount of pre-drying that is required and gives thee sheets a well finished appearance.

1.1.2 Screw

It is recommended to use a constant pitch gradual transition flight type of screw with a compression ratio of 2.0 2.5. Full flight screws and torpedo head screws can also be used. The flight depth in the metering section should be a little deeper to avoid the generation of excessive heat that could result due to TOYOLAC s slightly higher viscosity.

1.1.3 Sheet die

Either a T-shaped manifold or a coat hanger die can be used, however, a coat hanger die gives a smoother flow and less die line. A land length of 50-80 mm is adequate. The opening of the die lips should be kept constant along the length of the die during extrusion, and the uniformity of the thickness should be adjusted using the choke bar and differences in temperature. Draw down of approximately 10% is appropriate for operation efficiency and orientation of the sheet.

1.1.4 Cooling

A 3-roll, 8-inch diameter system made out of a hard chromium plate with a highly-polished finish is adequate. The temperature of the cooling roll should be kept at a constant level to prevent the molten resin from sticking to the mold. If the temperature is too low, warping or sinking spots could result. Embossing, which requires more accurate thicknesses, and temperature controls, should be carried out with the embossing roll in the middle.

1.2 Pre-Drying

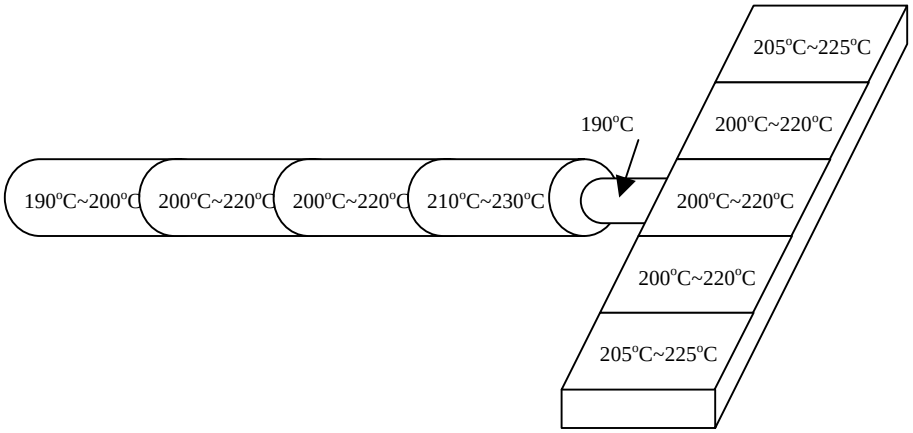
In order to obtain a good sheet having a fine surface finish, proper pre-drying is necessary. Insufficient drying will often result I poor surface finishes such as porosity or die-line, while proper drying will not only give sheets a good surface but will increase and improve the constancy of the output. For drying a small amount of materilas, a tr oven will be used. For large scale extruding of

more hatn 100kg/hr., a hopper dryer together with a tray oven or vent extruder will be necessary. Proper drying conditions are 4-6 hrs. at 80°C or 3-4 hrs at 90°C.

1.3 Extrusion Conditions

1.3.1 Barrel temperature and die temperature

An example of the typical extrusion conditions are illustrated in Fig.1.



1.3.2 Screen pack

Depending on the application, a 40/60/40 to a 80/100 x 2/80 mesh construction pack should be selected.

1.3.3 Cooling roll temperature

Temperatures should be as follows : for the upper roll 80 –105°C, for the middle roll 70-100°C, for the bottom roll 85-105°C.

1.3.4 Extrusion condition and mechanical properties of the sheet

The mechanical properties of the extruded sheet are not affected if extrusion is performed at 210 ~ 240° C of the barrel temperature. When the barrel temperature exceeds 240°C, however, the impact strength and heat distortion temperature tends to decrease. For best results, the barrel temperature should be kept below 240°C.

1.4 Purging and cleaning

The die should be cleaned and any remaining resin should be stripped off after the die head cooled to approximately 150°C. The screw can be easily cleaned by pulling it out from the barrel and blowing with compressed air.

2.0 Pipe Extrusion

Pipe extrusion of TOYOLAC can be performed easily with high precision results obtainable using any of the following methods :

(A) External Vacuum Calibration Method
(B) Internal Air Pressure Method
(C) Extended Mandrel Method

Since TOYOLAC is stickier than hard PVC, it is recommended that cooling water pass inside of the mandrel when using the mandrel method. With the other methods, the draw down should be kept to approximately 10% in order to obtain a good extrusion performance and less residual stress. Shrinkage of the extrudate will vary depending on the thickness, the draw speed, and the barrel temperature, ranging between 1.2 ~ 1.6%. The land length of the die lips should be longer that those of hard PVC and a 20 ~ 40 multitude of thickness should be used for best results.