

Bluepha® Processing Guide-blown film extrusion

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INTRODUCTION

This processing guide describes the blown film extrusion processing of Bluepha®. Blown film extrusion can be done on conventional extrusion equipments, though high-pressure blown film is more stable and recommended for processing Bluepha®.

Typical applications include film rolls, food packaging, disposable shopping bags, courier bags, etc.

Blown film extrusion is a versatile process with many possibilities in process and formulation.

The information given in this processing guide is for reference only and the customer is advised to optimize the process to find the optimal process conditions for the formulation and equipment used.

STORAGE CONDITIONS

It is recommended to store Bluepha® resin in their original packaging at temperatures below 50°C and away from direct sunlight.

The supplied Bluepha® resin are typically semi-crystalline.

TYPICAL Bluepha® RESIN PROPERTIES

Table 1: Typical physical properties of Bluepha® and Bluepha® compounds suitable for extrusion

Item	Unit	Result			
		BP350	Compound A	Compound B	Compound C
Application examples	-	blown film	blown film	blown film	blown film
Density	g/cm ³	1.20	1.20	1.21	1.22
Melt Index (165°C/5kg)	g/10mins	3-5	4-6	4-6	2-4
Melting Point (Tm)	°C	139	137	141	133
Glass Transition Temperature (Tg)	°C	-2	-1	-1	-2
DTUL (0.45MPa)	°C	86	83	91	60
Flexural Modulus	MPa	640	810	890	650
Charpy Notched Impact Strength	kJ/m ²	5.5	6.0	5.0	9.0

※Please contact Bluepha for the information of compound A, compound B and compound C

DRYING

Bluepha® resins are supplied in sealed barrier packaging with a maximum moisture content less than 5000 ppm. It is recommended to control the moisture content to less than 1000ppm before processing. Moisture can cause hydrolysis of Bluepha® resin during the melt process, resulting in reduced mechanical performance in the final product.

Bluepha® resins can be dried using most conventional drying systems. Blast drying oven or vacuum drying oven is preferred to use in the drying step. It is highly recommended to check the actual moisture content after drying, the Karl-Fischer or Brabender Aquatrac method can be used. In case other additives are added to the formulation, the moisture content of the additives should also be tested and dried if necessary.

The Bluepha® resin should be processed as soon as possible after drying and preferably stored under an inert (Nitrogen) atmosphere to prevent absorption of moisture. Starting at 200ppm, the moisture variation under atmospheric conditions is shown in Fig. 1.

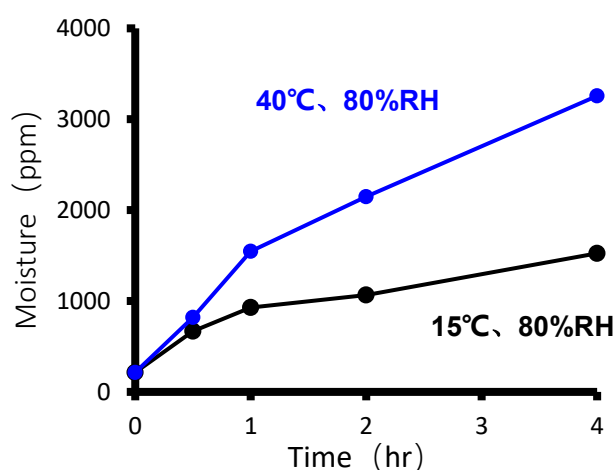


Fig.1 Moisture absorption curve of Bluepha®

Refer to Table 2 for the drying conditions using the blast drying oven. Please note that the drying temperature should not be higher than 80°C, otherwise there is a risk of adhesion of Bluepha® resin.

Table 2. Typical Bluepha® drying conditions

Parameter	BP350
Drying time	4-6 hours
Air temperature	60-80 °C

Under laboratory conditions, Bluepha measured the relationship between drying time and moisture content of different grades of Bluepha® at 60°C, as shown in Figure 2.

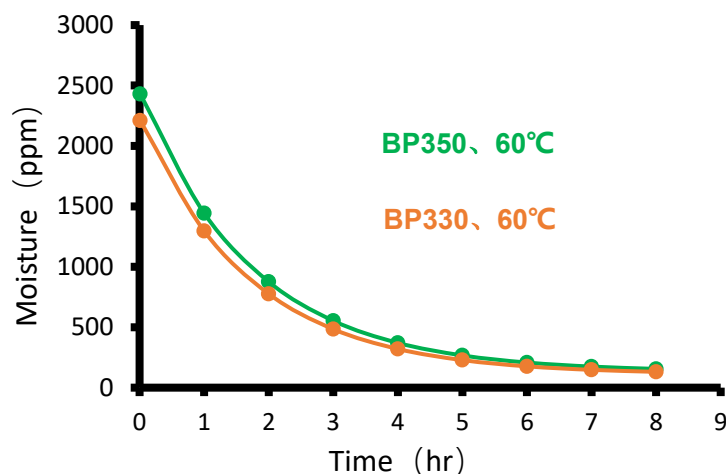


Fig. 2. Drying time and moisture content curve

EXTRUDER USAGE PROCESS

Before introducing Bluepha®, the extruder needs to be well cleaned and purged to prevent cross contamination from other polymers. Also, make sure that the feeding and blending equipment in the material preparation steps (before the materials and additives enter the extruder) is extensively cleaned to avoid contamination by dust and other polymers. The purging procedures below are recommended for removing other polymers when processing Bluepha®.

1. Check if the extruder has been used with other polymers. To prevent starting up the machine with nonmolten material, the extruder should be set at a temperature above the processing temperature of the other polymers or Bluepha® used before.
2. Purge the system with PBAT, PBS or PE which has similar MFR to Bluepha®, followed by purging with the Bluepha®.
3. Set the temperature of the extruder to the processing temperature of the Bluepha®.
4. Before starting the process, check if the Bluepha® resin are contaminated.
5. At completion of the process, it is recommended to clean the system again with purging compound to remove the remaining Bluepha® material. Check the recommendations of the supplier of the purging material for the right clean conditions.

After completion of the run, Bluepha® must be removed from the whole system. Bluepha® will degrade slowly over time and cause corrosion of the equipment.

EXTRUDER SETUP AND TEMPERATURE PROFILE

When processing the Bluepha® resins or compounds, if specific functions are required, corresponding additives (e.g. anti-static, anti-block, color concentrates, plasticizer, etc.) or masterbatch mixes can be added and processed.

Bluepha® can be processed in conventional extruders. A single-screw extruder with L/D>30 is

recommended, typical extrusion conditions for Bluepha® are shown in Table 3.

Table 3. Typical extruder temperature conditions for processing Bluepha®

Parameter	Unit	BP350	Compound A	Compound B	Compound C
Feed zone	°C	20-40	20-40	20-40	20-40
Melt zone	°C	120-140	120-140	120-140	120-140
Mixing & conveying	°C	140-165	140-165	140-165	140-165
Die head	°C	140-165	140-165	140-165	140-165
Blowing ratio	-	>3	>3	>3	>3

BLOWN FILM EXTRUSION

Blown film extrusion can be performed on conventional film blowing equipment, and a high pressure film blower is recommended for the process. To avoid cross contamination by other polymers, the extruder and auxiliary equipment need to be purged and cleaned before and after Bluepha® extrusion. BP350, Compound A, Compound B and Compound C are recommended for blown film extrusion. The blower connected to the air ring is recommended to have a constant temperature blowing function and the temperature needs to be set in the range of 40-60°C. Conventional blowers may lead to unstable temperatures on the film surface, which can affect the dimensional stability of the film.

STORAGE AND TRANSPORTATION OF FILM PRODUCTS

It is recommended to store Bluepha® film products in its closed, original moisture-blocking packaging at a storage temperature below 50°C. Store in a ventilated and cool warehouse, avoid direct sunlight and prevent moisture.

The use of sharp tools is strictly prohibited during loading and unloading. It is not allowed to be exposed to sunlight or rain during transport, and it is prohibited to mix with sand, broken metal, toxic substances, corrosive substances and inflammable and explosive substances.

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