

# *SPECIALTY PACKAGING PLASTICS*

Some Do's and Don'ts for  
Extruding APET Film  
From  
Eastapak PET Polyester

**EASTMAN**

# SPECIALTY PACKAGING PLASTICS

## Drying

### DO

- Use a high-temperature desiccant dryer equipped with an aftercooler in the return air line. Dew point should be as close to  $-40^{\circ}\text{C}$  ( $-40^{\circ}\text{F}$ ) as possible. The dryer should be equipped with a dew-point monitor and alarm. The drying hopper and air lines should be insulated. A temperature monitor on the dryer output line is suggested.
- Use an airflow of  $0.06\text{ m}^3/\text{min}$  times the extruder output rate in  $\text{kg}/\text{h}$  ( $1\text{ ft}^3/\text{min}$  times the extruder output rate in  $\text{lb}/\text{h}$ ) of PET. A volumetric flow indicator is suggested.
- Dry for approximately four hours at a temperature of  $150^{\circ}\text{C}$  ( $300^{\circ}\text{F}$ ). To minimize hydrolytic breakdown (molecular chain cleavage) and loss of properties, moisture content of pellets after drying should be less than 0.005%.
- Maintain drying equipment properly. Clean aftercooler every two weeks.
- Use over-temperature alarm.

### DON'T

- Dry PET in conventional hopper dryers. They are unable to attain temperatures around  $150^{\circ}\text{C}$  ( $300^{\circ}\text{F}$ ).
- Use dryers with air dew points above  $-30^{\circ}\text{C}$  ( $-20^{\circ}\text{F}$ ).
- Use dryers with insufficient airflow.

## Extrusion Equipment

### DO

- Use an extruder having an L/D ratio of at least 24/1 and an adequately sized drive motor. Outputs expected are generally in the range of 2 to 3  $\text{kg}/\text{h}$  (4 to 7  $\text{lb}/\text{h}$ ) per horsepower.

- Use a properly designed extrusion screw.
- Use internal screw cooling in the feed section of the screw to prevent air entrapment by the screw.
- Use a coat hanger, flexible-lip film die having a two-piece body. All internal flow surfaces should be highly polished.
- Use standard 3-roll sheet casting stacks [305- to 610-mm (12- to 24-in.) diameter rolls] for producing “kiss-polished” film. Film can also be produced by straight casting onto a chill roll without nipping. In either case, due to Eastapak PET polyester’s low melt strength, the die should be positioned as close as possible to the roll stack.
- Use winding equipment with adequate tensioning control.

#### DON'T

- Use short-barreled extruders (L/D ratio of 20/1 or less) or underpowered extruders.
- Use low-compression screws such as those commonly used with styrene and similar materials.
- Use dies having nontapered faces.
- Use a die with rough flow surfaces.

## Processing Parameters

#### DO

- Start with a completely clean hopper, extruder, and die before processing Eastapak PET polyester.
- Extrude PET at the minimum stock temperature possible—usually about 275°C (525°F). [Keep in mind that PET melts at 252°C (485°F).] Excessive stock temperature can cause molecular breakdown.

- Clean extremities of die lips thoroughly and apply silicone lubricant to these areas before starting the extrusion line. The lubricant will prevent the polymer from sticking to the die lips and causing flow lines in the film. Start the extrusion line with the “jump-start” technique—do not allow drool on the die face during start-up.
- Use a chill-roll temperature just below that at which chill-roll sticking begins to occur. Usually, this will be 60° to 80°C (140° to 170°F). This will minimize chill-roll plate-out and provide good film flatness.
- Use a die opening in the 0.8- to 1.0-mm (30- to 40-mil) range for film and sheeting gauges up to 0.5 mm (20 mil).
- Use sharp, rigidly mounted cutters for trimming film edges.
- Use a winding aid or denesting aid if needed for the particular application. An antiblock concentrate for this purpose is available from Eastman.
- Use a screen pack consisting of screens with the following mesh sizes, in this order: 24-60-24.
- Use proper procedure for machine shutdown if the extruder will not be used for two hours or longer. Run the barrel empty, cut off the heat, and seal the die orifice.
- Use PETG 6763 for purging when required.

#### DON'T

- Extrude PET at excessively high stock temperatures [above 290°C (550°F)].
- Use excessive barrel cooling because this interferes in attaining steady-state conditions.
- Use low casting-roll temperatures because this causes excessive roll plate-out and interferes with film flatness.
- Allow the extruder to sit, not operating, with temperatures at full operating conditions for more than two hours.

Conversions of metric/U.S. customary values of physical properties are exact. For processing conditions, values may have been rounded off; therefore, these values may not be exact conversions.

APET, a versatile, amorphous PET film, can be extruded from Eastapak PET polyester when proper operating equipment and techniques are employed. This publication contains some "Do's and Don'ts" that should be helpful.

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**For additional information, contact**

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Material Safety Data Sheets providing safety precautions that should be observed in handling and storing Eastman products are available on request. You should obtain and review the available material safety information before handling any of these products. If any materials are mentioned that are not Eastman products, appropriate industrial hygiene and other safety precautions recommended by their manufacturers should be observed.

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Publication DDS-7A

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January 1995

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