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Vol. 22 #3, December 1995

Blown Film:

1. Better balance of film physical properties (MD vs TD): This is especially true of linear polyolefins like HDPE and even LLDPE. The monoaxial drawdown in the cast film process coupled with the web neck-in tends to give very splitty cast film from resins like HDPE. Physical properties of most resins, such as tear strength and elongation, tend to be more balanced in the blown film process thus promoting better dart drop impact strength.

2. Denser film, stiffer, with better barrier properties: The lower cooling rate in the blown film process allows more crystallite formation and a higher film density. This generally promotes higher film modulus and lower rates of moisture and gas transmission for the same polymer.

3. Less trim, regrind: Because of the tendency to edge bead and because many cast film line dies are fixed slot width, the amount of edge trim that must be taken is a much higher percentage of the total web. This becomes less so as the cast film line is wider. The bubble diameter in a blown film line can be adjusted to give just the right size for mini mum edge trim.

4. Lower investment per annual pound for equipment: Because the line speed for a cast film line running the same lb/ hr. width and thickness is twice that for a blown film line, the takeoff drive system is more sophisticated and expensive. The web handling and winding systems are designed for much higher speeds, are more sophisticated, and more expensive. Automatic gage control is almost mandatory for cast film and adds about $200,000 to the price of a cast film line. Typical machinery investment numbers for blown film lines are 14 to 28 cents per annual pound of film production and for cast film lines is 25 to 50 cents.

5. Short runs are less expensive: Because the width is easily changeable on a blown film line, short runs are less ex pensive as less changeover scrap is run and less trim is taken during the run.

6. Thinner films can be made: Because the drawdown occurs in two directions (MD and TD), a thinner film can be made from the same resin on a blown film line than can be made on a cast film line. In addition, the web handling is easier because two thicknesses are transported to the winder at a slower line speed instead of one at a higher line speed.

7. 100% LLDPE does not have the drawdown instability problems with blown film that it has in cast film (draw down resonance).

Cast Film:

1. Better gage uniformity: The slot die can be adjusted from one point to the next and the adjustment can be made automatically by a computer control system.
Typical operating gage control for LDPE on a cast film line is within + or - 2%. Typical blown film gage uniformity is within + or- 10%, which can be reduced to = or - 5% with a good TD automatic gage control system. The viscosity of the melt in a cast film line is usually much less than that in a blown film line because of the resins used and because cast film generally is done at higher melt temperatures, (475 deg. F vs 375 deg. F).

2. Better optical properties: The quench rate at the casting roll contact area of a cast film line is much higher than the cooling rate in an air cooled blown film bubble. This tends to delay the crystallization and tends to make the film more amorphous with less haze and more gloss. Because of this, the transparency (see through) of cast film is much better. This is especially true for homopolymer polypropylene.

3. Better embossing quality: The embossing that can be done at the casting roll surface can be much finer in definition and have more retention with heat and time exposure than that which is done on blown film after the collapsing process.

4. Higher rates of production per total inch of web width are achieved in the cast film process because the cooling at the casting roll surface is so much more effective. Typical numbers for the blown film process are 10 to 20 lb/hr per inch of layflat tubing or 5 to 10 lb/hr per inch of bubble circumference, depending on resin and film thickness. Typical rates for cast film are 15 to 30 lb/hr per inch of web width, usually three times that for blown film. For a given width of take off, the cast film line will usually run 50% more pounds per hour than a blown film line (the blown film line makes two thicknesses for one web width of production).

5. Lower density, softer film: The same characteristic cited as a disadvantage for cast film in item 2. under blown film can sometimes be an advantage, especially if soft drapable film is desirable.

6. Allows some resins not readily runnable on blown film to run: A good example is polypropylene homopolymer. In the air cooled blown film process, polypropylene homopolymer produces a very hazy splitty film because the crystallites are so large. Rapid quenching in the cast film process produces a clear, soft film that is very useful for dry goods packaging and photo album pages. Note: some tubular water or mandrel quench processes exist that can run PP homopolymer film. The cast film process can run resins with low melt strength, (typically higher melt index) whereas the blown film process requires those with higher melt strength. LLDPE is an exception here and must be modified to prevent drawdown resonance.

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See also:

- Casting of extruded semi-crystalline film and sheet
- Extensional viscosity and melt strength and their role in film blowing
- Gage control for tubular film production
- HDPE LDPE properties
- Linear low density polyethylene
- Thickness uniformity in blown film extrusion
- Effects of molecular structure, rheology, morphology & orientation on blown film properties

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