Bio plastic blown film process and trouble shooting

The main steps involved in the process are:

1. Bio plastic pellets are fed from a hopper into the extruder.

   (Different density material dry blend (Filler mixed with PBAT) creates a problem in terms of gauge variation, strength variation and weight variation because filler compound with high density has different flow and strength than PBAT and when filler comes out it gives different strength and thickness than PBAT. This is because generally extruders with simple screw design, are short with maximum 24:1 L/D ratio , which are not capable of proper melt mixing. Bag has effective strength of minimum micron thickness and rest is waste, so controlling thickness variation and uniform melt mixing is very important.)

   To avoid this problem compounded material is always preferred. It is ultimately saves more cost than blend.

2. Inside a heated barrel, a rotating screw moves the pellets forward. The combination of heat and mechanical shear melts and homogenizes the bio plastic resin into a viscous melt.

3. The molten polymer is forced through an annular (ring-shaped) die to form a continuous tube. Recommended die gap is 1.5 to 2 mm .

4. An air ring blows high-speed air onto the exterior of the hot film to cool and stabilize the bubble. The point where the molten material solidifies is called the frost line.

   Air ring plays very important role in success of blown film .Preferably chilled air to be provided in the air ring.

5. The cooled, flattened bubble is guided through nip (traction) rollers and then wound onto a take-up unit to form the final film rolls.

6. Always recommended to pre dry material for better performance

Troubleshooting Guide

Bio plastics can present specific challenges due to properties like lower melt strength and higher moisture sensitivity.

Problem	Possible Causes	Solutions
Bubble Instability/Fluttering	* Inconsistent airflow from the air ring. * Incorrect melt temperature. * Low melt strength of the bioplastic. * External wind drafts affecting the bubble.	* Adjust the air ring for uniform air flow and proper centering. * Optimize melt temperature; use a higher melt strength resin. * Shield the area from drafts.
Poor Film Clarity/Transparency	* Inadequate plasticization (low temperature). * Poor cooling effect. * High moisture content in raw material.	* Increase extrusion temperature for uniform melting. * Use chilled air and improve cooling efficiency. * Dry the raw materials thoroughly before use.
Thickness (Gauge) Variation	* Uneven die gap or temperature distribution. * Inconsistent traction speed. * Non-uniform cooling. * Dry blend of 2 different density material	* Inspect and adjust the die gap and temperature settings. * Ensure constant, stable traction speed. * Clean and align the air ring. *Use compounded material
Gels, Black Spots, or Contamination	* Impurities in resin or degraded material. * Material resting on die lip (oxidization). * Dirty extruder or die.	* Use high-quality, clean raw materials. * Regularly purge and clean the extruder, screen changer, and die head.

Wrinkles or Folds	* Uneven film thickness. * Inconsistent pressure on the nip rollers. * Misalignment of guide rollers.	* Ensure uniform film thickness. * Adjust nip roller pressure evenly and check alignment of all rollers.
Poor Heat Sealing Performance	* Film orientation is too high (due to large blow-up or traction ratios). * Dew point is too low.	* Appropriately reduce the blow-up ratio (BUR) and traction ratio. * Increase the air volume to raise the dew point.
Film Blocking (Sticking)	* Insufficient cooling of the film. *Low tower height of machine * Wrong resin grade or lack of anti-blocking agent.	* Increase air volume to improve cooling. *Use machine with high tower height * Add anti-blocking agents to the material formulation.

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