



BIOGRADE LIMITED ACN 102 302 134

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Biograde B-F

Blown Film Resin

Biodegradable during Composting in Professionally Managed Facilities.

Description

BIOGRADE B-F is a Compostable and Biodegradable plastic based on a blend of thermoplastic starch (TPS), aliphatic polyesters (AP) and natural plasticizers. This grade of resin is compatibilised to offer a high level of mechanical strength, outstanding elongation properties and toughness. The resin is based on corn starch which is a renewable material.

Biograde B-F resins are certified biodegradable during composting in professionally managed composting facilities.

- Complies with European Standard EN13432, ASTM 6400 (USA), Australian Standard AS 4736 and Japan “GreenPla”.
- Complies with International Standard ISO16929, ISO 14855
- Used for blown film applications up to 120 microns.





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Applications

- Compostable bags
- Shopping bags/Check-out bags
- Garbage bags
- Leaf litter bags
- Green bin liners
- Overwrap Packaging

Properties

<i>Properties</i>	<i>Test Method</i>	<i>Typical Value/ Unit</i>
Melt Flow Index	ASTM D -1238	1.07 g/ 10 min (.325 Kg @ 150 deg. C)
Density	ASTM D-792	1.21 g/cm ³
Melting Temperature Range	ASTM D-3418	90 - 130 deg. C
Tensile strength at yield	ASTM D-883	> 10 MPa
Tensile strength at break	ASTM D-883	> 15 MPa
% Elongation at break	ASTM D-883	> 500 % at low strain rates

Processing Conditions

BIOGRADE B-F resin can be processed on standard LDPE or LLDPE blown film equipment. Specific Instructions for Film Blowing of BIOGRADE B-F Resin:

1. The resin is very sensitive to temperature during the film blowing process. Please be cautious of the temperature used during extrusion and film blowing. As a reference, the film-blowing temperatures successfully used by the manufacturer are:
90/130/130/120/105 deg.C.
2. Before blowing the raw material, you should check that the moisture level does not exceed 1%. If the moisture level is greater than 1%, the resin will need to be dried before film blowing. The drying temperature is no higher than 65 deg. C and drying time should be no longer than one hour.



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3. Before blowing the film, the film blowing extruder needs to be purged and cleaned of residual polyethylene and then the Biograde B-F resin can be used as the last cleaning step, after which the temperature can be adjusted to the correct settings.
4. The screw rotation speed should be slow at first and then fast to match the haulage speed which is first slow and then fast as well.
5. The inside and outside aeration should be gradually changed from weak to strong. Cold aeration is better; 10-15 deg.C works to avoid film blocking problems.
6. The preferred blow-up ratio is 1:2.5 or 1:3. The height from die orifice to the nip roll should be higher than 2.5 m to ensure full cooling and prevent film blocking.

Comparative Properties

A 30 micron in BIOGRADE-B-F gives similar performance properties to a 20 micron HDPE bag if properly blown with an air-ring chilled down to 10-12 deg.C and if allowed to 'condition' for 48 hrs. These thermoplastic starch polymer films need time to reabsorb moisture to develop their full physical properties.

Biodegradability

BIOGRADE B-F is a completely biodegradable polymer suitable for the manufacturing of film-type products. It can be directly used in the film blowing process. It does not contain any non-degradable polymers such as PE, PP, PS and PVC. Independent university testing shows that after biodegradation BIOGRADE B-F does not leave any harmful residues.

This film grade has been evaluated for compostability in accordance with INTERNATIONAL STANDARD ISO 16929 (2002-11-01) "Plastics — Determination of the Degree of Disintegration of Plastic Materials under Defined Composting Conditions in a Pilot Scale Test". According to the European certification scheme for biodegradable materials, Performance Standard EN 13432, the pass threshold for this test is 90% of the material passing through a 2 mm sieve after the 12 week test period.



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The testing shows that the plastic film samples used in this test are completely compostable as demonstrated by their 100% disintegration after 3 months and > 90% mineralization in less than 6 months. In the laboratory scale composting test according to ISO 14855: 1999 Biograde film grade resin reached 90% biodegradation relative to cellulose reference material and meets the biodegradability requirement specified in the EN 13432 standard

Other Comments

1. Film blown thin, the thickness can be less than 0.02 mm. The tensile strength is greater than 15 MPa on average and elongation at break is greater than 500%.
2. Good compatibility. The film is transparent with no granulation or lines of TPS seen in the film.
3. Easy film blowing performance. The film bubble is stable and no additional air cooling is needed.
4. By using film blowing temperature between 130-135 deg.C and blowing a general film-blowing machine, the production yield can achieve that of PE film blowing.
5. Easy colour-up.
6. Thermal sealing strength is as good as PE.
7. The biodegradable trim waste can be reprocessed and recycled as long as it is kept segregated (ie. not mixed with polyethylene) and kept dry. The film edge trim and bag handle "punch-outs" can be processed through a Muncy, an Erema or similar film reprocessing unit into regrind pellets or through an agglomerator or compactor to produce agglomerated/compacted pellets. The regrind pellets can be fed into the main film process at a ratio of 10:90 regrind/virgin resin. Care should be taken to ensure the zone temperature/s of any reprocessing equipment is not set at greater than 130-135 deg. C or else resin degradation (ie. brown discoloration, odour and fumes) will result.