



**BIOGRADE LIMITED** ACN 102 302 134

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## Blown Film Resin – Containing Renewable Resources

# Biograde D-F

- A degradable resin for film applications where Biodegradability is not required.
- For use where use of renewable resources is desired.
- Used for thin and thick gauge film applications.

### Description

BIOGRADE D-F is based on a blend of thermoplastic starch (TPS) with Polyethylene. 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.

### Applications

- Shopping bags/Check-out bags
- Garbage bags
- Leaf litter bags
- Bin liners
- Overwrap Packaging

### Properties

<i>Properties</i>	<i>Test Method</i>	<i>Typical Value/ Unit</i>
Melt flow index	ASTM D-1238	2 g/10 min (2.16 kg/ 190 °C)
Density	ASTM D-4883	0.98 to 1.05 g/cm <sup>3</sup>
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	> 10 MPa
% Elongation at break	ASTM D-883	> 300 %



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### **Processing Conditions**

BIOGRADE D-F resin can be processed on standard LDPE or LLDPE blown film equipment.

Specific Instructions for Film Blowing of BIOGRADE D-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:  
90/135/135/130/130 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.
3. Before blowing the film, the film blowing extruder needs to be purged and cleaned of residual polyethylene and then the D-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. A blow up ratio of 1:28 is recommended.

### **Comparative Properties**

BIOGRADE D-F gives similar performance properties to a HDPE bags 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.



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### **Biodegradability**

BIOGRADE D-F is not a biodegradable polymer. While it is suitable for the manufacturing of film-type products it is not intended for ultimate disposal in commercial composting facilities. If Biodegradability is required use of Biograde BF resin is recommended.

### **Other Comments**

1. Film blown thin, the thickness can be less than 0.02 mm. The tensile strength is greater than 10 MPa on average and elongation at break is greater than 300%.
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.