

Compostable Material

An Explanation...

Inter Bag System

What is compostable?

- Compostable material is defined as plastic material that degrade by 90% within 12 months in soil or marine environment through a bacterial composting process. It has stricter requirement than being biodegradable.
 - E.g. European Vincotte "Ok Compost" standards
- How is it different from oxo-biodegradable?
 - Oxo-biodegradable means that the plastic will degrade when exposed to oxygen/air over a long period of time. Biodegradable \neq Compostable
- How is it different from biobased?
 - Biobased defines the source of the plastic, i.e. petrochemical (not biobased) vs. plants (biobased)
 - For example, Braskem from Brazil produces PE derived from sugarcane, which makes it biobased



Above is typical compostable resin in its pellet form. The tan color comes from starch that is blended with a compostable polyester.

Resin

- Usually, compostable materials are a blend of different plastics, which typically include:
 - Polyesters
 - Starch
 - Polylactic acid (PLA)
- Although the polyester used is usually biobased, starch and polylactic acid are used to increase the biobased content of the resin, because most compostable laws also have a minimum biobased content requirement.



Physical Properties

- The film properties are more similar to LLD than to HD
 - Lower tensile strength – meaning it takes less force to stretch the film
 - Lower tensile elongation – meaning it will not stretch as much as LLD or HD before breaking
 - Lower melting temperature – meaning it does not take as much heat to melt or “burn” the plastic
 - Feels soft to the touch, but has more surface roughness – meaning it does not need any extra treatment to apply ink to the surface
 - Opaque, not transparent
 - Much denser than LLD or even HD
 - Tends to absorb moisture in the air
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Process

- The physical properties of an compostable film effects the extrusion and the conversion process
 - Extrusion
 - Needs much lower temperatures in the extruder and die when compared to the processing conditions of HDPE or LLDPE.
 - Due to the lower temperature requirements and inherent plastic melt properties, output [lbs/hr] is lower than when running HD or LLDPE
 - The melt of compostable materials are also much more sensitive to external forces than PE, so good extrusion process is critical.
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Process

- Similar to extrusion, conversion process into bags from film must also be adapted to run compostable material
 - Conversion
 - Surface of compostable films are rough, so ink is easier to adhere than PE
 - Tensile strength of compostable films are lower than that of PE of the same gauge, so conversion requires special attention to tension of the film
 - Temperature profiles of the conversion process is much different than that of PE conversion
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Lifetime

- After some time, when the finished compostable bags are stored inside a box, the film may start to dry out and degrade.
 - Studies have shown that within *2 years* of being stored, the film's mechanical properties will degrade and the bags will become brittle. It will become paper-like. Imagine what happens to leather as it dries out.
 - Storing the rolls in a closed container has shown to prolong the lifetime beyond 2 years.
 - When the finished bags are thrown away in landfills, it will be decomposed by bacteria and become a part of the soil and air.
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