W h i t e P a p e r

Material Options and Consideration for Utilizing Bio Content in Flexible Packaging Applications

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The use of renewable or bio-materials is one of many options to enhance the sustainability of your packaging solution and is complementary to source reduction, end of life strategies including recycling and compost, and the inclusion of recycled content. Each sustainable packaging strategy offers its own unique advantages and challenges. Careful consideration must be given to package complexity, end of life options, package performance needs, cost, and manufacturability objectives when choosing the appropriate solution.

Renewable materials include those materials or additives that are naturally occurring and derived from products such as vegetable fats and oils, corn starch, straw, woodchips, sawdust, and recycled food waste. Renewable products can be introduced into both traditional and sustainable packaging applications typically benefiting reductions in virgin, fossil-based feedstocks, greenhouse gas emissions, and can often be added to packaging materials with minimal impact to package properties or performance.

Motivation for inclusion of renewable content includes the US Plastics Pact seeking packaging to include 30% renewable or post-consumer recycled content by 2025. The US Plastics Pact represents more than 850 organizations working toward scalable solutions tailored to the needs and challenges within the US landscape and includes major grocers including Walmart, Aldi, and Target, who are ultimately driving their suppliers to make sustainable enhancements to the products they manufacture.

There are a variety of renewable material offerings, but it is important to note that there can be differences between the technologies. A few of the most popular options follow:

- Starches

  Sourced from corn and the by-product of potato, tapioca, wheat, or other products, these starches can be added to traditional or sustainable packaging materials acting as a filler. The starch can be beneficial in reducing the quantity of virgin, fossil-fuel derived plastic required for a packaging application. As a filler, starch can increase the package stiffness, resulting in the potential to downgauge the thickness of the package. The increased stiffness can also result in some loss of puncture performance with sharp or frozen items. Proper evaluation and testing are important. Emissions reduction is also a significant benefit as one supplier reports a 25% addition of starch can lower the greenhouse gas emission by 28%. Many starches degrade at lower temperatures and are not suitable for use in design for recycling applications.

- Bio-Based PE

  Derived from bio-ethanol, the byproduct of sugar cane. This final product is a polymer that includes both HDPE, LLDPE, and LDPE. The properties of this offering are similar in performance to that of virgin, fossil-based plastics yet offers substantial carbon reductions. The most in-demand bio-PE product is sourced from Braskem SA, a Brazilian producer of sustainable solutions through chemicals and plastics, who offers carbon sequestration at

-2.12 kgCO2eq/kg. This product is fully compatible with recycling, but the availability is limited due to the popularity of the product.

- Compostable Materials

  Renewable materials can also include compostable materials. This category can include PLA (polylactic acid) produced from corn and PHA (polyhydroxyalkanoates) produced from numerous microorganisms and the fermentation of sugars and a variety of other specialty materials. These products are designed to break down in the proper composting environment into organic matter. These products can differ from traditional plastics in terms of physical properties so they must be carefully selected and optimized for use in packaging applications. These materials are particularly sought after as they provide an end-of-life solution for hard-to-clean food packaging that may otherwise not be recycled. Many of these offerings are limited in availability and tend to be priced considerably higher than the conventional alternatives.

Certifying bio or renewable content is another important consideration, particularly for those seeking to make on-pack or marketing claims. According to the FTC (Federal Trade Commission) Green Guides, it is deceptive to misrepresent, directly, or by implication, that a product or package is made with renewable materials. Marketers must qualify any statements related to "made with renewable content". There is an increasing number of certifications that can be obtained for this purpose including ISCC+, USDA Bio-preferred program, and through certification companies such as SCS Global.

There continue to be a few hurdles when implementing bio or renewable content. The most significant challenges tends to be availability and cost. Often the demand for these technologies is low and the suppliers are developing their manufacturing processes. Supply is not available for broad commercial availability and must be scaled. Due to the lack of availability, there may be a higher cost particularly as compared to the use of virgin materials. Technologies such as the incorporation of starch can result in ~20-30% increase while compostable technologies are often 2-3x higher than traditional material offerings.

Renewable materials are a growing segment in response to the growing needs for sustainable solutions. Each technology differs in terms of the benefits and challenges, but innovation continues, and this segment should be considered as you seek to enhance the sustainability of your package.

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