

Energy requirements and fossil fuel consumption of production:

Obviously sourcing plastics from bio-based resources as opposed to fossil fuel is an intriguing option for those looking to reduce the burden of packaging on the environment. However, if the energy required to produce bio-based plastics exceeds the energy consumed in the production of traditional resins, then the sustainability profile of bio-based plastics can be compromised.

When bio-based plastics first became commercially available, the processing technologies were not developed to the point where producing plastics from bio-based sources consumed less energy than producing traditional, fossil-fuel based plastics. However, the bio plastics industry has dramatically evolved and is now able to produce certain bio-based resins with less energy when compared with traditional resins. Natureworks Ingeo PLA (2005), for instance, is processed in such a way that it actually consumes less energy and emits fewer greenhouse gas equivalents during production when compared with traditional, fossil-fuel based resins.¹

The Institute for Energy and Environmental Research (IFEU), Heidelberg, Germany, conducted the head-to-head lifecycle comparison on more than 40 different combinations of clamshell packaging made from Ingeo PLA, PET and rPET. Both PLA and rPET clamshells outperformed PET packaging in terms of lower overall greenhouse gas emissions and lower overall energy consumed and PLA exceeded rPET in its environmental performance.

According to the study, clamshell packaging consisting of 100 percent rPET emitted 62.7 kilograms of CO₂ equivalents per 1,000 clamshells over its complete life cycle. PLA clamshells emitted even less, with 61.7 kilograms CO₂ equivalents per 1,000 clamshells. Energy consumed over the lifecycle for 100 percent rPET clamshells was 0.88 GJ. This compared to 0.72 GJ for the Ingeo 2005 resin, which is an 18% reduction in energy consumed.

Taken together, one would assume that the 2005 Ingeo PLA is a more sustainable option than traditional plastics, as manifest through this study. However, it is important to take into account the other dimensions discussed above, such as end of life management, complete biodegradation, and sustainable sourcing. By understanding the advantages and disadvantages of bio-based resins from an environmental perspective, packaging professionals can make informed material selections and truly comprehend the ecological ramifications of their packaging selections and designs.

¹ M. Patel, R.Narayan in *Natural Fibers, Biopolymers and Biocomposites*.