GREENBLUE®

FEATURE: RESINATE MATERIALS GROUP

Chemical Recycling

Making Fiber-to-Fiber Recycling a Reality for Polyester Textiles

Resinate Materials Group: Turning PET Waste into High Performance Polyester Polyols

Although biorenewable materials have been used as alternative feedstocks for speciality applications, recycled content has remained relatively unexplored. In 2014 alone, over 9.4 billion pounds of plastic bottles were sold in the U.S., nearly all for one-time use, and less than 32 percent of them were recycled.[1] That means 6.4 billion pounds of those plastic bottles — many polyethylene terephthalate (PET) — are destined for landfills or incinerators.

Resinate Materials Group ("Resinate") has taken a different approach for using recycled PET (rPET) waste streams. The company has developed a patented process called Recycolysis™ to convert many forms of PET, PETG (glycol-modified polyethylene terephthalate) or PBAC (poly bisphenol A carbonate) plastics into polyester polyols which are used by their customers to make polyurethane-based coatings, adhesives, sealants, elastomers, lubricants and foams. PET offers excellent chemical resistance (semi-crystalline), low water uptake, high tensile strength and modulus, and excellent flexural strength.

Resinate has made a commitment to use recycled content and biorenewable materials as the feedstocks for making its polyester polyol products, using petroleum only when necessary. Their goal is to provide customers with polyols that are up to "100% green" by combining recycled and biorenewable materials as their feedstocks. Typical biorenewable sources include fermented sugars and plant-based oils, for example, to derive mono- and dicarboxylic acids as well as other hydrophobic substances.

Resinate's polyester polyols and hybrid systems utilize high levels of recycled content from solid-state plastics. The Resinate process does not depolymerize PET back to its monomers because from Resinate's perspective that would be "over-processing" the material beyond the point of optimal usefulness for their targeted market applications. Instead, Resinate utilizes a process called glycolysis to digest rPET into low to mid-molecular weight oligomers. Then, with the addition of other recycled, biorenewable or petro-based content, the process dials in the specific functionality to produce high-performance macromo-

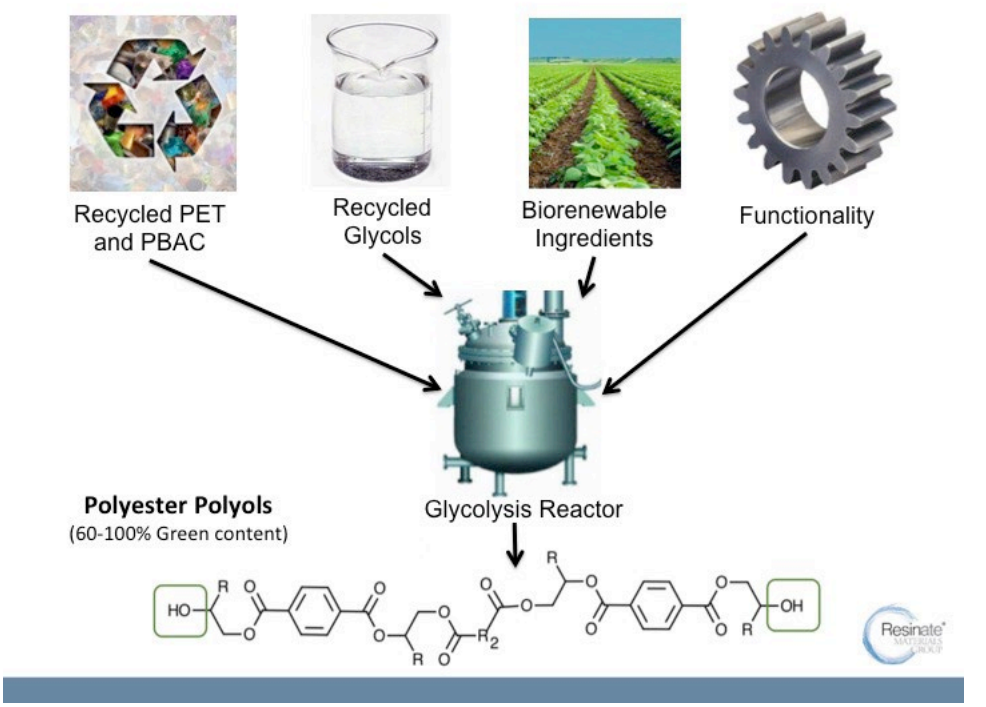

IMAGE COURTESY OF RESINATE MATERIALS GROUP, 2017

[1] Association of Postconsumer Plastic Recyclers and American Chemistry Council. 2014 United States National Postconsumer Plastics Bottle Recycling Report. 2015, http://www.plasticsrecycling.org/images/pdf/resources/reports/Rate-Reports/2014_US_National_Postconsumer_Plastic_Bottle_Recycling_Report.pdf.

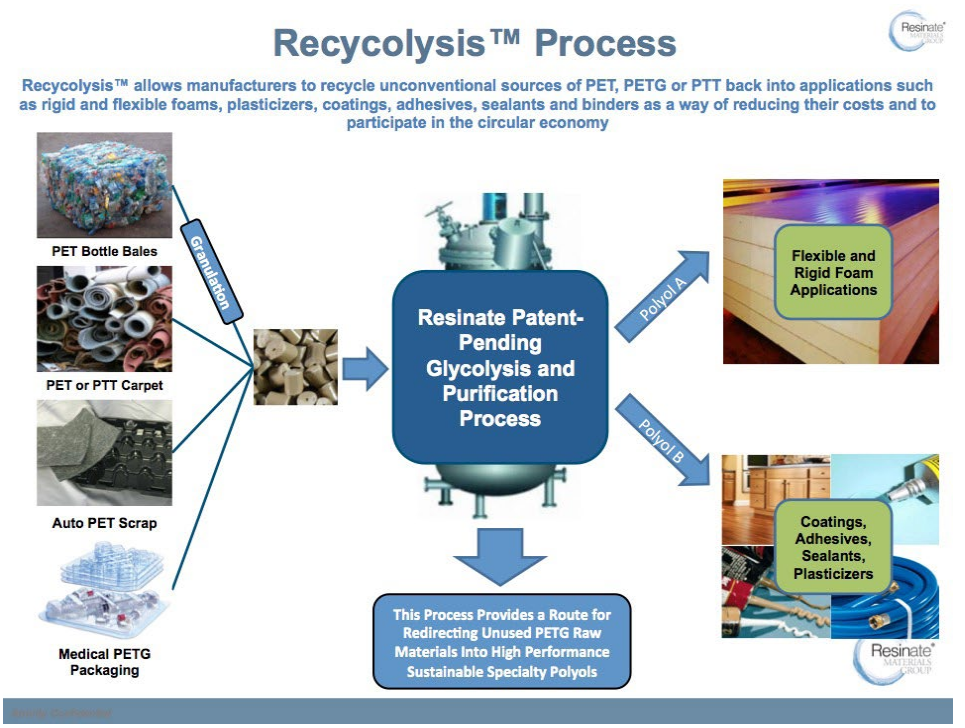

IMAGE COURTESY OF RESINATE MATERIALS GROUP, 2017

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lecular specialty polymers for adhesives, sealants, coatings, foams, elastomers, and other applications.

Resinate has several patents encompassing their Recycolysis™ technology, enabling the digestion of a multitude of post-industrial and post-consumer PET material streams into high performance polyester polyols. Thermoplastic feedstocks include, but are not limited to, carpet, automotive trunk bed liners, water bottles, and other packaging. Resinate's Recycolysis™ process allows utilization of a wide range of feedstocks, while maintaining consistency in the end product. The process requires the purity of PET feedstocks to be approximately 97% or higher, making it unsuitable for blended fabrics containing more than 3-5% of non-PET fibers. Resinate purchases rPET from recyclers that is already verified to meet the required level of purity and has been processed into flake, pellets or otherwise densified prior to digesting in the reactor.

Resinate collaborated with the Ford Motor Company to test performance of these polyols in automotive foam applications. Resinate's polyols based on rPET materials derived from automotive waste such as automotive dunnage trays, trunk bed liners and PET carpet proved to have similar performance to those polyols made from water bottle plastic. The primary goal of the Ford pilot was to prove Resinate's process could be used to create an economical circular economy with no sacrifice in performance properties. Results from the Ford trials proved that automotive foams manufactured with Resinate's high rPET polyols are mechanically stronger, stiffer and more thermally durable than traditional automotive foams. The trials also demonstrated that Ford could effectively create a closed-loop system for converting automotive PET rigid and carpet fiber waste into new and valuable applications for automotive manufacturing.