FEATURE: GR3N

Chemical Recycling
Making Fiber-to-Fiber Recycling a Reality for Polyester Textiles
“Gr3n” adopted its name from the three “R’s - Reduce, Reuse and Recycle. One of Gr3n's founders and its lead scientist Maurizio Crippa was asked if there was a better way to separate polyethylene terephthalate (PET) from other commonly co-mingled plastics. Intrigued by the question, Crippa took to his lab to experiment with various methods of chemically recycling PET to separate it from a mix of unwanted materials. Crippa was using basic hydrolysis to break down the PET into its primary building blocks, terephthalic acid (TPA) and ethylene glycol (EG), but was curious to see if there was a way to speed up the depolymerization process. He wondered if it was possible to use microwave radiation to speed the reaction time, so he used the microwave oven in his lab that he normally used to reheat leftovers for lunch to explore his hunch. He found that microwave heat was, indeed, a good method of catalyzing the reaction and that the greatest efficiency was achieved within a few centimeters of where the microwave radiation penetrates the surface of a viscous PET solution. Crippa then began the process to design a microwave reactor that could create as much surface area as possible to focus the microwave radiation within that zone of efficiency.

What most of the industry calls “recycling”, Gr3n calls “reuse” because mechanical recycling thermally degrades polymers, resulting in a loss of its functional properties and quality of the recyclate. After several heat cycles, restoring the PET to an intrinsic viscosity (“IV”) suitable for packaging or fiber applications is costly, so the materials tend to be downcycled, incinerated or disposed of in landfills.

Gr3n is currently operating its research and full-scale reactor production facility in Switzerland as a result of government incentives and a Swiss innova-
tion incubator. Gr3n is also part of an innovation consortium that will validate the technology at industrial scale, while also validating the market position of the technology in the PET recycling value chain. The company is planning to build a full-scale testing plant in Chieti Scalo, Italy to validate the microwave reactor and patented purification processes in 2018-19. Gr3n welcomes apparel brands to participate in piloting the technology at this plant.

Gr3n's business model is to license its innovation to companies interested in producing monomers to make recycled PET resins. Gr3n envisions that its technology will help to create a network of distributed small-scale platforms (processing capacity around 15,000 tons) that can be located closer to feedstock-rich sources of PET so that recyclers are transporting value-added monomers to resin producers as opposed to transporting much lower value raw materials like baled bottles, textile scraps or whole garments, along with a lot of air. Gr3n also has a vision that the scale of its technology may make it possible for other stakeholders to take a more direct role in the recycling of their products. For example, one apparel brand or a group of brands might create a recycling cooperative to license and build a Gr3n facility to process aggregated excess PET textiles.

SOURCE: GR3N, 2017