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IN PROCESS MONITORING OF POST-CONSUMER HIGH DENSITY POLYETHYLENE POLYMER CONTENT

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Most synthetic polymeric materials have low environmental degradation potential even under engineered conditions. Production of consumer goods with synthetic polymers increases the potential of environmental accumulation, such as the Great Pacific Garbage Patch. Polymer recycling reduces the risk of increasing environmental accumulation by diverting post-consumer waste and forming new products. Furthermore, it has been estimated that recycling HDPE (High-density polyethylene) consumes ~24% less energy than the production of virgin HDPE resin. Our previous work in polyethylene terephthalate and polyethylene polymers have demonstrated the ability to utilize empirically derived certification markers to calculate the post-consumer content in PCR (post-consumer recycled):V blends using benchtop analytical equipment. The current work correlates benchtop analysis to sensors capable of collecting measurements

in-process during conversion. Blends of commercially available virgin and post-consumer recycled (PCR) polyethylene (injection molding and blow molding grades) comprised of 0, 30, 40, 90, 95 and 100 wt% PCR were characterized for ultraviolet visible absorbance and fluorescence intensity during sheet extrusion conversion. The in-process data were determined to be statistically relevant indicating that the in-process sensors have potential to be utilized to monitor PCR content during conversion. Stakeholders across the supply-chain can profit from the ability to monitor PCR content in-process as these techniques have the potential to provide instantaneous feedback to the manufacturer to control material composition in real-time to achieve the desired properties of the final product during processing.

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