

The Optimization Of an Industrial Recycling Line : The Effect of Processing Parameters on Mechanical Properties of Recycled Polyethylene (PE) Blends

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Abstract : This study applies Taguchi's design of experiment methodology and grey relational analysis (GRA) for multi objective optimization of an industrial recycling line. This last is composed mainly of a mono and twin-screw extruder and a filtration system. Experiments were performed according to L₁₆ standard orthogonal array based on five process parameters namely: mono screw design, screw speed of the mono and twin-screw extruder, melt pump pressure and filter mesh size. The objective of this optimization is to decrease the loss of Stress Crack resistance (SCR) using Notched Crack Ligament Stress (NCLS) test and increase the gain of the elongation at break, flexural modulus, and Izod impact strength of the Polyethylene (PE) blend before and after recycling. Based on Grey Relational Analysis (GRA), the optimal setting of process parameters was identified, and the analysis of variance (ANOVA) indicated that mono-screw design and screw speed of the mono and twin-screw extruder impact significantly the mechanical properties of recycled Polyethylene (PE) blend.

Keywords : mechanical recycling, stress cracking resistance (SCR), anova, taguchi, grey relational analysis

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