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Waste management by recycling of polymers with reinforcement of metal powder

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Abstract

Recycling of plastics/polymers is one of the waste management techniques which have been followed by many researchers. In past 20 years large number of applications in this field has been highlighted. But hither to very few have reported on plastic waste management by recycling of polymers with reinforcement of metal powder. In the present work an effort has been made to perform recycling of waste plastic/polymer with reinforcement of metal powder by controlling the melt flow index (MFI). The present study of recycling of waste plastic has been performed on single screw extruder machine by considering various input parameters (namely: barrel temperature, die temperature, and screw speed/rpm). Investigations were performed for the parametric optimization of single screw extruder machine for different mechanical/metallurgical properties (like: porosity, peak elongation, break strength, Shore D hardness) with the help of case study of recycled high density polyethylene (HDPE)100%, HDPE90%+ Fe10%, low density polyethylene (LDPE)100% and LDPE94+6% (by wt.). As HDPE and LDPE do not decompose naturally, this nature makes these polymers suitable for structural applications (like in beams and reinforced concrete cements (RCC) structures).

Keywords: Recycling; High Density Polyethylene; Low Density Polyethylene; Porosity; Peak Elongation; Break Strength; Shore D Hardness

Introduction

Increase in polymer waste is major responsible factor for the hike in production of solid waste with a wide range of high impacts on the environment [1]. Annual consumption of polymer has increased up to 20 times from few million tons in 1950 to around 100 million tons in 2004 [2]. Highly versatile nature, lighter than competing materials and tailor made abilities is major reason for increased use of polymer materials. Further increase in polymer waste is creating pressure on limited space [3]. Therefore scenario has changed being that the polymer waste has to be recycled. Most of the polymer waste is coming out of