

CHAPTER 1

INTRODUCTION

1.1 Background Study

Nowadays, injection moulding method is very useful in the business, this method can create extensive amount of plastic products and furthermore can spare the time and the cost to make the product, and now more of plastic industries use injection molding method (Othman, Hasan, Khamis, Ibrahim, & Amin, 2017).

PPNC is a nanocomposite, which have obtained properties improvement as high modulus, increased strength and heat resistance, decrease gas permeability, flammability so that polypropylene-nanoclay gain a lot of public interest. Generally PPNC has better mechanical and materials properties among the other virgin polymer, the modulus increase also increased strength and heat resistance, same material will acquire smaller practical material properties improvement change with various processing condition, PPCN containing 1 wt%, 3 wt%, 5 wt% and 7 wt% nanoclay have been studied before in a research about its properties, tensile strength of PPCN had expanded proportional to the expanding in nanoclay content from 0 to 5 % of weight, in content more than 5 % weight there is no significant improvement. In Dynamic Mechanical Analysis (DMA), mostly proportions of PPCN indicates high progression of the modulus as long as the researched temperature range, mostly nanoclay based nanocomposites shows reduced flammability behavior. Heat Release Rate also reduce until 50 – 75 % for PP-g-MA added nanocomposites, when compared with the conventional composites PPNC has some advantages such as

PPNC is a very lightweight materials and PPNC is also more economical when compare with other material (M. H. Othman, Hasan, & Wahab, 2014).

Most of the polymer waste ends in landfills. Microbes need long time to decomposition this material because plastic/polymer is non-biodegradable. So this polymer should to recycled to clear the pollution problems, in this case is polypropylene. We know that recycled polypropylene has some problem, the reduced polypropylene is in quality and durability, physical and mechanical properties, surface appearance, and thermal properties. Therefore, recycled polypropylene should be mixed with nanoclay to improve the properties. It is of basic criticalness to effectively control all the impacting factors during manufacturing or injection molding process by precise optimization method as Taguchi method. Recently, Taguchi method become effective technique for improve the quality of part that created (Mehat & Kamaruddin, 2011).

Material characteristic, mold design and the process influence the quality of injection molding. If the design of the mold encountered an error will produce defects. Defects in dimensional stability of the parts result in shrinkage and warpage. Taguchi method use to minimize these defects to improve quality of the parts of injection molding (Altan, 2010).

1.2 Problem Statement

In this project, tensile strength is depends on the injection moulding parameter setting. So, the parameters chosen are important to produce good quality product. The parameter are melt temperature, packing pressure, screw speed, and injection time. However, recycled polypropylene-nanoclay has problem, that is the reduced in strength. Toincrease the strength of moulded product is require the best combination parameter of processing condition. This research will focus on finding the best combination parameters to optimise tensile strength of recycled polypropylene-nanoclay product.

1.3 Objectives

The objectives of this study is :

1. To perform injection molding process for 25%, 50%, 75%, 100% of recycled PPNC.
2. To measure the tensile strength and signal to noise ratio for the injected recycled PPNC.
3. To optimize the injection mold parameter towards the mechanical properties of the recycled PPNC.

1.4 Scope of Study

The scopes of study of this project are as follows :

1. The experiment is to optimize mechanical properties such as tensile strength of waste polypropylene-nanoclay.
2. The only four various proportion of recycled PPNC and pure PP which are 100 %, 75 %, 50 %, 25 % of recycled PPNC will analyze in this research.

1.5 Expected Result

Based on four various proportions of recycled polypropylene-nanoclay that injected through injection molding will successfully injected without any defects. Measuring mechanical properties of 0/100, 75/25, 50/50, 25/75 mixtures of nanoclay and recycled PP will be identified through tensile test, that various proportions will shows higher strength result compare to the past research. Processing parameters very important to increase product quality, so selected parameters that are taken should optimized to get product with high tensile strength without any short shots, fracture and flash marks.