UNIVERSITI TEKNOLOGI MARA

COTTON WASTES FOR COMPOSITE REINFORCEMENT

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Thesis submitted in partial fulfilment of the requirements
for the degree of
Master in Science

Faculty of Applied Sciences

February 2007

CANDIDATE'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any other degree or qualification.

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ABSTRACT

This study assesses the possibility of fabricating composites out of cotton waste. Two (2) types of cotton wastes were taken from a spinning mill and used in this study, which were blowing waste and comb noils. Two (2) types of matrices were used in this project: polyester resin (thermosets) and polypropylene (thermoplastic). Composite materials were fabricated using compression with mould (hot press) for thermoplastic resin and compression without mould for thermoset resin. Tensile and flexural test were done in order to assess the mechanical properties of cotton waste composites. Statistical analysis using ANOVA (analysis of variance) and post hoc; Duncan were derived to test any significant difference in tensile and flexural strength results. Comb noils-polyester composite was found to produce the highest result in tensile and flexural strength which are 71.01 MPa and 126.85 MPa respectively. The lowest is exhibited by blowing waste-polyester composite which is 48.73 MPa and 83.63 MPa for tensile and flexural strength. Comb noils-polypropylene composite also show the highest tensile and flexural strength of 54.22 MPa and 75.60 MPa respectively and the lowest is exhibited by comb noils-polypropylene composite via crushing method which are 26.97 MPa for tensile and 58.75 MPa for flexural strength. Regression and correlation analysis was also done in order to determine the trend of all the parameters. Good relationship between tensile and flexural properties was also found with cotton waste composites. It was also found that a positive correlation existed for tensile and flexural properties with the length of the waste fibres used. The longer the length of the fibres, the higher would be the strength. However, this is only true for normal size textile fibres and not the nano and other smaller size fibres.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Textile fibres can be divided into natural and man-made. Natural fibres are obtained from plants, animals and minerals, while man-made fibres are produced either purely using chemical (Synthetic fibres) or by modifying natural fibres by chemical means (Regenerated fibres). Cotton (plant fibres), silk (animal fibres) and asbestos (mineral) are few examples of natural fibres while polyester, nylon and acrylics are examples of synthetic fibres.

In processing textile material, a lot of waste will be produced. Today there is greater awareness that our landfills are filling up, our resources are being used up, our land and seas are being polluted and that non-renewable resources will not last forever. Textile factories especially the spinning mills, which process fibres to yarn, produce a lot of usable waste. Discarding it will be a big loss since the price of cotton and the cost of processing textiles are very high. In cotton spinning for example, short fibres are collected as waste from blowroom to combing process. However these waste fibres are too short to be useful for any textile applications except as filling material and for cleaning cloths [1, 2].

In North Carolina, U.S.A, it was estimated that 28600 tons of cotton waste, not including lint content were generated in 1995. Most of these wastes are currently disposed in landfills. However, there is an issue about the high cost to dispose the cotton waste. It was assumed that average landfill tipping fee is $35 per ton and accumulated more than $1 million is spent on disposal costs alone, and this amount does not account for the cost of handling and shipping [3].