CHAPTER 1

INTRODUCTION

In this chapter the issues related to natural fibres, the potential of natural fibres, advantages over synthetic fibres and the usage of natural fibres in industrial application are discussed. In addition, the availability of natural fibres in Malaysia, and the reinforcement of natural fibres are described. The potential of natural fibres to substitute the present synthetic fibres are discussed in general. Finally, the problem statement, objectives and scope of the study are presented.

1.1 BACKGROUND

Malaysia is rich with natural fibres such as kenaf, palm oil fruit, pineapple and coconut fibre. Million tons of these fibres had been produced and these fibres can be transforming to useful materials. Composite manufacturing industries have been looking for plant based natural fibre reinforcements, such as flax, hemp, jute, sisal, kenaf, banana as an alternative material which in order to replace solid wood. Natural fibres have the advantage that they are renewable resources and have marketing appeal. Natural fibre reinforced polymer composites have been used for many applications such as automotive components, aerospace parts, sporting goods and building industry (Rowell, 2008).

Natural fibres have been used as reinforcing materials for over 3000 years, in combination with polymeric materials. In the course of nature life, composite materials were subjected to both mechanical loading and exposed to severe environmental conditions. The natural fibre reinforced composite are lightweight and free from health hazard, reasonably strong, and hence it’s have the potential to be used as material for strong components such as building materials, shipping, and automotive. Despite the advantages, they suffer from some limitations such as poor moisture resistance especially absorption and low strength compared to synthetic fibre such as glass (Abdul Khalil et.al., 2009).
Humans have continued to domesticate the natural fibres crops over time and extensively developed through breeding and selection according to societies’ needs and values. The availability of natural fibres in worldwide is the cause for the new polymer science and engineering research and the search for sustainable technology. The study of fibre reinforced plastics began in 1908 with cellulose material in phenolics, later extending to urea and melamine and reaching commodity status with glass fibre reinforced plastics. Cotton–polymer composites are reported to be the first fibre reinforced plastics used by the military for radar aircraft (Lubin, 1982; Piggot, 1980). One of the earliest examples (1950) was the East German Trabant car, the frame was constructed from polyester reinforced with cotton fibres. As a consequence, a balance in cost and performance could be achieved through proper material design (John & Thomas, 2008).

The strength of the fibre reinforced composites is dependent on the properties of fibre, the aspect ratio of fibre content, length of individual fibre, orientation of fibre, extent of intermingling of fibres, fibre to matrix interface bonding and arrangement of both the fibres and also on failure strain of individual fibres. Maximum results are obtained when the fibres are highly strain compatible (Sreekala, George, Kumaran, & Thomas, 2002).

1.2 PROBLEM STATEMENT

The most crucial problems of current plastic materials are heavy in weight, non-biodegradable and expensive. Although natural fibres have similar properties to the synthetic fibres there are still several other challenges presented by natural fibres. Such as large variability of mechanical properties, lower ultimate strength, lower elongation, problems with nozzle flow in injection molding machines, and poor resistance to weathering. The major challenge is the water absorption of natural fibres.
1.3 OBJECTIVES OF THE STUDY

The objectives of research are as follows;

(i) To develop kenaf fibre composite.
   - Kenaf fibre mixed with TPE.
   - Kenaf fiber extruded with TPE using twin screw extruder.

(ii) To investigate mechanical properties of kenaf fibre composite.
    - Tensile strength of the kenaf fibre composite.
    - Flexural strength of the kenaf fibre composite.

(iii) To investigate physical properties of kenaf fibre composite.
     - Moisture content of the kenaf fibre composite.
     - Water absorption of the kenaf fibre composite.

1.4 SCOPE OF THE STUDY

The scope of this study is to develop a reinforced kenaf fiber composite. Then conduct investigation on the mechanical and physical properties of kenaf fibre composite. Finally, conduct studies on the SEM of the composite. The experiments were conducted in Gambang and Pekan, Pahang. The research scopes are as follows:

(i) Mechanical properties study in terms of tensile strength, and flexural strength.
(ii) Physical properties study in terms of the water absorption and moisture content.
(iii) Scanning electron microscopy studies on the reinforced kenaf fibre composite.

1.5 THESIS OUTLINE

The first chapter of the thesis presents the introduction part. In the introduction part the background and availability of natural fibres in Malaysia, fundamentals on natural fibres are described. Next, natural fibres potential to be used as alternative in