

Experimental Investigation of Unidirectional and Natural Fiber Composites for Ceiling Fan Blade Application

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Abstract : Ceiling fans are one of the main power consuming sources. In the recent world most of the household appliances and industrial appliances are using electric power. Because of the enormous use of Electric power, electricity shortage is main problem throughout the world. Ceiling fan is the one of the appliance that consumes electric power. This has been minimized by means of reducing the weight of the blade. The best way to reduce the power consumption without sacrificing safety is to employ fiber reinforced composite materials in the fan blades. The objective is to compare the power consumption, cost and weight of composite fan blade with that of steel fan blade. In this work the design and fabrication of composite fan blade made up of hybrid fiber reinforced polymer is carried out by which weight of the fan blade can be reduced. The properties are examined to, tensile strength, hardness and flexural strength.. This results obtained in this work were compared with that of commercial ceiling fan blade.

IndexTerms - --- ceiling fan blade, hybrid fiber, hardness, flexural strength, tensile strength

I. INTRODUCTION

A ceiling fan is a device hanging from the ceiling of a room. Ceiling fans utilize hub-mounted rotating paddles in order to produce a cooling effect as a result of air circulation. The circulation of air creates a wind-chill effect that makes a person feel cooler. The ceiling fan blades are usually made up of aluminium, steel, wood, etc. The ceiling fans have become a common appliance both in domestic and industrial applications. Though the power consumed by these fans is less, it is to be considered that these fans run on a continuous duty and this makes the power consumption significant. Energy crisis and less availability of natural resources being the major challenge, selection of better material and effective manufacturing processes, can reduce both the power consumption and the manufacturing cost. Composite materials have found a wide range of application in replacing the conventional materials with enhanced strength and mould ability.

Composites are compound materials, differ from alloys in the fact that individual components retain their characteristics but are so incorporated into composites so as to take advantages only of attributes, not that characteristics of short comings, to obtain improved materials.

Composite materials (also called composition materials or shortened to composites) are materials made from two or more constituent materials with significantly different physical or chemical properties, that when combined, produce a material with characteristics different from the individual components. The individual components remain separate and distinct within the finished structure. Properties of composites are strongly influenced by the properties of their constituent materials, their type, their distribution and the interaction between them. Like conventional materials, composites are not homogeneous and isotropic.

Composites are generally completely elastic up to failure exhibit no yield point or a region of plasticity. At present steel is widely deployed in blade manufacturing mainly due to the advantages such as less density compared to steel, corrosion resistance and aesthetic look. Though steel has wide advantages when compared to steel, it stays back in certain properties such as less strength to weight ratio, paint coating etc. Composites have become a better replacement for conventional steel with adequate improvement of mechanical properties and their reduced weight

Though a variety of resins and fibres are available, considering the manufacturing easiness and the mechanical aspects general polymer resin and hybrid fiber is employed in the fabrication work. Hybrid fiber has good tensile and compressive strength and stiffness, good electrical properties. It is relatively low cost, but the impact resistance is relatively poor.

II. LITERATURE REVIEW

Amazing Comfortson S was et al discussed about the fabrication of composite fan blade made up of glass fiber resin forced polymer is carried out and the performance of this fan is compared with the conventional fans. Compared to existing ceiling fan blade, the composite blade saves 31% of power, an reduces the cost by 28%. The weight is reduced by 30% without sacrificing the strength thus reducing the power consumption

Ahamed Faiyaz was et al discussed about the fabrication of composite fan blade made up of glass fibre reinforced polymer is carried out and the performance of this fan is compared with the conventional fans. Compared to existing ceiling fan blade, the composite blade saves 26% of power, and reduces the cost by 28%. The weight is reduced by 27% thus reducing the power consumption. It is also determined that the flow velocity through the composite blade is 15% more than that of the conventional fan.