CASE STUDY OF AN AIR CONDITIONING SYSTEM USED IN BIOCOMPOSITES HVAC SYSTEM

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Abstract- *With the ascent of globalization, the longing to propel innovation without hurting people in the future has gotten significant. Having the option to offer efficient power energy arrangements and eco-accommodating materials at serious costs will be vital to accomplishing market entrance for all-over world organizations thinking about worldwide development in the coming years. Perceiving the need to move towards all the more ecologically strong materials and assembling strategies, researchers started to investigate elective materials as a way to assist with lessening our day-by-day squanders. They took a gander at Biocomposites which is normally comprised of regular pitches and plant strands. The composite materials are delivered with elite provisions, making merchandise ideal for cooling applications (AC). Cooling frameworks have ordinarily been worked of metal before. A financially savvy method of this framework is to give more prominent toughness, longer perseverance, higher temperature opposition, and higher protection from erosion. As the Biocomposites or bio-based materials are impervious to buildup, the likelihood of molds is decreased. In the affected areas this offers cleaner air. This study aims to upgrade and direct applications in the HVAC framework that might be custom-made for customer prerequisites. The accompanying rundown incorporates UV obstruction, sound damping, hostility to microbial qualities, protection from warmth and fire, and protection from erosion. The accompanying components: shading formed, exact resistances, low shape shrinkage, and reproducible shapes. These factors are the ideal monetary decision for thermoset composite materials for HVAC frameworks.*

Key Words: **Bio composite, Green Technologies, Environment friendly, HVAC, Sustainability, Thermosetting.**

1. INTRODUCTION

A composite material is made by combining two or more materials from different element having different properties into a new product with different mechanical properties from the raw materials. The main advantages of composite materials compared to conventional materials are they have lightweight and high strength properties. In terms of design flexibility, composite materials also cater more desirable feature, due to the fact that they can be molded into desirable shapes, despite the complexity of the shape design. [1]–[3] In addition, composite materials are notably strong can be engineered to be strong in a specific direction, compare to metals that are equally strong in all directions. Natural composite or biological composite is a composite that originated from plants, animal and human sources [4], [5] Air conditioning is the system used to cool down temperature by removing existing heat and moisture from the required space; it controls the temperature, humidity and air quality in indoor space. Depending on the intricacy of the needs, the HVAC designer must consider far more than merely maintaining acceptable temperatures.

2. LITERATURE REVIEW

During the last decades several kinds of studies have concentrated on laboratory simulation and theoretical previsions for air conditioning applications. Various technology advanced software and hardware have helped to calculate cooling loads to conserve energy, improve waste heating recycling to absorb vapor, optimize cost and have an energy efficient system. The unifying issue is protecting the earth and the ecology, which is crucial for mankind. Most research was in the past available in a vapor compression refrigeration system, not in a vapor uptake chilling system. But the efficient and cost effective construction design has become increasingly vital in recent years, with the utilization of Biocomposites. HVAC cooling efficiency rose by 10% in hot regions, and by 7% in cold climates, reflective of the range in temperature cooling efficiency[5] Kosar et.al looked at recent research from the National Centre for Energy Management and Building Technologies, which showed the advent of a variety of air conditioning devices with improved dehumidification capabilities. The primary concern of these new cooling systems is the high dehumidification demands posed by moisture-laden outside air that is manually introduced into to meet improved ventilation speeds. Kazachki et. al and others found that indirect cooling systems cost 30% more and are using 30 percent more power in secondary systems. This was because the secondary coolant (brine) had poor thermos-physical characteristics and because the building methods utilized in the initial implementation

were defective. In combination with advanced engineering techniques over recent decades, the use of improved secondarily coolants based on organic salt water solutions has allowed secondary coolant technology to compete effectively with conventional DX systems (direct expansion), both for installed costing and energy use.

Kavanaugh et.al studied the Building cooling and heating criteria for the primary temperature zones were investigated. He calculated heat gain and heat loss for buildings that used energy-efficient envelopes, insulation, appliances, and ventilation [2].

3. METHODOLOGY

their using their views and experience own words (Jonker & Pennink, 2009). Figure 1 shows the overall flow of methodology.

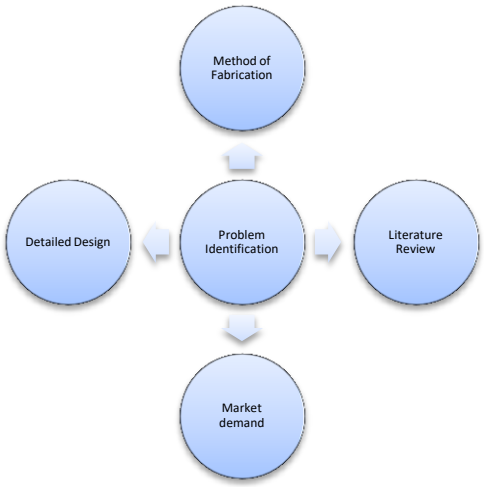

Figure 1: Overall methodology of this study

3.1 Market demand in recent scenario

Biocomposite HVAC system is a new production in commercial industry. Hence, some study is needed in the implementation of this project. The designs of existing system were gathered from HVAC engineers, internet sources and catalogues. The pattern, materials, processing cost and technique were identified in previous study (insert citation). In this study, some improvements are made in the designs and materials to improve the strength and reducing the weight of the table besides making the overall production process greener through the utilization of plant-based bio-composite materials.

Low quality of joining parts and not eco-friendly surface are the common problems in the existing products. Based on the market study, almost all of the table are made from wood and a few of them from metals. Wood is desirable over metal for reducing the weight of the table, however, wood is unable to stand moist condition and commonly absorbs the water. This is not a good feature for new system for long term use. To overcome the limitations of existing HVAC system, a biocomposite-based system from Natural fiber was fabricated in this study. Polyester resin used has good characteristic, includes high strength and water resistance. Combination between SPF and this resin has resulted in a great quality of table to compete the market demand. [6]

The design process was performed using the total design activities from identification of the market needs up to the satisfying the customer needs with eco-environment. The selected design will be fabricated with Natural fiber composites at the same times make the table have a great view, joining, and strength. The methodology of research provides a general overview of what must be done to attain a certain aim, without identifying all particular actions (Jonker & Pennink, 2009). Since the aim of qualitative study is not hard but focused on cultural and contextual components of an event, technical interviews with open-ended questions (Kvale & Brinkmann, 2009)

3.2 Design of Air Conditioning Equipment

3.2.1 Duct design calculation

The duct system functions in order to transport air from FCU (Fan coil unit) air conditioning to the condition speed. Air handling unit (AHU). The system has to be constructed in the constraints of space, friction loss speed, sound level, heat and leakage losses and gains to perform this role in an individual way. In any HVAC system, the duct design is crucial and must take into consideration many aspects such as space, noise, energy costs and initial installation costs. Deficiencies in the design of the duct may lead to systems that are ineffective and costly to run. For engineers who design, it is necessary to grasp the theory to perform duct design. [7]

3.2.2 Optimized air conditioning duct diameters may be calculated.

- Round, rectangular, flat and oval canal sizes compute.
- Include an integrated noise calculating fan library.
- Calculate the data input manually, or immediately through drawings of ducts generated with drawing board.
- In a single project you may enter almost limitless amounts of independent duct systems.
- Full color reports may be printed, viewed on a screen and stored on the disk.

• Determine noise and attenuation levels necessary.

The size of the duct can be determined by either the static recovery, equality of friction or a technique for a constant speed. The entry of the data can be made by hand or obtained visually from the 2006 or 2007 Drawing Board, or from the AutoCAD MEP of the year 2008. Duct sizes on a circular, rectangular and flat oval form basis may be determined. Each runoff can be printed with noise levels and the needed attenuation. A fan database is included in the software for sound calculations. The duct size allows for the limitation of duct sections and is appropriate as diversity for both constant volume and VAV systems (variable air volume). The duct size offers an option to set the control size restrictions for the height and breadth of the duct. This function is especially useful for problem analysis in existing systems, which already specify the size of ducts. The size of the duct is based on the design processes included in the SMACNA HVAC System Duct Design Manual and the ASHRAE Fundamentals Handbook. The project explorer and associated report that gives a picture of all trunks and runs in the project are important new features. Furthermore, the same project can enter both supply and return duct systems. [8]

3.2.3 Method of calculation and size of the duct

The Duct size software builds on the design processes set out in the Fundamental Handbook of ASHRAE, Duct Fitting Database of ASHRAE, and Duct Design handbook of SMACNA Systems. Either static recovery, equal friction or constant speed methodologies can be used to compute. Detailed information on the specific equations employed can be provided in the user handbook and how the results are to be manually checked.

1. Method of speed decrease.

2. The same method of friction.

3. Method of static recovery.

4. Method of equilibrium capacity.

5. Method optimized.

4. CONCLUSIONS

In conclusion, this study was successfully performed to fabricate a small part of Bio-based Air Conditioning system from natural fibers, following the main objectives to save our environment with fulfill customers' demands also. A lightweight, strong and high aesthetical value part was fabricated using compression of SPF and resin mixture and more economical due to reduction in amount of resin used in the fabrication. However, the natural fiber composite is a new type of material in HVAC industry. Hence, further research on the equipment preparation, composite fabrication and parts assembly should be made to improve the quality and aesthetical value of the fabrication product. The current study examines the use of Biomaterials in the computation of cooling loads with high strength for AC systems and development of computer-aided design, as well as software development. Bio-based Air conditioning system are used to make with some polymers to use for reinforcement or to enhance the properties of Bio-based small part of a system as a high-performance material. The huge advantages of biocomposites, such as abundance, light weight, biodegradability, several other intrinsic properties, and preferable properties compared with metallic materials or any other types of materials.

In the near future, great scope exists for the research and development in this direction. Biodegradable matrix, two or more reinforcement materials, their orientation and stacking sequence etc. are important parameters and must be taken into consideration judiciously. Their proper selection tailors the characteristics of the composites making them suitable for aerospace application. The research described that Biocomposites are very promising for developing environmentally friendly materials as an alternative material.

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