The Benefits of Using Composites Materials

Ranjeet Vitthalrao Gore[1] Dr. Anurag Tiwari[2]

Research Scholar, CMJ University, Shillong, Meghalaya

Assistant Professor, Govt. College, Kanpur (U.P.)

Abstract – Composite materials are formed by the combination of two or more materials, which retain their respective characteristics when combined together, but their chemical and mechanical properties are improved upon combination. "Two or more dissimilar materials when combined are stronger than that of individual materials." Today, where in world market demands for product performance are ever increases, composite materials have proven to be effective in reducing cost and improve in performance. Composites solve problems; raise performance levels by development of many new materials.

Key Words: Characteristics, Effective, Performance.

---♦-------------------------------------

INTRODUCTION

The use of natural composite materials has been a part of man's technology; the first ancient builder used straw to reinforce mud bricks. The 12th century Mongols made the advance weapons of their day with bows that were smaller and more powerful than their rivals. These bows were composite structures made by combining cattle tendons, horn, bamboo, which bonded with natural pine resin. The tendons were placed on the tense of the bow, the bamboo was used as a core, and sheets of horn were laminated the compression side of the bow. The entire structure was tightly wrapped using the rosin adhesive.

REVIEW OF LITERATURE

The 12th century weapons designers certainly understood the principles of composite design. In the recent time some of the old museum pieces were strung and tested. They were about 80% as some modern composite bows [51]. In the late 1800s Canoe builders were experimenting with gluing together 1st graft paper with shellac to form paper laminates. While the concept was such the materials did not perform well. W. Doppler, "Farmer's Business and Participation for Sustainable Agriculture", Proc. of SATHLA International Conference, Rio de Janeiro, Brazil, March-1998.

In the year between 1870 and 1890, revolution was occurring in chemistry, first synthetic (man made) resins were developed, which could be converted liquid to solid polymerization. These polymer resins are transformed from liquid state to solid state by crosslinking the molecules. Early synthetic resin included cellulose, melamine and Bakelite. In the early 1930s two chemical companies that were working on the development of polymer resins were American Cyanamid and DuPont. In the course of the experimentation, both the companies independently formulated polyester resin first time. In the same time period, Owens-Illinois Glass Company began the glass fiber into a textile fabric on commercial bases.

During the time between 1934 and 1936, experimenter Ray Green, in Ohio combined these two new products and began molding small boats. This was the beginning of modern composites. During World War II the development of required non-metallic housings and the US military advanced fledgling composites technology with many research projects. Immediately following war II composite materials immersed as major engineering material.

First composites industry began in earnest in the late 1940s and developed in 1950s. Most of the composites processing methods used today like molding, filament winding, hand lay-up technique, resin transfer molding, vacuum bagging were all developed and used in production between 1946 and 1950. Some products manufactured from composites during this period included: boats bodies (corvette), truck parts, aircrafts component, underground storage tank, buildings and many familiar products.

Composites typically use thermoset resins, which begin as liquid polymers converted to solid during the molding process. This process known as crosslinking is irreversible. Because of this, these polymers are known as thermosets and cannot be melted and reshaped. The benefit of composite materials have fueled growth of new application markets such as transportation, constructions, corrosion resistance, marine Infrastructure, consumer products, electrical, aircraft and aerospace application and business equipments.

MATERIAL AND METHOD

□□High strength: Composite materials can be designed to meet the specific requirements of an application. A distinct advantage of composites over other materials is ability to use many combinations of resins and reinforcement.

□□Light weight: Composites are materials that can be designed for both light weight and high strength. In fact composites are used to produce the highest strength to weight ratio structures known to man.

□□Corrosion resistance: Composites products provide long-term resistance from severe chemical and temperature environments. Composites are the materials choice for outdoor exposure, chemical handling application and severe environments service.

□□Design flexibility: Composites have an advantage over other materials because they can mold into complex shapes at relatively low cost. The flexibility creating complex shapes offers designers a freedom that hallmarks composites achievement.

□□Durability: Composite structures have an exceedingly along life span with low maintenance requirements, the longevity of composite is a beneficial critical applications. In a half–century of composite development, welldesired composite structures have yet to wear out. Compare a ¼ inch diameter steel rod to a ¼ inch diameter glass fiber composites rod. The steel rod will have higher tensile strength and compressive strength, but weight is more. If the fiber glass rod were increased in diameter to

the same weight as steel rod, it would be stronger [52]. Automotive industries in Europe show large interest in NFC (Natural Fiber Composite) that can be used in load bearing elements of cars. Some of the beneficial points for using composites over conventional ones are below [53].

"Composites Fabricators Association" – The Composites Industry Overview-2003. U. Gayer and Th. Schuh, "Automotive applications of Natural Fiber Composites", First International Symposium on ligno-cellulosic Composites – UNESP- Sao Paulo State, 1999.

□□Tensile strength of composites is four to six times greater than that of steel or aluminium

□□Improved torsional stiffness and impact properties

□□Composite have higher fatigue endurance limit (up to 60% of ultimate tensile strength)

□□Composite materials are 30-45% lighter than aluminium structures designed to the same functional requirements

□□Lower embedded energy compared to other structure materials like steel, aluminium, etc.

□□Composites are more versatile than metals and can be tailored to meet performance needs and complex design requirements

□□Long life offers, excellent fatigue, impact, environmental resistance and reduced maintenance

□□Composites enjoy reduced life cycle cost compare to metals

□□Composite exhibit excellent corrosion resistance and fire retardancy

□□Improved appearance with smooth surfaces and readily incorporable integral decorative melamine are other characteristics of composites

□□Composite parts can eliminate joints/ fasteners, providing part by simplification and integrated design compared to conventional metallic parts.

CONCLUSION

Different types of fibers for reinforcement and study of their properties Natural cellulose based fibers are gaining attention as their application is diversified into engineering end uses such as building materials and structural parts for motor vehicles [54, 55], where light weight is required. There are at least 1000 types of plant that bear usable fibers [56]. 54. A. Maguno, 2nd International wood and natural fiber composites symposium, Kassel, Germany, 29-1, June 28-29, 1999. 55. H. A. Al-Qureshi 2nd International wood and natural fiber composites symposium, Kassel, Germany, 32-1, June 28-29, 1999.

56. J. Robson, J. Hague, G. Newman, G. Jeronimidis and M. P. Ansell, Report No. EC/ 431/ 92 to DTI LINK, Structural Composites Committee, January – 1993.

India, endowed with an abundant availability of natural fibers such as jute, coir, sisal, pineapple, ramie, bamboo, banana, etc. have focused on the development of natural fiber composites. Primarily explore value-added application avenues. Such natural fiber composites are well suited as wood substitutes in the housing and construction sector [57]. In order to save a crop from extinction and to ensure a reasonable return to the farmers, non-traditional outlets have to be explored for the fiber. One such avenue is in the area of fiber-reinforced composites. Such composites can be used as a substitute for timber as well as in number of less demanding applications [57].

The estimated global tonnage of fibrous raw material from agricultural crops is provided in Table 1.1[58]. Jute, sisal, banana and coir, the major sources of natural fibers are grown in many parts of the world. Some of them have aspect ratios (ratio of length to diameters) > 1000 and can be woven easily. These fibers are extensively used for cordage, sacks, fishnets, matting and rope and as filling for mattresses and cushions. Cellulosic fibers are obtained from different parts of plants, e. g. Jute and remie are obtained from stem; sisal, banana and pineapple from the leaf; cotton from seeds; coir from fruit, vegetables. The properties of some of the natural fibers are compared in Jute is an attractive natural fiber for reinforcement in composites because of its low cost, renewable nature and much lower energy requirement for processing. Apart from much lower cost and renewable nature of jute and much lower energy requirement for the production of jute (only 2% of that of glass) makes it attractive as a reinforcing fiber in composites [59].

REFERENCES

R. K. Senthil and C. Rakkappam, Asian J. Phys., **6**, 467, 1997.

B. Saraf and K. Samal, Acoustica, **55**, 60, 1984.

S. Das, R. P. Singh and S. Maiti, “Ultrasonic velocities and rao formulism in solution of polyesterimides”, Polym-Bull., **2**, 400-409, 1980.

W. Bell and R. A. Pethrick, “Ultrasonic investigations of linear and star shaped polybutadiene polymers in solutions of cyclohexane, hexane and ethylbenzene”, Polym., **23**, 369-378, 1982.

R. A. Pethrick and B. T. Poh, “Ultrasonic attenuation and adiabatic

compressibility of poly (ethylene oxide)-water mixtures”, British Polym. J., **15**, 149-157, 1983.