**Research Assessment #3**

**Date:** September 18th, 2020

**Subject:** Effect of Chemical Treatment on Mechanical Properties of Banana and Abaca Fiber Reinforced Composites

**Source:**

Palanikumar, K., et al. Advances in Mechanical Engineering. Trans Tech Publications Ltd, 2015. EBSCOhost, search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1107280&site=ehost-live.

**Assessment:**

Modern-day cloth and papers used for their structural integrity are made from plastics and other synthetic materials. These materials are harmful to the environment and lead to pollution as they take longer lengths of time to decompose. They are often used due to their low weight to high strength ratio. A solution to this issue without affecting the weight to strength ratio is the use of natural fibers such as those found in banana and abaca.

The implementation of natural fibers rather than synthetic fibers may prove useful if used in everyday materials as they can fight the pressing issue of pollution. A prominent factor in pollution is the waste products created by materials used commonly in households. These materials include reinforced plastics and composite wood such as plywood. Materials made synthetically often require large amounts of energy to mass-produce, and they are not biodegradable. The use of biodegradable materials will decrease the buildup of pollution and return the materials to the environment.

The implementation of natural fibers requires a process that allows them to withstand forces and not fracture. This process is called chemical treatment, and it eliminates excess surface particles such as dust and oil. Chemical treatment also reduces moisture absorption which is a primary cause of decreased strength of materials. The reduction of moisture absorption leads to increased adhesion in the fibers.

One of the potential natural fibers that can be used is derived from the abaca plant, also known as Manila Hemp. This plant is innately strong and is used to make twines and ropes. This can be attributed to its high density of 1.5 g/cm^3 compared to other plant fibers. A promising aspect of the abaca plant fiber is cheap to obtain for commercial use. Banana fibers are slightly less dense (1.35 g/cm^3) but have high strength. The significance of banana fibers is that it can be easily blended with synthetic fibers such as cotton. This means that banana fibers can prove versatile when incorporated into fabric and textiles.

Concerning the chemical treatment aspect of the experiment, alkaline and potassium permanganate were used. Alkaline is a commonly used treatment. It works by increasing the surface roughness by disrupting the hydrogen bonds. It removes the wax and oils on the surface to decrease moisture. Potassium permanganate was also used. When this treatment is used, it forms MnO3- ions, This leaves highly reactive Mn3+ ions which react with the fiber, increasing its adhesion and surface roughness.

When comparing the two fibers, banana and abaca, they yielded different results. The chemically-treated banana fibers proved to have greater tensile strength than the abaca fibers. The banana fibers also proved to have greater flexural strength. However, the abaca fibers had greater impact strength than the banana fibers. This can be attributed to its higher density.

The implementation of natural fibers can prove very significant in the future as pollution is rapidly increasing across the world and this can be a step in the right direction for increasing the sustainability of the materials we use in our everyday lives.

Mechanical engineering has conveyed to be an ongoing process of problem-solving. As more modern problems arise in the world, modern solutions must be found. Engineers create these solutions, and often times the most commonly occurring problems are solved by mechanical engineers. Even the materials used in clothes and other objects must be innovated, such as through the implementation of biodegradable fibers in order to increase sustainability as seen in this experiment.