

Analysis of Tensile Strength and Impact Toughness of Banana Stem Fiber-Reinforced PMC with Polyester Resin Matrix (Case Study ib Motorcycle Exhaust Cover)

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ABSTRACT

*In the present era, various composite materials derived from natural resources are being developed. A composite is a type of material produced by combining two different materials with distinct characteristics to form a new material. Composites reinforced with natural fibers continue to be studied and developed as alternatives to synthetic fibers, and they are applied in various fields, both in terms of usage and technology, including automotive components such as vehicle bodies. However, testing shows that the strength of natural fiber composites is still lower than that of synthetic fibers; therefore, the fabrication process of natural fiber composites can be carried out by arranging the fibers in horizontal, vertical, or random orientations. Fibers obtained from banana fronds of the kepok banana tree (*Musa paradisiaca*) exhibit good mechanical properties. Banana frond fibers have a density of 1.35 g/cm³, cellulose content of approximately 63–64%, hemicellulose of 20%, lignin of 5%, an average tensile strength of 600 MPa, an average tensile modulus of 17.85 GPa, and an elongation of 3.36%. The diameter of banana frond fibers is about 5.8 μm. In the composite manufacturing process, pressing is applied to eliminate voids so that the fibers and resin can bond strongly, which is expected to produce higher test results compared to synthetic fibers and potentially exceed the findings of previous studies. The composite material was fabricated using the Hand Lay-Up technique. The impact test value for the polyester resin composite reinforced with banana fiber was 13.90 J, while the tensile strength of the composite was 41.35 N/mm².*

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Keywords: *Composite, Kepok Banana, Polyester Resin*