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Effect of NaOH Soaking Time on the Mechanical and Physical Properties of Polypropylene Composites *with Bagasse* Filler

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ABSTRACT

Bagasse is a natural fiber that has the potential *to* be used in making composites. The fiber has good characteristics used as a reinforcement. This study uses bagasse powder as a filler and polypropylene as a matrix. The purpose of this study is to make a composite and analyze the effect of bagasse soaking time with NaOH on the quality of the composite and also analyze the effect of the ratio of pp and bagasse on the mechanical and physical properties of the composite . The method used is quantitative with the independent variable in the form of composite volume fraction and the dependent variable in the form of composite mechanical properties. The sample of this study was made with a ratio of the volume of 20 mesh and 50 mesh sieve sizes, powder and polypropylene respectively 70:30, 60:40, 50:50, 40:60, 30:70. Each NaOH soaking time was 1 hour, 2 hours, 3 hours , and 4 hours . Based on the tensile test results, the highest tensile strength value of 28.6 MPa was shown by the sample of 20 mesh powder and 40:60 polypropylene ratio with a soaking time of 4 hours. Based on the impact test results, the highest impact energy value of 8.37 J was shown by the sample of 20 mesh powder and 50:50 polypropylene ratio with a soaking time of 3 hours. Based on the density test results, the highest density value of 0.763 g / ^{cm3} was shown by the sample of 20 mesh powder and 40:60 polypropylene ratio with a soaking time of 2 hours. Based on the water content test results, the highest water content value of 7.14 % was shown by the sample of 20 mesh powder and 40:60 polypropylene ratio with a soaking time of 2 hours.

ABSTRACT

Bagasse is a natural fiber that has the potential to be used in making composites. The fiber has good characteristics used as a reinforcement. This study used bagasse powder as a filler and polypropylene as a matrix. The purpose of this study was to make a composite and analyze the effect of bagasse soaking time with NaOH on the quality of the composite and also analyze the effect of the ratio of pp and bagasse on the mechanical and physical properties of the composite. The method used is quantitative with the independent variable in the form of composite volume fraction and the dependent variable in the form of composite mechanical properties. The sample of this study was made with a ratio of the volume of 20 mesh and 50 mesh sieve sizes, powder and polypropylene respectively 70:30, 60:40, 50:50, 40:60, 30:70. Each NaOH soaking time was 1 hour, 2 hours, 3 hours, and 4 hours. Based on the tensile test results, the highest tensile strength value of 28.6 MPa was shown by the sample of 20 mesh powder and 40:60 polypropylene ratio with a soaking time of 4 hours. Based on the impact test results, the highest impact energy value of 8.37 J was shown by the sample of 20 mesh powder and 50:50 polypropylene ratio with a soaking time of 3 hours. Based on the density test results, the highest density value of 0.763 g/cm3 was shown by the sample of 20 mesh powder and 40:60 polypropylene ratio with a soaking time of 2 hours. Based on the water content test results, the highest water content value of 7.14% was shown by the sample of 20 mesh powder and 40:60 polypropylene ratio with a soaking time of 2 hours.

1. Introduction

The rapid growth of science and technology in industry is pushing people to think creatively. One way to achieve this is by using environmentally friendly materials in product manufacturing, particularly those that are affordable and high-quality. Examples of environmentally friendly materials include composite materials, which are scientifically proven to be easier to recycle, readily available, inexpensive, and biodegradable. The use of metal as a raw material for product creation is a non-renewable natural resource, meaning the availability of metals will eventually dwindle. One natural fiber composite material that can be used to meet this need is bagasse fiber composite. Bagasse fiber *is* the residue from the milling process of sugarcane (*Saccharum oficinarum*) after the juice is extracted, resulting in a fibrous waste product. Until now, bagasse fiber has been used only as a fuel substitute for wood, livestock feed, and fertilizer, and has been left unused, potentially polluting the environment. Considering the potential availability of raw materials, this research aims to utilize bagasse fiber as a composite reinforcement material.

Basically, a composite material is a combination of two or more different materials into a *microscopic unit* . The combination of filler and *matrix* consists of various combinations. Fillers can be in the form of small particles or in the form of fibers. Currently, fiber-reinforced composite materials are widely used engineering materials because of their specific strength and stiffness far exceeding those of engineering materials in general. The desired properties of composites cannot be obtained from other materials when standing alone. The desired material properties are obtained by making them into composites, so that their properties can be designed according to needs. Composite materials are known to be light, strong and resistant to corrosion, making them able to compete with metal materials.

Plant sugarcane or *Saccharum officinarum* including in family *Graminease* or grass group. This plant can only growin areas with moderate to hot climates. Sugarcane is suitable for areas that has a land height of 1 to 1300 meters above sea level. Age plants from planting until they can be harvested reach less than more than 1 year. In Indonesia sugarcane Lots cultivated in island Java And Sumatra. In a way morphology, plant sugarcane can shared become four part, that is stems, leaves, roots and flowers. Sugarcane stems have a tall, thin figure, not branched and grows upright and consists of many segments, each segment limited by nodes as a place for the leaves to sit. The height of the plant stem sugarcane on generally Can reach 5 meters or more. Skin stem sugarcane hard, colored green, yellow, purple, red old or combination of colors the. Sugarcane stalks have segments the length each-10-30 cm each. The shape of sugarcane leaves is in the form of strands with a midrib. Long leaf can reach 1-2 meters And wide 4-8 centimeters with surface rough and hairy. Sugarcane flowers are compound flowers that are spread out at the top A axis reed. Whereas the roots shaped fiber

In this study, sugarcane powder will be used as *a filler* in making composites, while *the matrix* used is *a matrix. Polypropylene* (PP). This PP *matrix* was chosen because of its strong properties and relatively high melting point, around 160°C. The resulting composite will be used to make composite boards. With the powder's significant potential as a filler, it is hoped that it will expand the use of composite materials in various industrial fields.

2. Method

This research was conducted at the Materials Engineering Laboratory, Faculty of Engineering, Malikussaleh University. The materials used were sugarcane powder, polypropylene, 5% NaOH, Aquades, BPO, Xylene. The tools used were a heat press machine, an extruder, tensile and impact specimen molds, a digital scale, aluminum foil, a measuring cup, scissors, and a catering knife.

The procedures carried out in this research include:

a. Preparation of material composition
b.

No	Soaking time for sugarcane bagasse with NaOH	Composition	
		Polypropylene (gr)	Sugarcane bagasse (gr)
1	1 HOUR	70	30
2		60	40
3		50	50
4		40	60
5		30	70

6	2 HOURS	70	30
7		60	40
8		50	50
9		40	60
10		30	70
11	3 HOURS	70	30
12		60	40
13		50	50
14		40	60
15		30	70
16	4 HOURS	70	30
17		60	40
18		50	50
19		40	60
20		30	70
21	POLYPROPYLENE	100	

c. Bamboo fiber processing

1. Prepare bagasse from sugar cane traders.
2. The sugarcane bagasse obtained is cleaned by washing and drying.
3. The dried pulp is cut into 5cm lengths.
4. After obtaining 5cm long sugarcane bagasse, it is then soaked in NaOH solution according to the specified variables.
5. After soaking, the sugarcane pulp is dried until dry at room temperature.
6. After drying, the bagasse is ground using a blender and then sieved using a 20 mesh and 50 mesh sieve.
7. After sifting the filler is ready to use.

d. Preparation of composite samples

1. Prepare the materials and tools needed.
2. Mix 0.5g of BPO into 100ml of *xylene solution* , then take 20ml of the solution and put it into the matrix according to the specified variables. BPO is used as an initiator, a compound that begins a radicalization reaction, which is a process that causes chemical bonds to form quickly.
3. Mix the matrix and fiber according to the variables.
4. Put it into the extruder machine to make it homogeneous.
5. Print using a hot press machine
6. The printed results are cut according to ASTM sizes.
7. The specimen is ready to be tested.

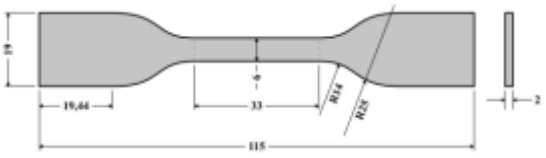

Figure 1. Image of Tensile Test Specimen

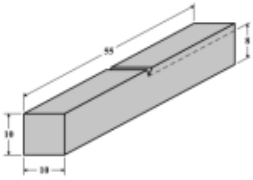

Figure 2. Shape and Size of Specimen

3. Results and Discussion

3.1 Tensile test results

Test pull, is method or procedure For test strength And toughness material or structure to style interesting. Objective from test Thisis to determine how much maximum load can be supported by ingredients before experience failure or cracked

From the results of research on the Effect of NaOH Soaking Time on the Mechanical and Physical Properties of *Polypropylene Composites* with Bagasse *Filler*

data obtained Tensile testing (Strong Tensile, Strain and Modulus Elasticity) as follow:

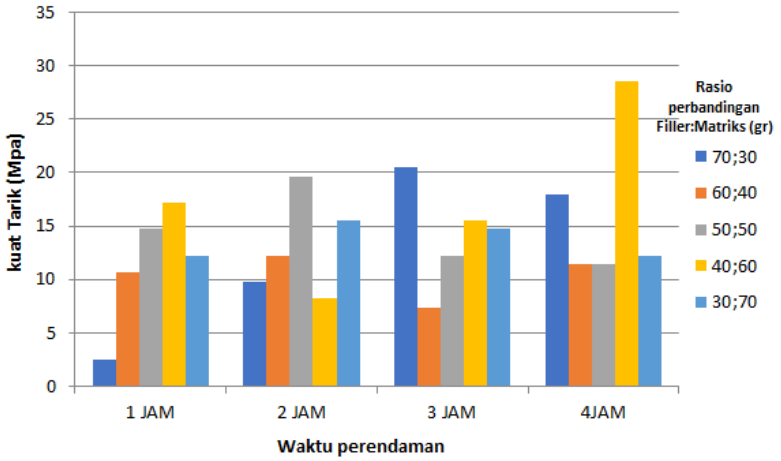

Figure 3. Effect of Ratio with Soaking Time on Tensile Strength at 20 Mesh Particle Size

The image above shows the results of the Tensile test on composite specimens with variations in powder size, soaking time, powder and pp . on 20 mesh Composite powder with 1 hour soaking has a Tensile strength of 17.16 MPa. soaking carried out for 2 hours has a Tensile strength of 19.61 MPa. In soaking carried out for 3 hours has a tensile strength of 20.43 MPa . While in soaking carried out for 4 hours has a tensile strength of 28.6 MPa . The increase in the graph occurs because the NaOH soaking of the fiber aims to increase fiber compatibility by reducing or eliminating the content of other elements that can reduce the strength of the fiber such as lignin and hemicellulose content. The loss or reduction of lignin in the fiber makes the fiber surface change to become rougher so that the fiber bond with the matrix becoming stronger. However, soaking for too long can also reduce the fiber strength, as the fiber will become brittle or damaged.

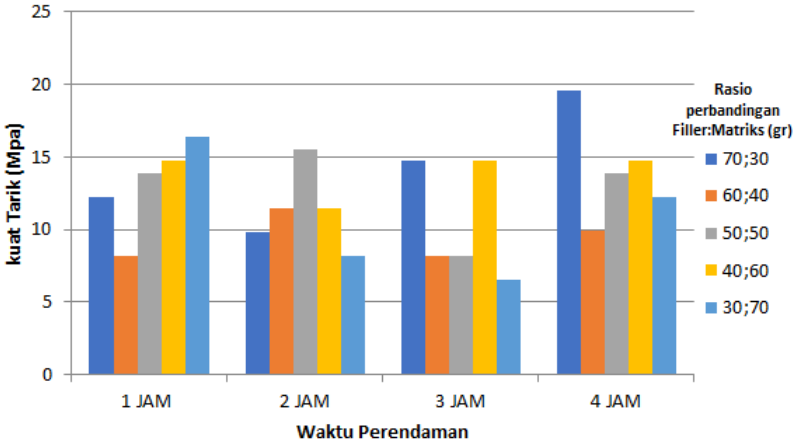

Figure 4. Effect of Ratio with Soaking Time on Tensile Strength at 50 Mesh Particle Size

In 50 mesh composite powder with 1 hour immersion, it has a tensile strength of 16.34 MPa . Immersion for 2 hours has a tensile strength of 15.52 MPa . Immersion for 3 hours has a tensile strength of 14.71 MPa. Meanwhile, immersion for 4 hours has a tensile strength of 19.61 MPa . The increase in the graph occurs because the immersion of NaOH on the fiber aims to increase fiber compatibility by reducing or eliminating the content of other elements that can reduce the strength of the fiber, such as lignin and hemicellulose. The loss or reduction of lignin in the fiber makes the fiber surface change to become rougher so that the fiber bond with the matrix becoming stronger. However, soaking for too long can also reduce the fiber strength, as the fiber will become brittle or damaged.

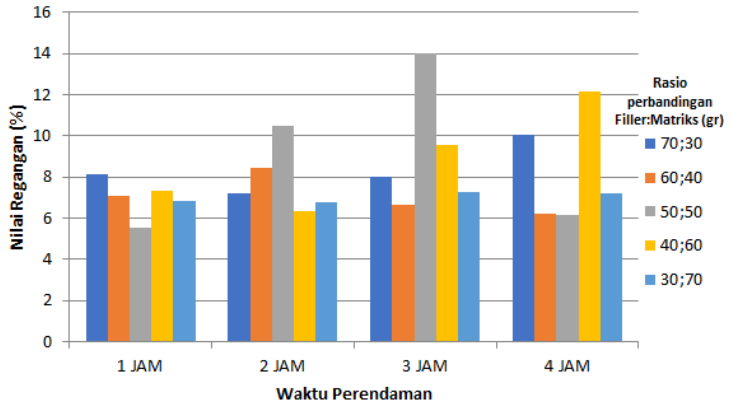

Figure 5. Effect of the Ratio with Soaking Time on the Strain Value at a Particle Size of 20 Mesh

Test results showed that the specimen experienced a strain of 13.99% before breaking. Strain is the ratio of the change in length to the specimen's initial length and indicates how far a material can stretch before breaking or fracturing. A high strain value indicates that the material has good elastic or plastic properties , meaning it can undergo significant deformation before breaking. Conversely, a low strain value indicates that the material is brittle and tends to break without significant deformation.

In the graph above we can see that the immersion time can also affect the strain value, at 1 hour immersion the strain value is 7.33%, at 2 hours immersion it is 10.45%, at 3 hours immersion it is 13.99%, and at 4 hours immersion it is 12.13%, therefore the influence of the immersion time is very decisive in determining the results of the composite strain value.

In the context of polymer or composite materials such as polypropylene (PP) and natural fiber-based composites , the strain can change depending on the type and proportion of filler material.

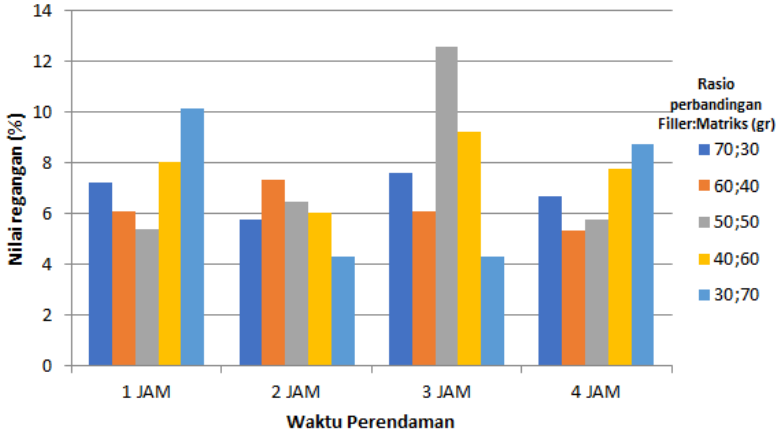

Figure 6. The Effect of the Ratio with Soaking Time on the Strain Value at a Particle Size of 50 Mesh

Results The strain value in the image above is also not much different from the results of the 20 mesh powder value, where the test results show that the specimen experienced a strain of 12.60 % . before breaking. Strain is the ratio of the change in length to the initial length of the specimen, and indicates how far a material can stretch before breaking or fracturing.

In the graph above we can see that the immersion time can also affect the strain value, at 1 hour immersion the strain value is 10.17%, at 2 hours immersion it is 10.45%, at 3 hours immersion it is 12.60%, and at 4 hours immersion it is 8.76%, therefore the influence of the immersion time is very decisive in determining the results of the composite strain value.

In the context of polymer or composite materials such as polypropylene (PP) and natural fiber-based composites , strain can vary depending on the type and proportion of filler material. Based on research

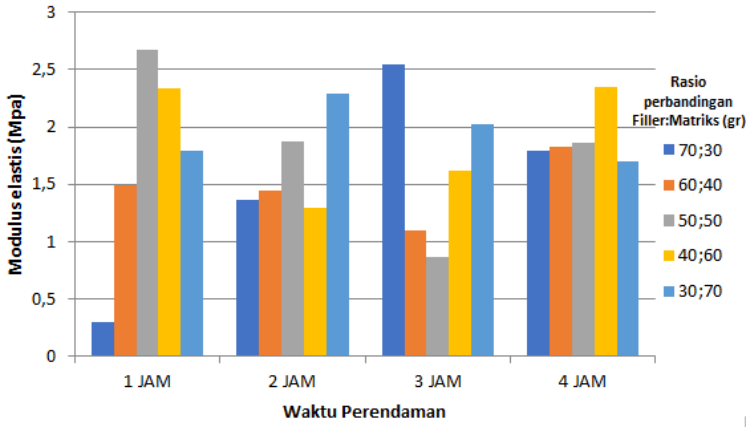

Figure 7. Effect of the Ratio with Soaking Time on the Elastic Modulus Value at a Particle Size of 20 Mesh

The results of the tensile test on 20 mesh powder showed that the elastic modulus of the test specimen was 2.67Mpa. The elastic modulus describes the ability of the material to withstand elastic (reversible) deformation when subjected to force.

In the graphic image above, we can also see that the size of the powder, soaking time, and volume fraction greatly determine the value of the modulus of elasticity, in 20 mesh powder, soaking for 1 hour, the modulus of elasticity value is 2.67Mpa, soaking for 2 hours is 2.29Mpa, soaking for 3 hours is 2.55Mpa, and soaking for 4 hours is 2.35Mpa. From the results above, we can see that soaking can affect the properties of the composite.

A high elastic modulus indicates that the material is rigid and experiences very little deformation under load. Conversely, a low modulus indicates a material that is more flexible or easily deformed elastically.

In the context of materials such as polypropylene (PP) **,** the elastic modulus is generally in the range of 1.0–1.5 GPa **.** However, if polypropylene is blended with fillers such as natural fibers or bagasse particles **,** the modulus can increase because the filler is stiffer and helps resist deformation.

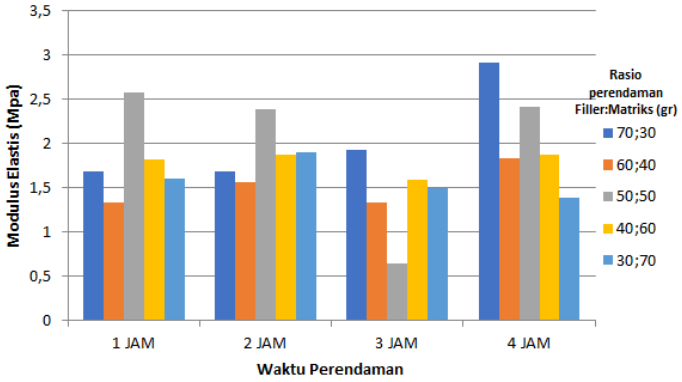

Figure 8. Effect of the Ratio with Soaking Time on the Strain Value at a Particle Size of 50 Mesh

Results The test in the graphic image above is also not much different from the results of the elastic modulus of 20 mesh powder, where the tensile test results on 50 mesh powder show that the elastic modulus of the test specimen is 2.67Mpa. The elastic modulus describes the ability of the material to withstand elastic (reversible) deformation when subjected to force.

In the graphic image above, we can also see that the size of the powder, soaking time, and volume fraction greatly determine the value of the modulus of elasticity, in 50 mesh powder, soaking for 1 hour, the modulus of elasticity value is 2.57Mpa, soaking for 2 hours is 2.39Mpa, soaking for 3 hours is 1.93Mpa, and soaking for 4 hours is 2.92Mpa. From the results above, we can see that soaking can affect the properties of the composite.

A high elastic modulus indicates that the material is rigid and experiences very little deformation under load. Conversely, a low modulus indicates a material that is more flexible or easily deformed elastically.

In the context of materials such as polypropylene (PP) **,** the elastic modulus is generally in the range of 1.0–1.5 GPa **.** However, if polypropylene is blended with fillers such as natural fibers or bagasse particles , the modulus can increase because the filler is stiffer and helps resist deformation.

3.2 impact test results

impact is one of the important properties that must be explained show Mechanic material. Principle from testing This that is absorption energy potential load of a pendulum swinging from a certain height and knock object test so that object test experience deformation. With use testing *impact* , will found size strength, violence, andtenacity material Which experienced. Method Which used in this test, namely *the Charpy method* . This method is used to study fracture pattern of the composite specimen so that it is known that the specimen has brittle fracture *or* ductile fracture *or* a combination of both *Granular fracture* or *cleavage fracture* is a brittle fracture surface. shiny and granular whereas ductile fractures appear duller and stringy or called Also *fibrous broken* or *slide fracture* . Results Which obtained from testing *impact* on Study Which own Finished on the material combination Can seen on the table under This.

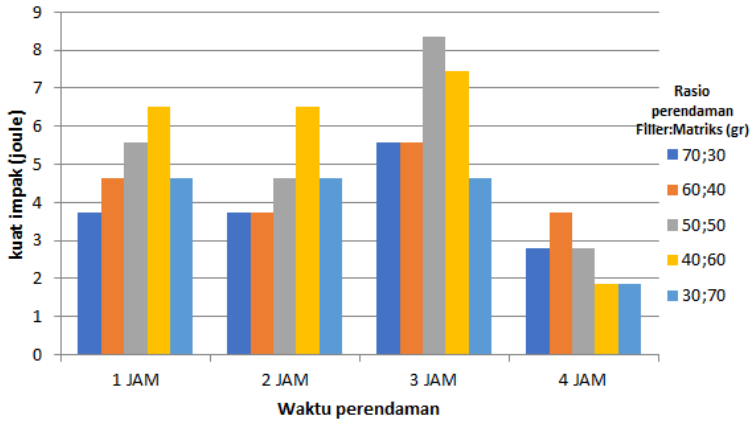

Figure 9. Effect of Ratio with Soaking Time on Fracture Strength at 20 Mesh Particle Size

The image above shows the Impact test value that the longer the NaOH immersion of the fiber, the lower the composite value of the Impact test results will be. The results of this comparison show that the NaOH immersion time is limited by the length of immersion time, the longer the immersion time can result in damage to the fiber structure containing cellulose , therefore it is very important to analyze to determine the right immersion time to get good breaking strength.

In the graph above, it can be seen that 4 hours of immersion has a low value compared to 1 , 2, 3 hours of immersion, due to the influence of immersion time, the longer the immersion, the lower the value obtained.

Soaking in NaOH solution functions as an alkali treatment. For natural fiber or particle materials. This treatment removes hemicellulose, lignin, wax, and other impurities from the fiber surface, and opens up the fiber microstructure, resulting in a rougher surface. This rougher surface can improve adhesion between the polymer matrix and the filler , resulting in a more even load distribution during impact.

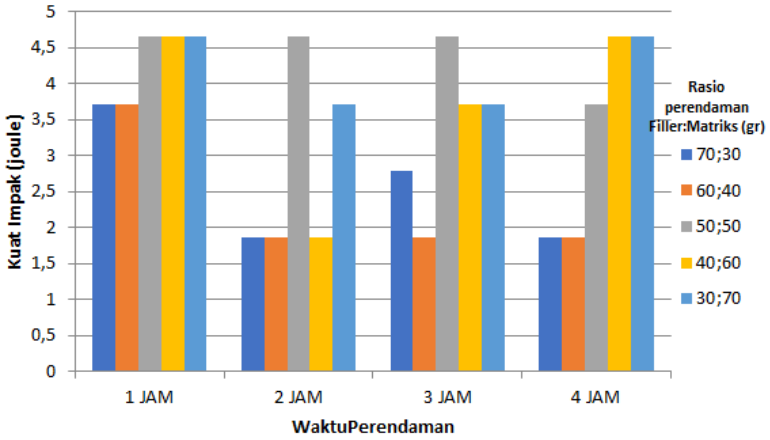

Figure 10. Effect of Ratio with Soaking Time on Fracture Strength at 50 Mesh Particle Size

The results of the graphic above show that the powder size, immersion time, and volume fraction significantly affect the impact strength value. Impact testing was conducted to determine the material's toughness to shock loads after being immersed in NaOH (Sodium Hydroxide) solution . The test results

showed that the impact value of the sample soaked in NaOH for 4 hours experienced a decrease compared to samples 1, 2, 3 hours. Soaking in NaOH solution serves as an alkaline treatment for natural fiber or particle materials. This treatment removes hemicellulose, lignin, wax, and other impurities from the fiber surface, as well as opening the fiber microstructure, resulting in a rougher surface. This rougher surface can increase adhesion between the polymer matrix and the filler , so that the load distribution is more even when an impact occurs.

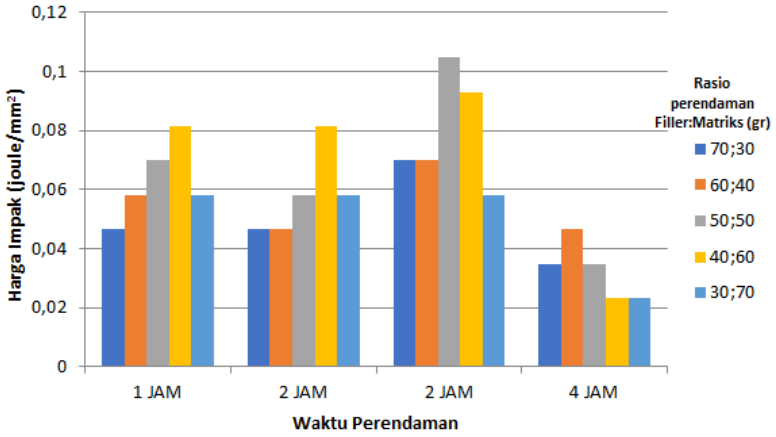

Figure 11. Effect of the Ratio with Soaking Time on the Fracture Value at a Particle Size of 20 Mesh

After testing using the Charpy method, the impact value was obtained. the highest amount of 0.1047 joule/mm ^{2} at 1 hour immersion , at 2 hours immersion 0.0814 joule/mm ^{2} , at 3 hours immersion 0.1047 joule/mm ^{2} at 0.0465 immersion joule/mm ^{2} Impact strength reflects a material's resistance to shock loads or sudden impacts . A high value indicates that the material can absorb more energy before failing, while a low value indicates that the material tends to be brittle and easily fractures upon impact. In this test, the filler material (e.g., natural fiber or bagasse powder) was also immersed in NaOH . The purpose of the NaOH treatment was to clean the fiber surface , removing lignin, hemicellulose, and other impurities that could disrupt the bond between the phases. The test results showed that The impact value increased after NaOH immersion , which indicates that the adhesion between the matrix and the filler became better.

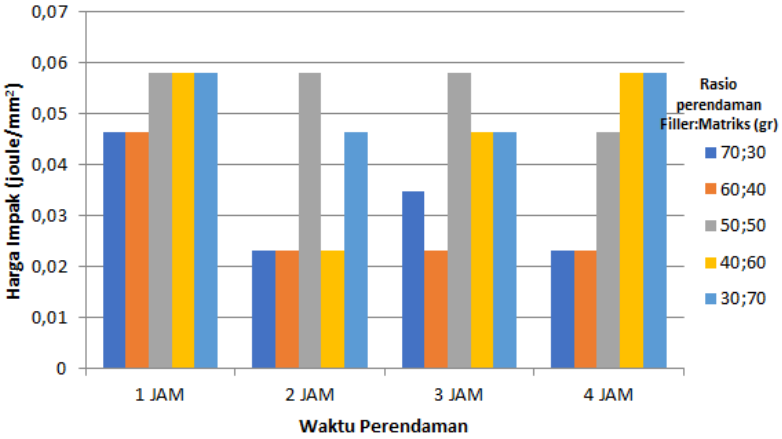

Figure 12. Effect of the Ratio with Soaking Time on the Fracture Value at a Particle Size of 50 Mesh

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3.3 Density and water content test results

A density test is a method for determining the density of an object or substance. Density is defined as mass per unit volume. A density test is performed to measure how dense or dense an object or substance is.

A bar chart of density test results can be seen in the image below.

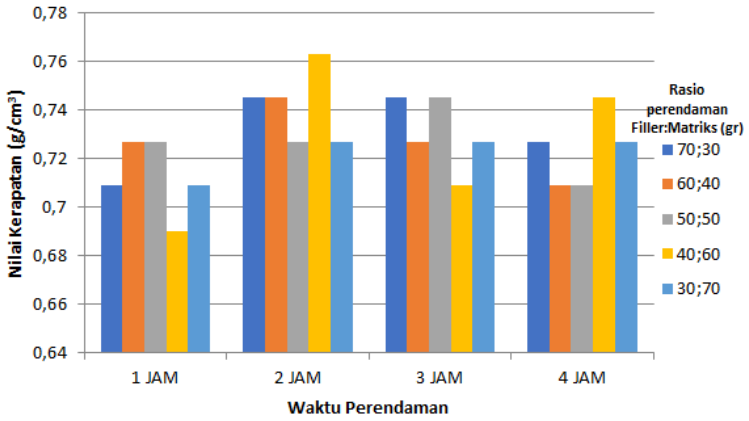

Figure 13. Effect of the Ratio with Soaking Time on the Density Value at a Particle Size of 20 Mesh

Density testing is carried out to determine the density of a material, namely how dense the arrangement of particles is in a unit volume. Based on the test results, the density value obtained was 0.727 for 1 hour of immersion , 0.763 for 2 hours of immersion , 0.745 for 3 hours of immersion , and 0.745 for 4 hours of immersion . The density value obtained is still within the standard range for composite materials, which follows the SNI 03-2105-2006 Standard which requires a particle board density of 0.40 – 0.90 g/cm3. which shows that the specimen has a fairly dense particle arrangement. The addition of bagasse powder as a filler in the PP matrix has the potential to affect the final density value of the material. Bagasse powder has a porous and light structure , so it can reduce the density of the composite if it is not mixed homogeneously or has air cavities (voids) in the structure.

A decrease in density can also be an indication of poor interactions between the filler and the matrix , such as a lack of interphase bonding or the presence of micro-voids. In some samples, the addition of untreated natural fibers or powders can cause uneven dispersion , forming void areas, and reducing the overall density. Sample of treated sugarcane bagasse powder NaOH soaking (alkali treatment) shows changes in the surface structure and can affect density. NaOH removes lignin, hemicellulose, and other impurities from the fiber surface , this causes the density of the composite material to decrease. compared to untreated powder. However, if the mixing and fabrication process is carried out properly, the density between the phases can be increased , and voids can be minimized.

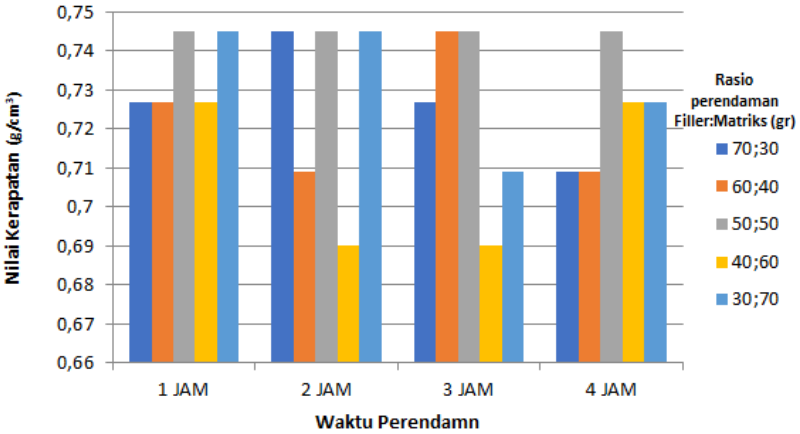

Figure 14. Effect of the Ratio with Soaking Time on the Density Value at a Particle Size of 50 Mesh

Density testing is carried out to determine the density of a material, namely how dense the arrangement of particles is in a unit volume. Based on the test results, the average density value obtained was 0.745 g/cm^3 . This value indicates how dense a material is in a given volume unit, which is closely related to the material's internal structure, the type of constituent material, and the presence of pores or

cavities within the material. The density value obtained is still within the standard range for composite materials, which follows the SNI 03-2105-2006 Standard, which requires particleboard density of 0.40 – 0.90 g/cm3 . If the sample shows a decrease/increase in density, this decrease can be caused by the addition of materials that have a lower density or contain natural pores, such as fibers or biomass particles. Conversely, if there is an increase, it is likely that the filler particles have a higher density or better compaction occurred during the fabrication process.

A decrease in density can also be an indication of poor interactions between the filler and the matrix **,** such as a lack of interphase bonding or the presence of micro-voids. In some samples, the addition of untreated natural fibers or powders can cause uneven dispersion , forming void areas, and reducing the overall density. Sample of treated sugarcane bagasse powder NaOH soaking (alkali treatment **)** shows changes in the surface structure and can affect density. NaOH removes lignin, hemicellulose, and other impurities from the fiber surface , this causes the density of the composite material to decrease. compared to untreated powder. However, if the mixing and fabrication process is carried out properly, the density between the phases can be increased **,** and voids can be minimized.

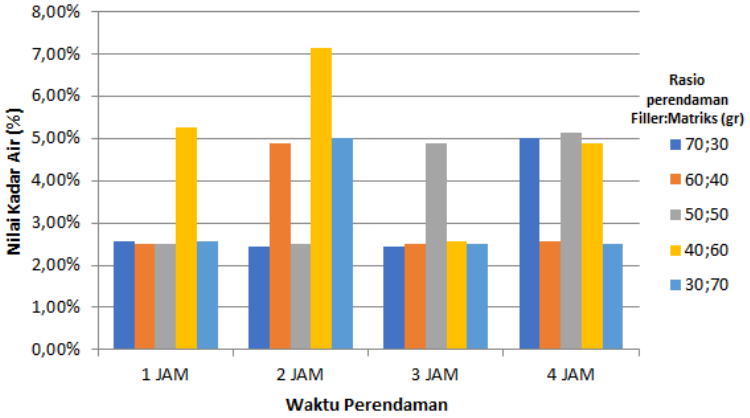

Figure 15. Effect of Ratio with Soaking Time on Water Content Value at 20 Mesh Particle Size

The water content test is carried out to find out how much water content (moisture) is contained in the material . From the test, the highest water content was obtained at 5.26 % at 1 hour immersion, 7.14 % at 2 hours immersion, 4.88% at 3 hours immersion, 4.88 % at 4 hours immersion. These values indicate that The higher the water content, the greater the likelihood of the material experiencing degradation in mechanical properties . Composites made from natural materials such as bagasse tend to absorb more water due to their hydrophilic (water-attracting) nature. High water content can affect the mechanical properties, thermal resistance, and the mixing and molding processes of a composite material. In composite materials , high water content can cause degradation, or the emergence of steam during the heating process, which can affect the quality of the final product. Therefore, drying the material before use is often necessary to reduce the moisture content to the optimal level. In this test, the moisture content value was classified as low and met the SNI 03-2105-2006 standard, which requires a particleboard density of ≤14% **.**

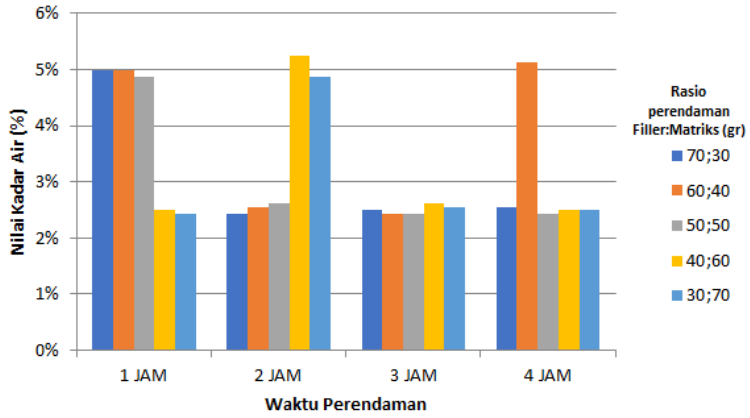

Figure 16. Effect of Ratio with Soaking Time on Water Content Value at 50 Mesh Particle Size

Based on the test results, the water content contained in the sample in 20 mesh powder was 4.88 % . at 1 hour immersion, 5.26 % at 2 hours immersion, 2.63 % at 3 hours pre-immersion, 5.13 % at 4 hours immersion . This value shows that The higher the water content, the greater the likelihood of the material experiencing mechanical degradation . Composites made from natural materials such as bagasse tend to absorb more water due to their hydrophilic (water-attracting) nature. This moisture content indicates the percentage of water mass contained in the material compared to the total mass before drying. High moisture content can affect the mechanical properties, thermal resistance, and mixing and molding processes of a composite material. In composite materials , high water content can cause degradation, or the emergence of steam during the heating process, which can affect the quality of the final product. Therefore, drying the material before use is often necessary to reduce the water content to the optimal limit. In 20 mesh powder, the water content is 7.14 % and in 50 mesh powder, the water content is 5.26%, which is considered low and meets the SNI 03-2105-2006 Standard which requires a particleboard density of ≤14% **.**

3.4. 100% Polypropylene Testing

The results of tensile strength, impact strength, brittleness and water content tests on 100% polypropylene samples can be seen in the table below .

No	Tensile test			Impact test		Density g/cm ^{3}	Water content %
	Voltage	strain	elasticity	Impact force	Impact price		
1	63.74Mpa	16.21%	3.93Mpa	12 joules	0.151	0.727	0

In the table above, we can conclude that in the tensile test, the stress value is 63.74Mpa, where this value shows that the material has good resistance to tensile forces, at a strain value of 16.21%, this strain value is This indicates that the material is still capable of undergoing deformation before breaking. This means that this composite is not brittle , but rather quite plastic/flexible . The elastic modulus value is 3.93 MPa . This value reflects the material's stiffness level . A relatively low value indicates that the material can still deform elastically before exceeding the proportional limit.

In the impact test, we can conclude that the fracture strength value is 12 joules, this value is the total energy absorbed when the material breaks due to impact. This value is sufficient to indicate that the material is able to withstand impact loads well, at an impact value of 0.151, the value This is the specific energy per cross-sectional area at fracture. This value indicates moderate toughness – the material is not too brittle, but also not extremely tough like polycarbonate or metal. The material has adequate impact resistance for products such as automotive interior components, household appliances, or rigid packaging .

The density test yields a value of 0.727 g/cm^3 . This is quite low, indicating a lightweight material . This is important in various applications that require mass efficiency, such as in transportation, lightweight construction, or household appliances. The low density makes the material suitable for applications that require lightness yet strength **.**

In the water content test , the value is 0% or the absence of water content indicates that the material is hydrophobic. or has undergone drying or chemical treatment effective, such as NaOH immersion. This value is excellent for preventing degradation due to moisture, increasing the product's service life and dimensional stability.

In every test conducted on pure polypropylene, we can conclude that the material has high tensile strength and sufficient flexibility . Its impact value indicates adequate impact toughness . It is lightweight and does not absorb water , making it suitable for a variety of applications, especially engineering products based on modified natural fibers .

4. Conclusion

a. conclusion

Based on the analysis and calculation of data obtained from the test results on the Effect of Variations in Powder Size, NaOH Soaking Time and Matrix and Filler Fractions on Bamboo Fiber (Gigantochloa Apus) and Polypropylene Binder on the Mechanical and Physical Properties of Composites, the following conclusions can be drawn:

1. The results of the tensile strength of sugarcane powder composites with the influence of NaOH soaking time tend to increase. NaOH soaking treatment for 4 hours with a variation of 40gr: 60gr is the best variation to obtain a tensile strength of 28.6 Mpa on 20 mesh powder and the NaOH soaking treatment for 4 hours with a variation of 70gr: 30gr is the best variation to obtain a tensile strength of 19.61 Mpa on 50 mesh powder . This is due to the increasing bond between the fiber and PP. Therefore, the influence of NaOH soaking in the process of making bagasse powder composites is very important because the right method can increase the strength and quality of the composite.
2. Of all the specimens with different NaOH soaking time values, the highest Impact test was obtained by the specimen with a NaOH soaking time of 3 hours on the powder , namely an impact strength of 8.37 joules and an impact price value of 0.104 joules / ^{mm2} .
3. After conducting tensile tests on bagasse and PP composites with the influence of NaOH immersion time, the quality is better if the immersion is carried out for a long time than if the immersion is not too long. In contrast to the impact test, if the NaOH immersion is too long, the lower the fracture strength value obtained.
4. The conclusion of the purpose of this study is that we can know the effect of the size of bagasse powder can affect tensile strength, such as the effect of 4 hours of soaking time with a ratio of 40gr of powder and 60gr of polypropylene in 20 mesh powder has greater strength compared to 1 hour soaking with a ratio of 70 powder and 30 polypropylene in 20 mesh powder has a little strength, as well as the effect of soaking time, where in tensile testing must analyze in order to determine the efficient time for making composites, not too long so that the filler substances and components are not brittle or eroded, and not too fast so that the soaked filler can be substances or impurities that are not needed such as lignin. And the same is true with the effect of the ratio of bagasse and polypropylene, bagasse and polypropylene are two good materials used in making composites, because they have good strength as in this study, therefore composites with bagasse filler and polypropylene matrix are very good to be used for making composites.

b. Suggestion

The researcher realizes that the results of this study are far from perfect. Therefore, the researcher greatly appreciates constructive criticism and suggestions from readers to improve the results. The author suggests several things to consider during the composite manufacturing process, including :

- When making composites, it is very important to pay attention to the mixing process of the powder and matrix so that it is perfectly homogenous and there are no air cavities (voids) in the composite, thus producing a more optimal composite.
- Further research can be carried out with different fibers or matrices and different variations in order to produce a more optimal composite .

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