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ACOUSTIC PANEL CHICKEN FEATHER WASTE ENVIRONMENTALLY FRIENDLY

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ABSTRACT

Chicken feathers are the result of waste from slaughterhouses and billions of kilograms of waste produced by various kinds of poultry processing. This hal is a very serious problem for the environment because it causes the impact of pollution. Has many utilization of chicken feather waste such as making komocen, accessories, upholstery materials, making brackets to the manufacture of animal feed but from the results of this activity cannot reduce the production of chicken feathers that his continuously increase every year. This is due to the fact that the selling price of chicken meat has been reached by consumers with middle to upper economic levels. This can easily be a chicken menu in almost all restaurants and restaurants to the food stalls on the side of the road. An alternative way of utilizing chicken feathers is to make composite materials in the form of panels. Recent studies have shown that the pvac material can be utilized as a mixing and adhesive material with mashed or ground feathered composites to form a panel that can later be used as an acoustic material. The test results show that the absorption of chicken feathers and pvac glue into panels can absorb sound well with an absorption coefficient of 0.59, light. This result is very economical so it is worth to be recommended as an acoustic material. Apart from the results of research methods carried out is one of the environmentally friendly activities in particular the handling of waste problems

Keywords: Acoustic Panel, Chicken Feather Waste, Environmentally friendly.

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1. INTRODUCTION

Chicken Feathers which is a waste from a chicken slaughterhouse, chicken feathers can be used because they contain keratin and protein, making it strong, tough and lightweight. The increase in chicken feather waste continues to increase due to the high demand and consumption due to the increasing purchasing power of the people.

Increased demand for chicken meat from the chicken slaughtering business, causing waste problems. The results of slaughter of poultry produce an average feather weight of 4 - 9% of live weight. According to [2], the nutritional content of chicken feathers contains about 91% protein (keratin), 1% lipid, and 8% water.

So that technology and methods for disposal and utilization of waste are needed to reduce threats to the environment [14]. Half of a chicken feather is a feather fiber based on weight, the thorn is a rigid core with a hollow tube structure. Both feather fiber and chicken feathers are made from keratin (about 90% by weight), an insoluble and very durable protein found in animal hair, nails and horns [12].

Advances in technology in the chicken slaughtering industry will have positive and negative impacts on both the environment and humans. According to [9], the rapid growth of the slaughtering industry means that more waste is generated and causes complex problems for the surrounding environment, so that technology and methods for disposal and utilization of waste are needed to reduce threats to the environment.

Utilization of chicken feather waste has been done for a long time including making fillers for pillows, making feather duster, brackets, animal feed and accessories. This waste also attracts many researchers' attention in the development of science and technology.

The development of good quality acoustic environmental technology is a fundamental requirement in building materials. Room where human activities are needed, acoustic quality for comfort, productivity, and health of the occupants or users. This is often overlooked because of the relatively high cost of management, especially in public facilities buildings and construction buildings.

According to [15], to create a comfortable atmosphere of acoustic environment, several techniques can be used. One of them is by reducing sound absorption and reflection. This can be achieved by lowering the intensity of the sound that does not interfere with human hearing. The results show that the fiber board has a slight decrease in strength but increases dimensional stability and decay resistance compared to boards made of wood fiber. Other researchers use fur fibers to develop new bio-composites [1], [11], or as reinforcement in plastics [3], [4], [5], [6], [7].

The use of acoustic materials in the form of panels in sound absorption in order to improve the quality of sound in the room is now increasingly needed, but the sound-giving material is very expensive. Acoustic panels made from raw materials for chicken feathers in the initial stages are expected to reduce the selling price of acoustic panels. As has been investigated the possibility of using waste as raw material for acoustic panels.

The selection of chicken feather waste because this material has characteristics as material for acoustic purposes, such as high elasticity and containing air cavities. Early research shows that chicken feathers are very potential to be used as raw material for panels [10]. However, further research on the ability of quill panels as an acoustic panel material needs to be done. Tests are carried out by mixing chicken feathers that have been ground or crushed with PVaC adhesives and water for panel formation.

This research is part of research on the utilization of chicken feather waste as material for making Acoustic Panels. Previous studies have revealed that chicken feather waste that has been cleaned and finely chopped or ground with a mixture of PVAc adhesives can be formed into an acoustic panel, the results of which are quite dense, lightweight and textured. The result can be used as an acoustic panel because it matches the nature and character of the acoustics.

The purpose of this study was to obtain a more accurate panel absorption coefficient value, so that the researchers continued the experiment by making acoustic panels of 10 samples with different thicknesses (0.9 cm, 1.6 cm and 2.5 cm), then testing the ability in absorbing sound more accurately.

2. METHODS

The making of the panel referred to as an acoustic panel material, conducted several experiments of several treatments, one of the treatments is mixing chicken feathers and PVAc adhesives, [14] by using clean water as a solvent.

2.1. MATERIALS

The material mixed was chicken feather waste which had been cleaned and finely ground with a commercial polyvinyl acetate (PVAc) polymer in FOX glue, with clean water (in this study, the composition was 70% feather weight, 30% (PVAc) and 100% clean water.

FIGURE 1. Aluminum pans and basins as a mixing medium for sample making work

FIGURE 2. Prefab Samples of iron pipe diameter of 10 cm, scales of materials and electric ovens and hydrolide presses

3. PANEL MAKING METHOD

This research is a continuation of previous research, the research was made by using the experimental method, and the panel that was made was then carried out by the process of measuring samples in the acoustic laboratory of Hasunuddin University to determine the ability of panel material absorption with several treatments. The process used in making chicken feather panel samples is chicken feather waste that has been washed dried, dried and ground with a grinding machine until smooth. PVAc is measured to be dissolved in water 15% of the 100% water that has been prepared. Then stir with a spoon to combine glue and water evenly. This feathered chicken feather is then mixed with a PVAc solution.

3.1. The Process of Making a Test Panel Sample

After the three materials have been mixed well and evenly, the next step is printing panel samples with different models, sizes and thicknesses. The mixture of PVAc, chicken feather was put into a mold, then pressed using a hydrolyte press with a pressure of 10 kg / cm, then put into an electric oven with a temperature of 100C for 60 minutes. After the process the material has been removed by storing it at room temperature.

Then the panel that has been dried at room temperature is removed from the container. Then put into an electric oven for the second time at the same time in order to give stiffness to the printed panel. The panel is then dried for several days in a place exposed to direct sunlight. After drying the panel samples were tested for sound absorption in the Unechoic Chamber Acoustic Workshop, Building Science Laboratory, Faculty of Engineering, Hasanuddin University.

4. RESULTS AND DISCUSSION

In this research will be discussed and the method of making panels from the results of mixing chicken feathers that have been ground with PVAc adhesive and water. The results of this study in the form of 10 pieces of feather panels with a diameter of 10 cm with several thicknesses, including thickness 0.9 cm, 1.6 cm and 2.5 cm, and then the absorption coefficient was tested using a 4206 impedance tube.

4.1. Absorption Coefficient of Chicken Feather Waste Panel Material

After the panels are formed several pieces with different thicknesses, the measurement of the panel is to find an accurate value of the absorption coefficient of chicken feather waste material. An impedance tube with two microphones is used. Selection of tubes with a diameter of 10 cm, presented in the form of a curve. The measurement is limited to a frequency of 100 Hz - 1,600 Hz which is in accordance with the limitations of this study.

4.1.1. Panel thickness 0.9 cm

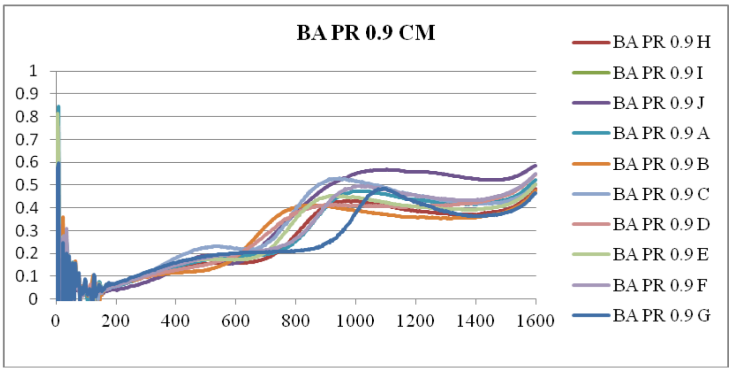

FIGURE 3. Curve absorption coefficient of 0.9 cm sample thickness (sample BAPR A-J)

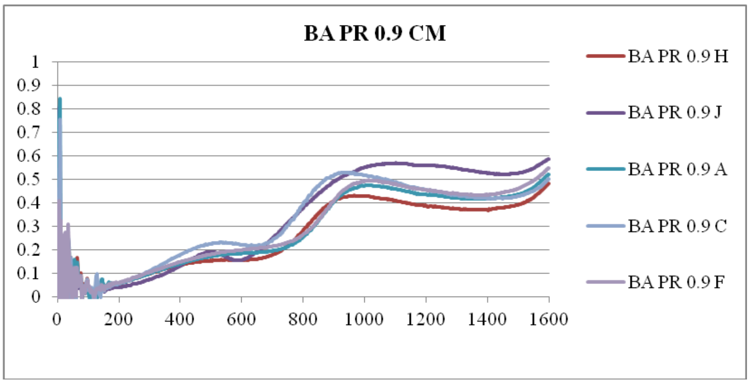

FIGURE 4, Curve Absorption Coefficient of 0.9 Cm Sample Thickness (Sample A-C-F-H-J)

n BAPR sample measurements. 0.9 cm thick in Figure 3, shows the absorption coefficient values of 10 samples. Of the ten samples, there are several samples that have absorption coefficient values with maximum deviation values of 0.57 at frequencies of 1000 Hz and 1600 Hz, thus for variations of BAPR 0.9 cm thick only 5 samples are shown in Figure 4.

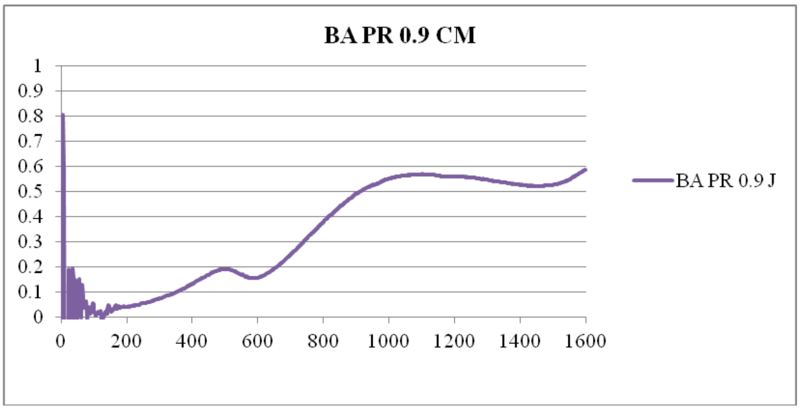

FIGURE 5. Curve absorption coefficient of 0.9 cm sample thickness (sample A-C-F-I-J)

TABLE 1. BAPR absorption coefficient 0.9 cm thick

Frekuensi (Hz)	KOEFISIEN ABSORBSI	Frekuensi (Hz)	KOEFISIEN ABSORBSI
	BAPR 0.9		BAPR 0.9
100	0.02	850	0.44
150	0.03	900	0.49
200	0.04	950	0.52
250	0.06	1000	0.55
300	0.07	1050	0.56
350	0.10	1100	0.57
400	0.13	1150	0.56
450	0.17	1200	0.56
500	0.19	1250	0.56
550	0.17	1300	0.55
600	0.16	1350	0.54
650	0.19	1400	0.53
700	0.25	1450	0.52

750	0.31	1500	0.53
800	0.38	1550	0.55
		1600	0.59

Based on the results of the average calculation of the five samples used, the BAPR absorption coefficient value of 0.9 can be seen by the curve in Figure 5. Thus, the absorption coefficient of chicken feather waste material for BAPR 0.9 in the study is to have the ability to absorb the sound from low frequency to high frequency continues to increase, the highest absorption coefficient is 0.59 at 1600 Hz frequency.

4.1.2. The thickness of the panel is 1.6 cm

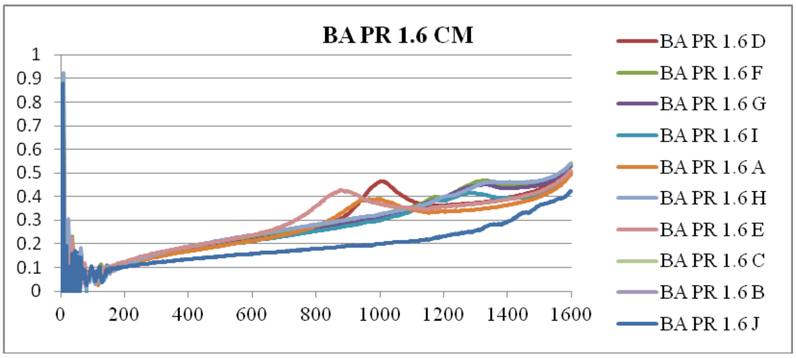

FIGURE 6, Curve Absorption Coefficient Of 1.6 Cm Sample Thickness

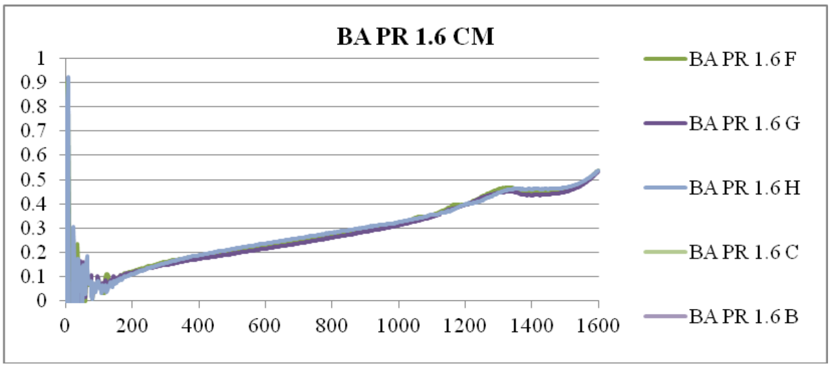

FIGURE 7, Kurva Koefisien Absorpsi Tebal Sampel 1,6 Cm (Sampel B-C-F-G-H)

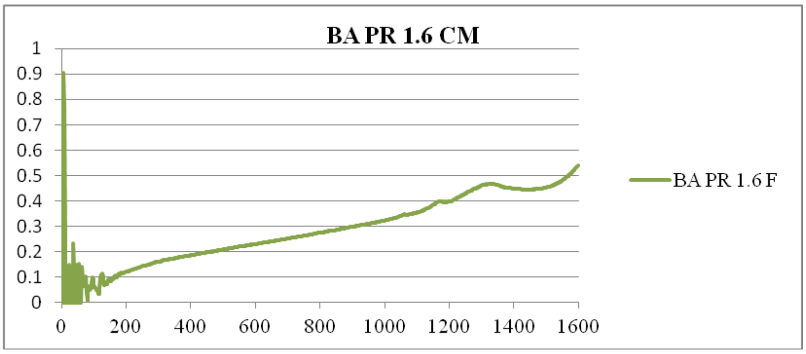

FIGURE 8, Curve Absorption Coefficient Of Sample Thickness 1.6 Cm (Sample B-C-F-G-H)

In BAPR sample measurements. 1.6 cm thick as in Figure 6, shows the absorption coefficient value of 10 samples. From these ten samples, there are several samples that have absorption coefficient values with maximum deviation values of 0.57 at frequencies of 1000 Hz and 1600 Hz, for variations of BAPR 0.9 cm thick only 5 samples are taken as in Figure 7.

TABLE 2. Absorption Coefficient Of 1.6 Cm Thick BAPR

Frekuensi (Hz)	KOEFISIEN ABSORBSI	Frekuensi (Hz)	KOEFISIEN ABSORBSI
	BAPR 1,6		BAPR 1,6
		850	0.29
100	0.06	900	0.30
150	0.08	950	0.31
200	0.12	1000	0.32
250	0.14	1050	0.34
300	0.16	1100	0.35
350	0.17	1150	0.39
400	0.19	1200	0.40
450	0.20	1250	0.43
500	0.21	1300	0.46
550	0.22	1350	0.45
600	0.23	1400	0.44
650	0.24	1450	0.45
700	0.25	1500	0.46
750	0.26	1550	0.48
800	0.28	1600	0.54

Based on the results of the average calculation of the five samples carried out, obtained the absorption coefficient value of BAPR 1.6 as in the curve of Figure 8. Thus, the absorption coefficient of chicken feather waste material for BAPR 1.6 in the study is to have the ability to absorb sound from the frequency low to high frequencies continue to increase, where the highest absorption coefficient is 0.54 at 1600 Hz.

4.1.3. Thickness of 2.5 cm

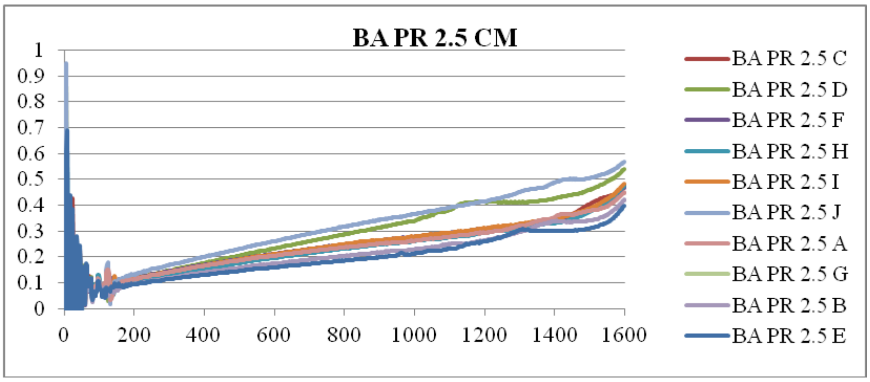

FIGURE 9, Curve Absorption Coefficient of 2.5 Cm Sample Thickness

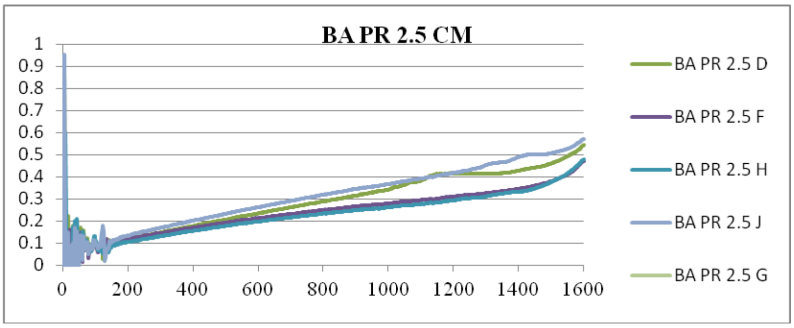

FIGURE 10. Curve Absorption Coefficient of 2.5 Cm Sample Thickness (sample D-F-H-J-G)

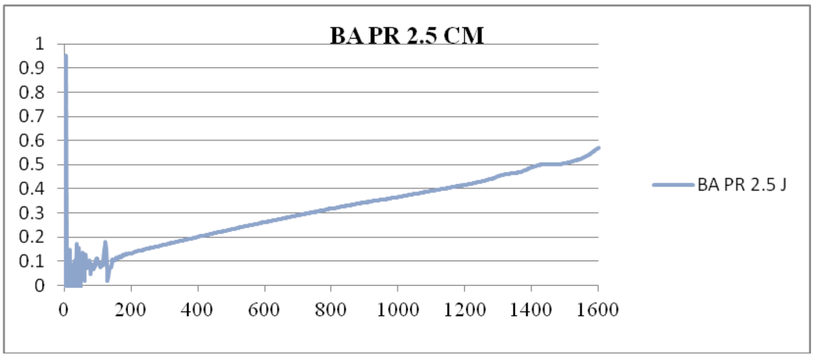

FIGURE 11. Curve Absorption Coefficient of 2.5 Cm Sample Thickness

In BAPR sample measurements. 2.5 cm thick as shown in Figure 9, shows the absorption coefficient value of 10 samples. From the ten samples there are a number of samples that have absorption coefficient values with maximum deviation values of 0.57 at frequencies of 1000 Hz and 1600 Hz, thus for variations of BAPR 2.5 cm thick only 5 samples are taken as in Figure 10.

TABLE 3. BAPR Absorption Coefficient of 2.5 Cm Thick

Frekuensi (Hz)	KOEFISIEN ABSORBSI	Frekuensi (Hz)	KOEFISIEN ABSORBSI
	BAPR 1,6		BAPR 1,6
100	0.09	850	0.33
150	0.10	900	0.34
200	0.13	950	0.36
250	0.15	1000	0.37
300	0.17	1050	0.38
350	0.18	1100	0.39
400	0.20	1150	0.40
450	0.22	1200	0.42
500	0.23	1250	0.43
550	0.25	1300	0.43
600	0.26	1350	0.47
650	0.28	1400	0.49
700	0.29	1450	0.50
750	0.30	1500	0.51
800	0.32	1550	0.53

Based on the calculation results of the average of the five samples used, the absorption coefficient value of BAPR 2.5 is obtained as shown in the curve of Fig. 11. Thus, the absorption coefficient of chicken feather waste material for BAPR 2.5 is the ability to absorb sound from low frequency to high frequency continues to increase, where the highest absorption coefficient is 0.57 at 1600 Hz frequency.

4.1.4. Absorption Coefficient 3 Variations in Sample Thickness

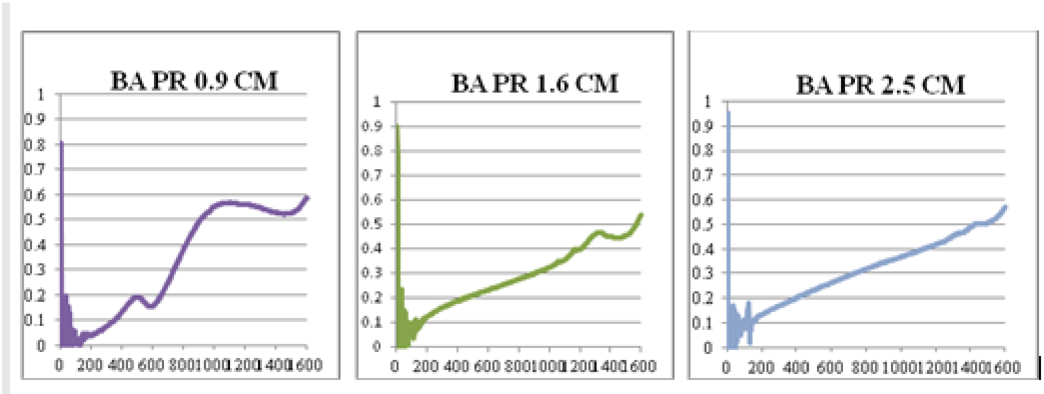

FIGURE 12, Graph Of Absorption Coefficient Of The Three Sample Variations.

TABLE 4. Absorption Coefficient of Sample Variation

No	Sampel	Frekuensi (Hz)				α Maximum
		250	500	1000	1600	
1.	BAPR.0,9	0,06	0,19	0,55	0,59	0,59
2.	BAPR.1,6	0,14	0,21	0,32	0,54	0,54
3.	BAPR.2,5	0,15	0,23	0,37	0,50	0,57

Based on the measurement results for all variations in sample thickness In table 4, the data obtained shows that:

- All samples have an absorption coefficient that continues to increase with increasing frequency of measurements.
- The BAPR.0.9 sample absorption coefficient is faster and increases in the 1000 Hz frequency, then decreases in the 1200-1400 Hz frequency, and rises again at the 1600 Hz frequency until it reaches the maximum value.
- The BAPR.2.5 sample has an absorption coefficient that continues to increase with increasing frequency of measurements.
- All samples the higher the frequency of sound received, the absorption coefficient also increases.

5. CONCLUSION

Based on research results in the utilization of chicken feather waste into an acoustic panel product, it can be concluded as follows:

1. In the context of saving the environment, there is a lot of untapped waste around us, so researchers are trying to utilize chicken feather waste from a chicken slaughterhouse into a panel product that will later be used as an environmentally friendly alternative material.
2. Utilization of chicken feather waste is quite easy to do, simply by taking the chicken slaughterhouse waste from the chicken slaughterhouse to be disposed of in a landfill that if not handled quickly will cause unpleasant odors and pollute the surrounding environment and can cause disease.
3. Chicken feather waste is waste from chicken slaughterhouses that really must be cleaned so that it is free from larvae and fungus that can cause disease so it must be washed clean and preserved so that it can last a long time and does not re-emerge the fungus or odor from the waste.
4. Chicken feather waste cannot be used as a panel if it is intact so that it has to be chopped to make it easier to make panels by adding PVAc glue as an adhesive and water as a solvent and mixed so that it quickly blends due to the condition and character of the feathers that are slippery, stiff and contain keratin.
5. In the manufacturing process special treatment is needed because the character of the chicken feather itself that is young is absorbing water because it has a cavity tube on the hair shaft, but it cannot store water because of the feather nature which is light, slippery and has karatin

6. Panel that has been formed as a sample in acoustic laboratory testing can absorb sound with an absorption coefficient value of 0.6 which means the sound absorption value is quite good, because the perfect sound absorption is 1.

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