



EFFECT OF KATALIS ON MAKING MARBLE SYNTHETIC

Sintha Soraya Santi

Chemical Engineering Department, Faculty of Technology Industry

UPN "Veteran" Jawa Timur

E-mail : sinthaay@gmail.com

ABSTRACT

The aim is to utilize waste synthetic marble made of marble and study the effect of these variables marble grain size, amount of catalyst and heavy marble grain on the compressive strength, the wear and water absorption. Materials - the materials used, among others; a. Marble waste, which is obtained from the village Besole, Tulungagung, b. Synthetic Resin (R-154) already in accelerasi. C). Catalyst acid (HCl) with $pH \pm 4.5$. Tools - tools used are a). Machine press with a maximum capacity of 60 tons that have hit the maximum scale division 500 kg.b). Pengaus machine or abrasive objects that can rub try with 3.33 kg load and speed of 49 meters per minute wear. C). Matter. D). Pestle., e). Measuring cup. F). Analytical Balance. Research variables are specified condition that is a). Temperature = 30 o C, b). Resin volume = 40 ml; c). The samples sizes are: Diameter = 5.08 cm, Height = 2 cm; (surface area = 40.5161 cm²); d). Time = 4 hours The treatments are carried out is a). Size Pellets Marble = (10, 16, 20, 35, 48) mesh, b). Catalyst amount = (0.2; 0.4; 0.6, 0.8; 1.0) ml; c). Marble Grain weight = (50, 55, 60; 65; 70) grams.

Keywords: marble grain size, amount of catalyst and heavy grain marble.

INTRODUCTION

One type of rock Metamorphic rock is marble. The process of metamorphosis is caused by pressure and heat from deep below the earth's surface. It is this process that makes the limestone is very dense and hard that they become marble or alabaster.

Synthetic marble was first made Klaten area by using an adhesive - glue egg white duck or chicken egg white, which is known by the name marbut or artificial marble. Marbut dough consists of flour as an ingredient of glass and powder hardener to offset fossil shells or flour hardness of glass so that no brittle or easily broken. In order for all materials used strong glue white chicken egg. Calcite flour is added to dry quickly. This dough is pressed or heated nature such as the formation of the original marble.

In this study utilize the waste marble shape of the plates or in the form of granules and small granules are very small. This wastes a lot of marble found in front of houses - houses marble mining area Besole, Tulungagung. There are about 32 large-scale marble craftsmen and small villages Besole Tulungagung, that every day could generate up to 0.5 m³ of marble waste for a small-scale artisans and approximately 0.5 to 1 m³ of waste marble for a large-scale

producers (Research , 2002). Waste marble can be used or processed, by the way glue grain - grain of marble by using a chemical called resin and catalyst HCl. The addition of HCl catalyst is intended to accelerate the process of hardening (hardening) of the resin used. The reason the manufacture of synthetic marble by using a chemical adhesive, the first because the egg white of duck or chicken egg whites hard to get so expensive in the market, both white duck or chicken eggs nutritious so it is better used as a food a day - the day that many contain protein. Synthetic marble made in this study will be tested compressive strength, the wear and water absorption. The addition of the catalyst is very influential on the printout. Because the catalyst that affects whether or not rapid hardening process on the test object. Strong wear and press the power that determines whether or not the synthetic marble made, when compared to natural marble.

Resin

Natural resins are carbon compounds that contain oxygen and nitrogen, in general the natural resins are viscous, sticky liquid form or nature of all liquid. And this resin will harden slowly - the land when exposed to open air. Slightly yellow in color

and insoluble in water, but dissolved out in CS₂ and some solvents such as benzene, alcohol, and ether.

Synthetic resins were developed by Leo Hemdrik Bakeland in 1909. The material is made of Phenol and Formal Dehida. It turned out to have similarities with the synthetic resin of natural resins.

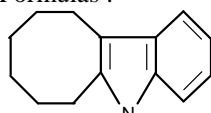
Resins used in this study include synthetic resin which is a type R - 154 which has the following characteristics:

Chemical Name: 1 - (3-dimethylaminopropyl)-hexamethyleneindole -2,3;5 - [3 - (dimethylamino)-propyl]-hexahydro-5H -6,7,8,9,10,11-cyclooct [b] indole.

Chemical formula: C₁₉H₂₉Cl N₂

Molecular Weight: 320.92

Formulas :



CH₂CH₂CH₂N(CH₃)₂ · HCl

Under ordinary circumstances viscous liquid with a characteristic smell. ("The Merk Index an Encyclopedia of Chemical & Drug").

The process of hardening of the resin mixed with marble needs to be controlled in order to obtain the best conditions. Thickening and hardening process is called the Curing Reaction.

There are several stages of Curing Reaction:

1. Gel Time (gelling time)

Is the addition of accelerator to form a soft gel or when the resin to form a gel.

2. Hardening Time (hardening time)

Is the time required by the resin to reach a desired shape to improve the process of Gel Time and hardening time made with hot or cold curing curing. Hot curing is the repair events gelatin and hardening (hardening acceleration and refinement hardening) the resin by using catalysts and heating, while cold curing repair events are gelatin and hardening (hardening acceleration and refinement hardening) the resin by using a catalyst and accelerator.

Catalytic

The function of the catalyst is to accelerate the hardening process or a process of hardening resin. The catalyst used in the resin will release heat and

heat that accelerates the process of unification and the hardening mixture of grains of marble.

The catalyst can be used is the type of catalyst paste H, H liquid catalyst, the catalyst liquid L, M liquid catalyst and the catalyst liquid O. Catalysts L, M and O is a derivative of methyl-ethyl ketone peroxide (MEKP). Differences catalyst paste and liquid catalyst lies in its activity in affecting the speed of hardening of the resin. Liquid catalyst is much better than the catalyst paste, because the liquid is much better than the catalyst paste, because the pot life of his only ± 6 hours while the pot life of the catalyst paste is ± 8 hours. In addition liquid catalyst is more easily distributed evenly in the mix rather than the catalyst paste.

The catalyst used in this study is a liquid catalyst, may be L, M or O. Catalyst concentration in the resin liquid L ± 1% by weight, while the concentration of liquid catalyst M and O ± 2% by weight. ("Polyester Handbook").

Accelerator

In the process of cold, heat accelerator serves as a substitute for, namely to raise the temperature so that gelling process is faster and the liquid resin can metamorphose into a gel. The more accelerator that is added will provide a faster gelling times and better results. Gelling process that will either result in hardening and maturing process lasts well too.

Accelerator market directly mixed with resin, to avoid reactions eksplotif. This type of accelerator is the accelerator E, G or R. Accelerator E is the most widely used, containing 0.4% cobalt as strene aktoat in solution, while the accelerator G and R respectively - each containing 1% and 6% ("Polyester Handbook").

The quality of the material to be made, particularly compressive strength and power ausnya influenced factors - factors as follows:

1. Grain size

When the grain size is small, robust and high compressive keausannya% down. This is because the smaller the grain size of a large surface area, so that the granules were united by a compact that led to a strong high compressive and low keausannya%.

2. Number of Catalysts

When the ratio of the amount of catalyst and resin amount is more than 2%, the gelling process takes place very rapidly so that the gas in a circle of grain -

grain did not get out. Leading to formation of cavities - cavities in the marble and synthetic surfaces.

3. Number of Resin

The number of resins that cause a lot of high compressive strength and wear rendah.hal power is due to the more compact granules, due to the resin that acts as a glue to fill the cavities between the granules. Thus, strong high compressive and low-power .

4. Content of Water

The water contained in the materials will lower the compressive strength and power up the water crystal ausnya because this will hinder the adhesive resin with a grain of marble. The water content of small crystals causes the solids so that a strong compact high compressive and low-power .

RESEARCH METHOD

Research objectives were to utilize the waste synthetic marble made of marble and study the influence of these variables marble grain size, amount (volume) of catalyst and heavy marble granules to the compressive strength, the wear and water absorption.

Materials - the materials used, among others; a. waste of marble, obtained from the village Besole, Kab. Tulungagung, b. Synthetic resin (R-154) is in acceleration. c). acid catalyst (HCl) with pH \pm 4.5.

The research equipments used are a). Machine press with a maximum capacity of 60 tons that have hit the maximum scale division 500 kg.b). Pengaus machine or abrasive objects that can rub try with 3.33 kg load and speed of 49 meters per minute wear. c). Mold. d). Pestle., E). Measuring cup. f). Balance analytical.

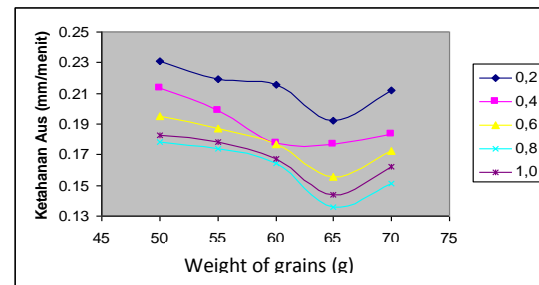
Research variables are specified condition, namely 1). Temperature = 30 ° C, 2). Resin volume = 40 ml, 3). Size Test Objects, which are: Diameter = 5.08 cm; Height = 2 cm (surface area = 40.5161 cm²), 4). Time = 4 hours

The treatments carried out are: 1) Grain Size Marble = (10, 16, 20, 35, 48) mesh, 2). The amount of catalyst = (0.2: 0.4: 0.6: 0.8, 1.0) ml, 3). Marble Grain weight = (50; 55; 60; 65; 70) grams.

RESULTS AND DISCUSSION

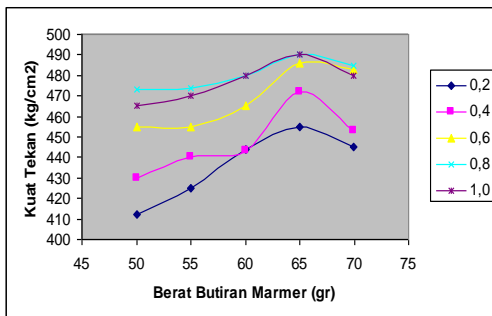
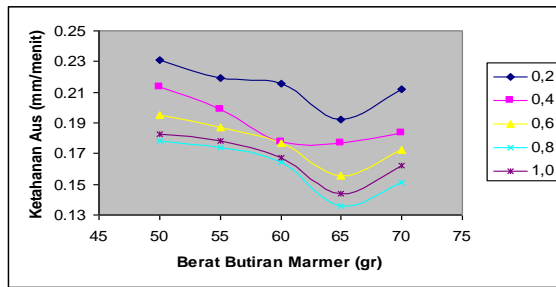
Streight Press Testing

From the test results with a compressive strength test compressive strength of test specimens obtained in kg/cm² which can be seen in chart 1 to chart 5 below:



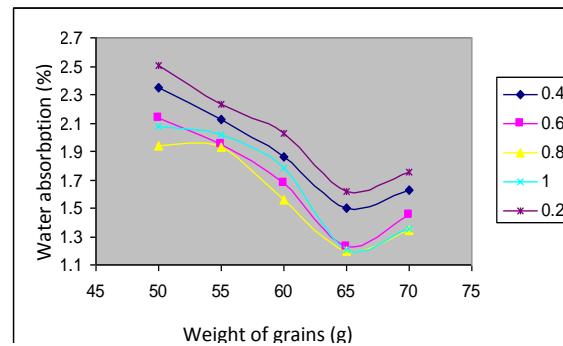
Grafik 1. Effect weight grains to number of catalys

From grafik1 , the above shows that the larger the grain size of marble, the smaller the compressive strength. Because the smaller the grain size of marble, then the vast area of contact between the marble and resin increases. Thus the adhesion between the grains of marble and resin will be stronger, so strong tekannya also getting bigger. The greater the number of grains of marble used, the compressive strength of the material rises. But after passing a certain point decreases strongly compressed. The more grains of marble were added in the mix (ingredients), then the free electrons that exist in the resin binds all of the cation - cation contained in the granules of marble, forming a complex bond. The more complex molecular bonds in the material compressive strength of materials is increasing. But if the number of grains of marble too much even fragile materials, because not all cations in the grains of marble can be bound by the resin. So easy to loose granular marble. The greater the volume of catalyst used, the greater the compressive strength. But after a certain point, the compressive strength tends to fall. With the amount of catalyst is too much, then the process of hardening of the resin will be faster. So that the gas and water contained in the materials did not get out, which will cause bubbles in the material. This is what led to the addition of catalytic amounts of excess, strong compressive tends to fall.



Grafik 2. Effect weight grains to power of exhausted

From Graph 2 the above can be seen, the larger the grain size of marble, the increased wear resistance. Because the smaller the grain size of marble, then the vast area of contact between the marble and resin increases. Thus the adhesion between the grains of marble and resin will be stronger, so little wear resistance. The more grains of marble were added in the mix (ingredients), then the free electrons that exist in the resin binds all of the cation - cation contained in the granules of marble, forming a complex bond. The more complex molecular bonds in the material, the material is more resistant to wear. The greater the amount of catalyst used, the smaller the wear resistance. But after passing a certain point of wear resistance tends to rise again. With the amount of catalyst is too much, then the process of hardening of the resin will be faster. So



Grafik3. Effect weight grains to power of exhausted

From graph. 3 above can be seen, the larger the grain size of marble, the greater water absorption. The greater the number of grains of marble were added, the greater the water absorption of the smaller material. But after passing a certain point, the water absorption of the smaller material, but that air and water contained in the materials did not get out, which will cause bubbles - bubbles in the sample and the surface of the sample to be rude. This is what led to the addition of catalytic amounts of excess wear resistance of the sample tends to rise.

CONCLUSION

The results can be concluded marble wastes can be utilized again to glue the molding material by means of grain - grain from the waste marble with resin R-154 which has diaccelerasi and using acid catalyst (HCl). The best results are achieved on the amount of catalyst = 0.8 ml, marble grain size = 0.356 mm and weight of grains of marble = 65 grams after a certain point, the water absorption of the smaller material. Because if the amount of catalyst added too much then the process pengeraan of material will be faster. So that the gas is formed and the water present in the material did not get out, which will cause bubbles and voids in the material, which will cause the water absorption of the water rises.



References

Dewan Standarisasi Nasional, 1987. **Mutu dan Cara Uji Marmer**, SIN 13-0089-1987.
Departemen Perindustrian dan Perdagangan, 1998. **Pengembangan Pembuatan Ubin Marmer dengan Memanfaatkan Limbah Pengolahan Marmer**, Balai Perindustrian Ujung Pandang, Sulawesi Selatan.

Kirk-Othmer, **Encyclopedia of Chemical Technology**, 3th ed, Vol. 23, pp 225 Mc Graw Hill inc, New York.
M. Considine, Douglas, 1974. **Chemical and Process Technology encyclopedia**, pp 685 – 690, 974 – 980, Mc Graw Hill inc, New York.
Malcom, P, Stevent, 1975. **Polymer Chemistry**, Addison Wesley, inc, Canada.