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THE EFFECT OF ADDITIVE TYPE "X" WITH FOAM AGENT AND COCONUT FIBER ON CONCRETE

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ABSTRACT

One of the building materials that has developed very rapidly is concrete. Some of the advantages of concrete include the relatively low price, high compressive strength, rust resistance, easy transport and printing, and are relatively resistant to fire. There are several ways that can be used to make concrete light, including the use of lightweight aggregates, foam agents, coconut fibers and additive types "x", where coconut fiber waste has not been used optimally. In this study a lightweight concrete mixture of additive type "was made using x 5M additive products, foam agents and coconut fibers using a cement content of 650kg / m^3. The variation of the "x" additive is 2%, 4%, 5%, foam agent is 2.5%, 3%, 4% and coconut fiber is 15%, 20%, 25%. with the treatment conditions for the specimens for 28 days soaked and not soaked. Test objects are made of cubes with a size of 15x15x15cm. This study is to determine the weight / m^3, the compressive strength of the lightweight concrete produced. The results showed that the increase in the use of additive types "x", foam agents and coconut fibers caused the weight of the concrete to be heavier and compressive strength. The highest weight of this lightweight concrete at the age of 28 days is not immersed in 1.867 kg / m^3, while the lowest is 1.665 kg / m^3. The test object for non-soaked conditions has a better compressive strength of 324 kg / cm^2 than the test object with the condition soaked press test which is 293 kg / cm^2.

Keywords Lightweight concrete, *mix design,* compressive strength, *additive, foam agent,* coconut fiber.

INTRODUCTION

Basically, concrete has a weak nature of tensile, strong against pressure and has a composition of cement, sand, aggregate and water (Asroni, 2010). Indonesia is a country with coconut plantations covering 3,585,599 ha a year (2015) with a production value of 2,920,665 tons. The industrial sector, coconut is processed only on the flesh of the coconut fruit and partly in the form of waste. One of the coconut wastes is coconut fibers which have soft, light, absorb water, wood texture, so coconut fibers have the quality as aggregate.

Concrete foam is a mixture of cement, water, aggregate with certain admixture materials, namely by making bubbles of gas or air in mortar so that there are many air pores in the concrete (Husin and Setiaji, 2008). One of the "x" additive chemicals for research uses the Additon 5M additive produced by PT. Karya Sembada Additon

(Utilization of Stone Ash as Powder on Self Compacting Concrete (SCC), 2008). Widodo's (2003) study of the use of stone ash as a material for partial replacement of cement in a mixture of concrete mixtures can also increase concrete compressive strength.

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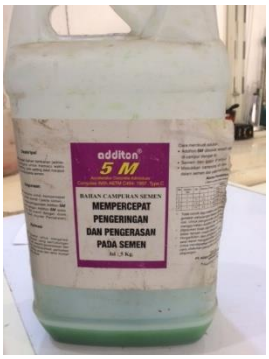
<tr><td>  </td><td> 
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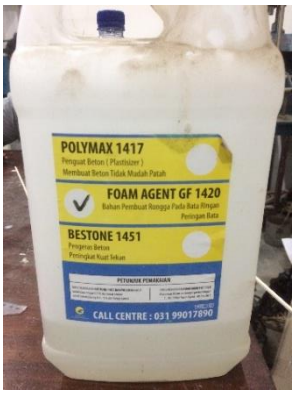
<tr><td>Stone ash material</td><td>Additive additon 5M material</td></tr>
<tr><td> 
</td><td>  </td></tr>
<tr><td>Foam agent material</td><td>Coconut fiber material</td></tr>
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Figure 1. Lightweight concrete material

RESEARCH METHODOLOGY

Processing coconut fibers as an aggregate, namely, first cutting coconut fibers with a size of 3cm, then decomposing.

The materials used include: coconut fibers that have been processed, Foam Agent and Additon 5M which are used, namely the brand "Additon" Ash Stone originating from broken stones.

Plan the proportion of concrete mix materials by using mixed selection planning that is based on SNI 7656: 2012 with the results as a reference for normal concrete developed into concrete innovation.

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Table 1. Formula of Test Objects

Test Object	Cement	Sand	Gravel	Rock Ash	Coconut Fiber	Foam Agent	Water	Additon 5M	F.w.c
	(kg)	(kg)	(kg)	(kg)	(kg)	(*l*)	(*l*)	(*l*)	
Normal	413	681	1021	1021	-	-	-	-	0.52
A.D.F.S.1	650	1103	-	1400	15% From Cement	2.5% From Cement	-	2% From Cement	0.3
A.D.F.S.2	650	1103	-	1400	20% From Cement	3% From Cement	-	4% From Cement	0.3
A.D.F.S.3	650	1103	-	1400	25% From Cement	4% From Cement	-	5% From Cement	0.3

The making of specimens was made in 24 cubes, each made with six variations of the test object. The specimen is in the form of a cube that has 15 cm sides.

In the mixing stage, Rock Ash is mixed with the Foam Agent which has been mixed with water to the foam, then mixed with coconut fibers and additive addition 5M is stirred until the concrete is mixed. After the fresh concrete reaches homogeneous. At the stage of maintenance the test object is carried out by curing and non-curing methods.

Compressive strength testing was carried out on specimens aged 7, 14 and 28 days, after the drying process from the treatment of specimens. Compressive strength testing was carried out in the Civil Engineering and concrete laboratory of Narotama University Surabaya.

The quality relationship with weight is a compressive strength equation (fc ') divided by specific gravity (kg / m^3). The equation is to determine the efficient compressive strength of its weight. The lighter the concrete with a high compressive strength value is an ideal value.

RESULTS AND DISCUSSION

Testing of fine and coarse aggregate includes, density, volume weight, sludge cleanliness, as the following table;

Table 2. Testing of Aggregates

Type Of Testing	Rock Ash
Bulk density	2.30
Heavy saturated dry surface	2.26

False type weight	2.35
Water absorption	0.016 %
Mud Cleanliness (deposition)	1.6 %

In the compressive strength test, the resulting compressive strength is as follows;

Table 3. Results of Compressive Strength and Specific Gravity Test

Test Object	Age	Specific Gravity (kg/m^3)		Compressive Streight (kg/cm^2)	
		N	C	N	C
Normal	7	-	2,209	-	244
		-	2,242	-	273
	14	-	2,244	-	313
		-	2,274	-	316
	28	-	2,306	-	324
		-	2,277	-	338
ADFS 01	7	1,680	1,695	256	244
	14	1,658	1,687	276	267
	28	1,665	1,712	287	278
ADFS 02	7	1,851	1,865	416	333
	14	1,860	1,871	336	316
	28	1,865	1,888	324	293
ADFS 03	7	1,865	1,894	336	316
	14	1,874	1,891	249	236
	28	1,867	1,897	287	267

Normal concrete has an average weight strength of 2,306 kg / cm^3. Additon 5M test object, foam agent, coconut fiber has a significant decrease in weight. That is a decrease of normal concrete by 26% for specimens (ADFS1) 1.712 kg / m^3. Furthermore, for specific gravity (ADFS2) 1.888 kg / m^3. Decreased by 18%, and on concrete density (ADFS3) 1,897 kg / m^3 by 17% of normal concrete.

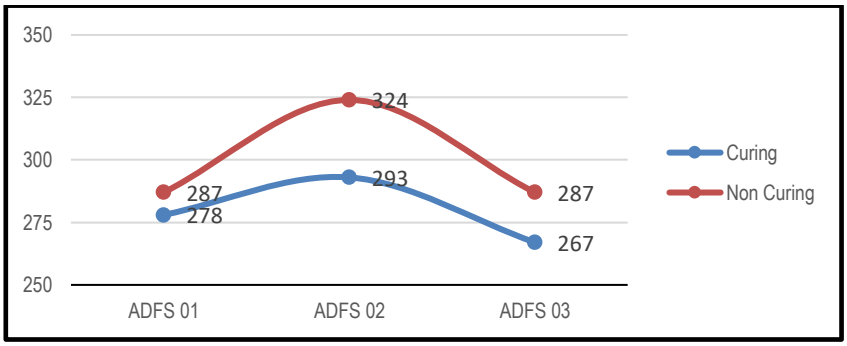
Tabel 4. Berat Jenis Rata-Rata dan Kuat Tekan Rata-Rata

Test Object	Age	Care	Specific Gravity Average (kg/m^3)	Compressive Streight Average (kg/cm^2)	fc' / Weight
Normal	28	-	2,292	331	144.447
ADFS 0.1	28	N	1,665	287	172.372
		C	1,712	278	162.383
ADFS 0.2	28	N	1,865	324	173.727
		C	1,888	293	155.191

ADFS 0.3	28	N	1,867	287	153.723
		C	1,897	267	140.749

In Table 4, the value of quality efficiency with specific gravity is obtained on the specimen (ADFS2) with an average compressive strength of 324 kg / cm^2 and specific gravity of 1865 kg / m^3.

Graph 1. Test Object Compressive Strength



Normal concrete has an average compressive strength of 338 kg / cm^2. Test material (ADFS1) curing treatment has a compressive strength of 278 kg / cm^2, non-curing treatment has increased by 3% with a compressive strength of 287 kg / cm^2. Likewise the specimen (ADFS2) curing treatment is compressive strength of 293 kg / cm2. Non-curing treatments experienced a compressive strength of 324 kg / cm^2, experiencing a 10% increase. The last test object (ADFS3) is curing the compressive strength of 267 kg / cm^2. Experienced a 2% increase in non-curing treatment and compressive strength to 273 kg / cm^2.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of research and discussion, conclusions can be taken as follows:

1. The test results of the cube compressive strength that have been carried out show that the composition of the material worked in accordance with the mix design of rock ash, addition 5M, foam agent, coconut fibers can increase the compressive strength of lightweight concrete and the density of lightweight concrete. The more mixing of the material with lightweight concrete affects the compressive strength of lightweight concrete in the age of 28 days in lightweight concrete (ADFS2) the compressive strength of 324 kg / cm^2 decreased by 4% compressive strength of normal concrete strength of 338 kg / cm^2.
2. The average compressive strength of the concrete is getting bigger along with the increasing use of addition 5M, foam agent, coconut fibers both soaked and not soaked. The highest concrete compressive strength was reached by concrete with addition 5M 4%, foam agent 3%, coconut fiber 20% and addition 5M 5%, foam agent 4%, coconut fiber 25%, respectively 324 and 287 kg / cm^2 . Regarding the increase

in the composition of 5M Additon, Foam Agent, Coconut Fiber also affects the weight of lightweight concrete and the quality of lightweight concrete.

3. The most optimum results of the concrete compressed test which were soaked and not soaked also experienced a considerable difference in the concrete press test, it could be seen the 28-day compressive strength of the soak with addition 5M 3%, foam agent 2.5%, coconut fiber 15% strong press for 278 kg / cm^2 while not soaking reaches a 3% increase with a compressive strength of 287 kg / cm^2. While the proportion of addition 5M 4%, 3% foam agent, 20% coconut fiber compressive strength of 293 kg / cm^2 while not soaking reached a 10% increase with a compressive strength of 324 kg / cm^2. Furthermore, the proportion of addition 5M 5%, 4% foam agent, 25% coconut fiber compressive strength of 267 kg / cm^2 while not soaking reached a 2% increase with a compressive strength of 273 kg / cm^2. The process of treating lightweight concrete by means of drying also affects the weight and quality of concrete if the drying process has not been long or not yet one day, so if it is weighed and tested it will experience a decrease.

In order to produce research that will later become better in further research the authors suggest paying attention to the following:

1. Based on the above conclusions after conducting research and conducting test tests In the early stages of material preparation, especially fine aggregates, the aggregates that have been washed and already in the SSD state, should be placed in a place that can truly maintain the condition of the SSD until it is ready to use.
2. In order to get the right mixing, further research is needed regarding the properties of lightweight concrete such as trial and error.
3. It should be noted on the water content if using added ingredients such as the 5M additive additon, the level of the accident in the water is quite high.

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