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CUTTLEFISH BONE OPTIMIZATION IN FOAM CONCRETE

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ABSTRACT

Improving and studying other foam concrete along with marine-based cuttlefish bone can be an creative way and a good choice to be included in a concrete as sufficient cementitious materials to provide environmental friendliness. In this regard, lightweight foam concrete was produced to determine its compressive strength using different percentages of cuttlefish bone as an additive. The overall strength performance of foam concrete with cuttlefish bone addition is calculated and analysed in this research. The percentage of cuttlefish bone as an additive was determined by total cement weight, such as 0%, 1%, 2%, 3%, and 4% were applied to various 900 kg/m^3 and 1800 kg/m^3 foamed concrete densities. As a result, it gives a compressive strength value greater than standard foam concrete without an additive by referring to the results obtained when 2% of cuttlefish bone was applied to the foam concrete of 1800 kg/m^3 specimens. The compressive strength tends to gain late strength for 900 kg/m^3 foam concrete specimens. It can be concluded that the optimum quantity of cuttlefish bone additive required to increase the early strength is 2% and excessive percentage of additive amount would be degraded the strength of foam concrete.

Keywords: cuttlefish bone, foam concrete, compressive strength, density

1. INTRODUCTION

In a developing country such as Malaysia, the future demand in construction needs a use of materials that are light, durable, simple to use, economic and yet more environmentally sustainable (Jones & McCarthy, 2005). Ordinary concrete which mixes composition with natural aggregate have a high density which range lies within 2200 kg/m^3 to 2260 kg/m^3. Usually, the density of lightweight foam concrete lies between range 2000 kg/m^3 or less, if the density is greater than that it is classified as ordinary concrete. Moon, Varghese, Waghmare, Moon & Engineering (2015) stated in their study that they are focusing on testing different density of foam concrete without any natural or marine additive. Compared to this study, different density of foam concrete with different percentage of marine additive (cuttlefish bone) was tested on its mechanical properties (compressive strength). In contrast of this study, calcium properties from cuttlefish bone were used as addition together with cement paste to increase the strength of foam concrete. Referring on study made by Ujin, Shavarebi Ali & Hanur Harith (2016), the purposes and objective of conducting the study is same with my study which is to determine the compressive strength and water absorption of lightweight foam concrete using agriculturally based which is eggshells. In a previous study of using cuttlefish bone as an additive, they add the cuttlefish into a normal concrete and the test conducted was soundness and water demand of foam concrete. In this study, cuttlefish bone was added in lightweight concrete to determine its compressive strength.

2. METHODOLOGY

In this study, 1800 kg/m^3 concrete density, 24 cubes were prepared which contains varies of cuttlefish bone addition which 1, 2, 3 & 4%. While for 900 kg/m^3 concrete density, only 6 cubes were prepared with only 2% of cuttlefish bone added into mixture. All this sample were subjected to compression test and water absorption test to compare which percentage give the optimum results of compressive strength and water absorption ability. Foam is produced using air compressor which connected to the foam generator that will generate a certain amount of foam. This process was conducted by using a ratio method 1:33 which respect to the foaming agent required and total volume of water. Both foaming agent and water was put into a foam generator and the air compressor was switched on. Up until the pressure shown at foam generator reach 80 kPa, then foam was able to be release out from the generator. In order to transform the original physical state of cuttlefish bone into powder, the cuttlefish was grinded using 0.7 mm particle size to make sure it will produce a very fine powder and to fulfil its suitability to be used for any stiff products.

3. RESULT AND DISCUSSION

To determine the strength development of concrete, the compression test was conducted. After identifying the average compressive strength of the foam concrete density of 1800 kg/m^3, the ideal percentage for the inclusion of cuttlefish bone is 2%. Therefore, for foam concrete density, a mixture was applied with just 2% cuttlefish bone additive. Meanwhile, for 900 kg/m^3 foam concrete specimens, the compressive strength seems gain the late strength. Compressive strength after 7 days of curing only achieve 5 times lower compare to the results shown from the past study. On top of that we can summarize the cuttlefish bone additive only efficient for high density of concrete which is 1600 kg/m^3 and above

Table 1. Compression Strength Results

Specimen/	1 days	3 days	7 days
Density = 1800 kg/m^3			
0% (Control)	7.350	12.19	14.55
1%	10.355	12.50	15.74
2%	10.725	13.915	18.315
3%	9.910	12.000	14.245
4%	7.593	11.325	13.440
	Density = 900 kg/m^3		
0% (Control)	0	0.657	0.789
2%	0	0.945	1.104

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Kelulusan daripada pihak YBhg. Profesor dalam perkara ini amat dihargai.

Sekian, terima kasih.

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