



TO PRODUCE MORTAR USING EGGSHELL AS AN ADDITIVE.

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Department as a partial fulfillment of the
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CIVIL ENGINEERING DEPARTMENT

SESSION I : 2022/2023

DECLARATION OF ORIGINAL AND OWNERSHIP

TITLE: TO PRODUCE MORTAR USING EGG SHELL AS AN ADDITIVE.



SESSION I: 2022/2023

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2.WAN AMEERUL EIMAN BIN WAN AINOL AMIR

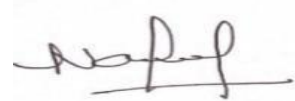
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In front of me,

PUAN NORHAYATI BINTI PALIL



as project supervisor on date:

(Norhayati binti Palil)

ACKNOWLEDGMENT

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ABSTRACT

Secara amnya kulit telur merupakan sisa buangan organik yang sangat banyak dibuang dari semasa ke semasa. Oleh itu kami menginovasikan projek fyp kami menggunakan kulit telur sebagai bahan tambahan dalam pembuatan mortar ikat bata. Antara objektif kegunaan kulit telur dalam projek kami adalah untuk menghasilkan mortar bersama kulit telur lalu membandingkan nya dengan mortar biasa dengan menjalankan ujian terhadap kedua dua mortar. Hasil skop kajian bagi projek ini adalah dengan mencampurkan kulit telur yang telah dihancurkan menjadi debu terlebih dahulu sebagai bahan tambah dalam pembuatan mortar. Projek ini menggunakan nisbah iaitu sebanyak 1:3 dimana nisbah 1 adalah simen manakala nisbah 3 adalah pasir. Kemudiannya kulit telur ditambah mengikut peratus sebanyak 5% dan 10 % daripada jumlah kedua-dua pasir dan simen. Air yang digunakan pula kurang daripada 25% daripada jumlah bancuhan mortar tersebut. Bagi membuat ujian kekuatan mampatan, mortar akan diletakkan di dalam bekas acuan 50cmx50cmx50cm terlebih dahulu dan projek ini menyediakan 21 kube yang terdapat 0, 5, 10% kulit telur yang dicampur

didalam bancuhan mortar lalu direndam selama 7, 14 , 28 hari. Bagi ujian keterlapan air pula mortar akan ditimbang terlebih dahulu sejurus mould dibuka dan ditimbang mengikut 7, 8 , 28 hari bagi tujuan menilai resapan air yang di serap bagi setiap kiub tersebut. Kesimpulannya ialah projek ini dapat membantu kurangkan kos pelupusan bagi sisa buangan yang disebabkan oleh kulit telur. Hipotesis bagi projek ini adalah mencapai standard iaitu $7.5 N/mm^2$ pada hari ke 14 dan 28.

In general, eggshells are a very large amount of organic waste removed from time to time. Therefore we innovated our fyp project using eggshell as an additive in the manufacture of brick mortar. Among the objectives of using eggshells in our project is to produce mortar with eggshell then compare it with regular mortar with conduct tests on both mortars. The result of the research scope for this project is by mixing eggshells that have been crushed into dust first as an additive in the manufacture of mortar. This project uses the ratio of 1:3 where ratio 1 is cement while ratio 3 is sand. Then the eggshell is added according to the percentage of 5% and 10% of amount of both sand and cement. The water used is less than 25% of the total mix of the mortar. To make a compressive strength test, the mortar will be placed in a 50cmx50cmx50cm mold container first and this project provides 21 cubes containing 0, 5, 10% mixed eggshells in a mortar mixture and then soaked for 7, 14, 28 days. For the eighth test water and mortar will be weighed first as soon as the mold is opened and cut according to 7, 8, 28 days for the purpose of evaluating the absorption of water per cube the said. The conclusion is that this project can help reduce disposal costs for waste caused by eggshells. The hypothesis for this project is reach the standard of $7.5 N/mm^2$ on the 14th and 28th day.

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CHAPTER 1: INTRODUCTION

1.1. INTRODUCTION

Project Course is a compulsory course for certain programs of study that must be implemented by the student as meeting the qualification requirements of the award Diploma in Polytechnic Ministry of Higher Education (MOHE). This course provides an opportunity to students to apply knowledge and skills and showcase the ability in the realization of the idea of innovation creativity and the solution of the problem to direction of production of projects/studies that have commercial value and are competitive. Project/study implementation covers all learning and teaching processes (PdP) is theoretical, practical, scientific writing, monitoring and evaluation. Throughout the implementation of the project, students are guided by supervisors to explore new knowledge and skills as well as associating with existing knowledge and ensure that the project can be completed within the stipulated time. From the chapter 1 we talk about the produce mortar using eggshell as an additive.

Mortar is a bonding agent which is generally produced by mixing cementing. For your information, mortar is used to bind together the bricks or stones in brick or stone masonry and it is used to give a soft even bed between different layers of brick or stone masonry for equal distribution of pressure over the bed. Then, it is used to fill up the spaces between bricks or stones for making walls tight. It is used in concrete as a matrix and it is used in plastering works to hide the joints and to improve appearance. Lastly it is used for molding and ornamental purpose.

1.2 RESEARCH BACKGROUND

This project uses cement, sand, water and eggshell as an additive to the mortar. All of the material has important use in our distributing the reaction results better and increasing the reactivity of the cement.

1.3 RESEARCH PROBLEM

•Agricultural wastes are some of the most emerging problems in food industries because of their disposal cost. However, it is also an opportunity for the bioeconomy society if new uses for these residual materials can be found. Eggshells, considered a hazardous waste by UE regulations, are discarded, amounting hundreds of thousands of tons worldwide. This egg processing waste is a valuable source material, which can be used in different fields such as fodder or fertilizer production. Additionally, this residue offers interesting characteristics to be used in other applications, like its employment as an environment-friendly catalyst. In the present review we provide a global view of eggshell waste uses as catalyst in different processes.

•Throughout the world, waste products are seriously polluting the environment. There are many types of waste disposal system such as land filling, open burning, drains clogged up with rubbish and river fill definitely indicate solid waste is a major environmental problem in Malaysia. Despite the massive amount and complexity of waste produced, the standards of waste management in Malaysia are still poor. These include outdated documentation of waste generation rates and its composition, inefficient storage and collection systems, disposal of municipal wastes with toxic and hazardous waste, indiscriminate disposal or dumping of wastes and inefficient utilization of disposal site space. (Global Environmental Centre, n.d) According to The Star (2013), reported that Malaysia not allow any type of development on landfill for the next 25 years as there are many gases trapped from the decomposed garbage and this will be hazardous to the environment. Therefore, the way should be found to utilize the waste efficiently such as through recycling.

•Plastering is the process or item in the construction, where (in general) mixture of cement + sand + water is applied on wall, ceilings, soffit, etc. to make the surface level, or to bring it to required flatness or to decorate it or to make it ready to

receive the subsequent applications like painting, tile/stone installation. This will also hide the structural process of making it or hides error. Ex, construction joints, defects like cracks, plumpness level difference, etc. As per the usage areas, modern technology provides us many types of admixtures for use with plastering to enhance the strength of the plaster and extend the strength and durability of plastering.

Eggshell waste as catalyst: A review

Amanda Laca¹, Adriana Laca¹, Mario Díaz²

Affiliations + expand

PMID: 28407598 DOI: 10.1016/j.jenvman.2017.03.088

Abstract

Agricultural wastes are some of the most emerging problems in food industries because of their disposal cost. However, it is also an opportunity for the bioeconomy society if new uses for these residual materials can be found. Eggshells, considered a hazardous waste by UE regulations, are discarded, amounting hundreds of thousands of tonnes worldwide. This egg processing waste is a valuable source material, which can be used in different fields such as fodder or fertilizer production. Additionally, this residue offers interesting characteristics to be used in other applications, like its employment as an environment-friendly catalyst. In the present review we provide a global view of eggshell waste uses as catalyst in different processes. According to reviewed researching works, a huge variety of added value products can be obtained by using this catalyst which emphasised the interest of further investigations in order to widen the possible uses of this cheap green catalyst.

Keywords: Bioactive compounds; Biodiesel; Catalyst; Eggshell waste; Syngas; Synthesis.

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1.1 INTRODUCTION

Throughout the world, waste products are seriously polluting the environment. There are many types of waste disposal system such as land filling, open burning, drains clogged up with rubbish and river fill definitely indicate solid waste is a major environmental problem in Malaysia. Despite the massive amount and complexity of waste produced, the standards of waste management in Malaysia are still poor. These include outdated documentation of waste generation rates and its composition, inefficient storage and collection systems, disposal of municipal wastes with toxic and hazardous waste, indiscriminate disposal or dumping of wastes and inefficient utilization of disposal site space. (Global Environmental Centre, n.d)

According to The Star (2013), reported that Malaysia not allow any type of development on landfill for the next 25years as there are many gases trapped from the discompose garbage and this will be hazardous to the environmental. Therefore, the ways should be found to utilize the waste efficiently such as through recycling.

Nowadays, waste products such as oil palm shell, fly ash and bottom ash used in construction industry to maximize the profit while reducing the amount of waste. The construction industries are searching for alternative products that can reduce the construction cost. Eggshells are known to have good strength characteristics when mixed with concrete. Most of the eggshell waste is commonly disposed in landfills without any pretreatment because it is traditionally useless.

1.4 RESEARCH OBJECTIVE

The objective project should include the following, to produce mortar using eggshell as an additive. To differentiate normal mortar and mortar with eggshell. To determine the strength of mortar with eggshell.

1.5 SCOPE OF STUDY

The project is more focused on eggshell is used as the alternative material in mortar. The project we will only use small amount of sand to mix in the mortar. To mix the eggshell, we will crush the eggshell until it become dust then mix it to the mortar.

1.6 CONCLUSION

The conclusion that I get from the project is by using eggshell, it also can reduce waste on the landfill which can cause greenhouse gases and it also can reduce disposal cost on the landfill. Each of the project materials we utilise has a different purpose. For example, we use cement to connect blocks together by filling the gaps between them. After that, add sand to reduce the mortar adhesion and strength during drying. Then, as a lubricant for fine and coarse aggregates, we use water. Finally, eggs are used to increase the adhesion strength of the mortar and facilitate the application of the mortar against the bricks.

CHAPTER 2: LITERATURE STUDIES

2.1 INTRODUCTION

A literature review is a thorough summary of earlier studies on a subject. The literature review examines scholarly books, journals, and other sources that are pertinent to a particular field of study. This prior research should be listed, described, summed up, impartially evaluated, and clarified in the review. It ought to provide a theoretical framework for the study and assist the author in defining its scope. By acknowledging the work of earlier researchers, the literature review reassures the reader that the research has been well-conceived. When a previous study in the subject is mentioned, it is assumed that the author has read, assessed, and incorporated that study into the current work. This mortar using eggshells product uses recyclable recycled materials and has its own content. Therefore, the function of each material will also be described in this chapter in detail. Field studies should be studied first to ensure the effectiveness of the project to achieve the objectives of the product. Researchers have searched for some information related to the project materials that will be used

through resources available on the internet to meet the exact specifications for the project.

2.2 LITERATURE REVIEW

i) Agricultural wastes are some of the most emerging problems in food industries because of their disposal cost. However, it is also an opportunity for the bioeconomy society if new uses for these residual materials can be found. Eggshells, considered a hazardous waste by UE regulations, are discarded, amounting hundreds of thousands of tons worldwide. This egg processing waste is a valuable source material, which can be used in different fields such as fodder or fertilizer production. Additionally, this residue offers interesting characteristics to be used in other applications, like its employment as an environment-friendly catalyst. In the present review we provide a global view of eggshell waste uses as catalyst in different processes.

Chandrashekar Annayya(2020)

The image shows a screenshot of a technical article. The main content area on the left contains the following text:

19
Aug 2016

What are the most common quality problems of mortar? Why do these problems occur?

Dry-Mixed Mortar 0 Comment

Most mortar is applied onto the surface of buildings, such as plastering mortar, floor mortar, waterproof mortar and decorative mortar, etc. Mortar has a very large contact area with the surrounding environment, so that the moisture in mortar is very easy to lose. In addition, the used site of mortar is not easy for conservation. **And mortar is a brittle material, so the most quality problem prone to occur is cracking of mortar, for the main reasons as below.**

① Chemical Shrinkage

Most mortar uses cement as a cementitious material. After cement is in contact with water, hydration reaction will occur to form hydration products. The reaction will consume part of water. Since the volume change arising therefrom is related to the hydration products, it is commonly referred to as autogenous volume deformation.

② Drying Shrinkage

The sidebar on the right, titled 'Categories', lists the following items:

- > calcium formate
- > Carboximetilcelulosa
- > Cellulose Ethers
- > Dry-Mixed Mortar
- > Ethyl Cellulose
- > Hydroxy Propyl Methyl Cellulose (HPMC)
- > Hydroxyethyl Cellulose
- > Microcrystalline Cellulose
- > Oildrilling
- > Redispersible Polymer powder
- > sodium carboxymethylcellulose
- > Целлюлозы Эфиры

ii) Throughout the world, waste products are seriously polluting the environment. There are many types of waste disposal systems such as land filling, open burning, drains clogged up with rubbish and river fill definitely indicate solid waste is a major environmental problem in Malaysia. Despite the massive amount and complexity of waste produced, the standards of waste management in Malaysia are still poor. These include outdated documentation of waste generation rates and its composition, inefficient storage and collection systems, disposal of municipal wastes with toxic and hazardous waste, indiscriminate disposal or dumping of wastes and inefficient utilization of disposal site space. (Global Environmental Centre, n.d) According to The Star (2013), reported that Malaysia not allow any type of development on landfill for the next 25 years as there are many gases trapped from the decompose garbage and this will be hazardous to the environment. Therefore, the ways should be found to utilize the waste efficiently such as through recycling.

(MUHAMMAD NUR SHAFAIN BIN HUT)(2014)



**THE PERFORMANCE OF EGG SHELL POWDER AS AN ADDITIVE IN
CONCRETE MIXED**

MUHAMMAD NUR SHAFAIN BIN HUT

**Report submitted in partial fulfilment of requirements
for the award of the degree of
B. Eng. (Hons.) Civil Engineering**

**Faculty of Civil Engineering and Earth Resources
UNIVERSITI MALAYSIA PAHANG**

JULY 2014

ABSTRACT

In this developing world, many countries are going to urbanization due to population growth. Since Malaysia is one of developing countries, the construction will grow in the future. Chicken egg is one of the waste materials which generated from the industry and it is contributed to the environmental and disposal problem due to eggshell increase continuously in recent years. Therefore, reuse eggshell as an additive in concrete is a better solution to reduce the environmental problem. The experiments were carried out into four proportions which are 0%, 5%, 10%, and 15%. These eggshells must be grinded into fine powder. The objective of the experiment is to determine the performance of eggshell powder in term of its strength. The experiments were used to investigate the eggshell is slump test, compressive strength test, flexural test and water penetration test respectively. From the results, eggshell powder in 5% additive in concrete has a good compressive strength which is 28.87 N/mm² compared with the others proportion. Furthermore, it also improved in flexural strength in all additive proportions. The results show eggshell powder has a best performance in water penetration test which is 11.5 mm in depth. The findings suggested that the suitability of eggshell powder with different proportions is applicable in the structural system of the buildings.

iii) Agricultural wastes are some of the most emerging problems in food industries because of their disposal cost. However, it is also an opportunity for the bioeconomy society if new uses for these residual materials can be found. Eggshells, considered a hazardous waste by UE regulations, are discarded, amounting hundreds of thousands of tonnes worldwide. This egg processing waste is a valuable source material, which can be used in different fields such as fodder or fertilizer production. Additionally, this residue offers interesting characteristics to be used in other applications, like its employment as an environment-friendly catalyst. In the present review we provide a global view of eggshell waste uses as catalyst in different processes.

(Amanda Laca, Adriana Laca, Mario Díaz)(2017)

Properties of concrete with eggshell powder: A review

B.W. Chong^a, R. Othman^a, P.J. Ramadhansyah^b, S.I. Doh^b, Xiaofeng Li^b

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<https://doi.org/10.1016/j.pce.2020.102951>

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Highlights

- A comprehensive review of eggshell concrete studies.
- Eggshell has chemical compound similar to limestone.
- Partial replacement of cement with eggshell reduces workability of concrete.
- Eggshell concrete has improved mechanical properties at optimal proportion.
- Eggshell concrete experiences greater damage under acid and sulphate environment.

Utilization prospects of eggshell powder in sustainable construction material – A review

Navaratnarajah Sathiparan

Show more

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<https://doi.org/10.1016/j.conbuildmat.2021.123465>

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Highlights

- The main component of ESP is CaCO_3 .
- The ESP can be used as cement replacement in construction materials.
- The effects of ESP on cementitious materials depend on its replacement level.
- The ESP as soil stabilizer improved its mechanical properties.

2.3 CONCLUSION

As a conclusion, we might examine the information from earlier investigations in this chapter. This allowed us to gather a variety of knowledge and concepts for our endeavour. As a result, we were able to carry out the project more effectively and without making mistakes with the aid of earlier studies. The project may also make use of recycled materials.

CHAPTER 3: METHADODOLOGY OF STUDIES

3.1 INTRODUCTION

The approach and process for developing, gathering, and evaluating data to generate a thorough design study is known as methodology. The way of a topic being examined, as well as the reasons for using a certain approach and technique, is referred to as methodology. The methodology's goal is to assist people comprehend the technique of application more broadly or in greater depth by providing a description of the research process.

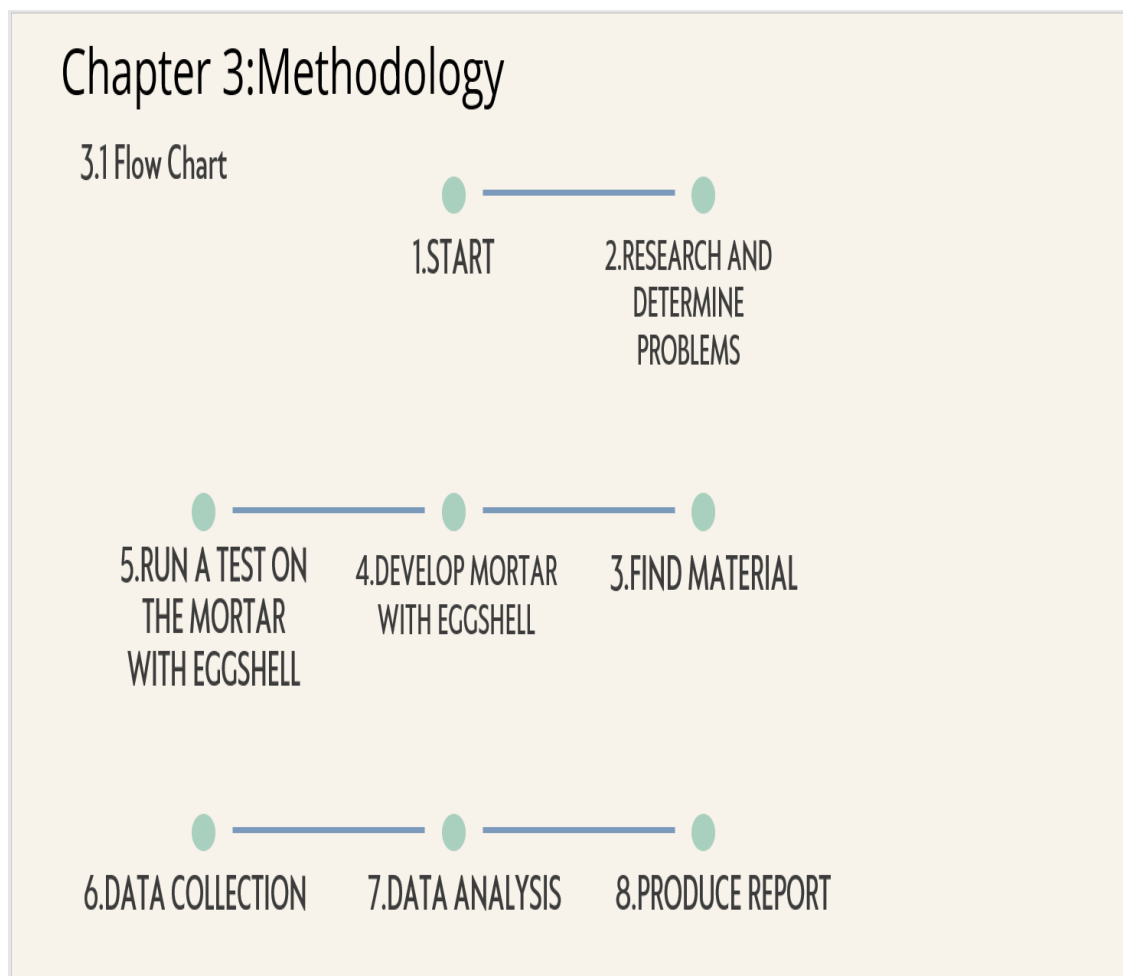
The design of this mortar with eggshells as an additive from recycle eggshells is the result of discussions and ideas from group members. This design is very easy to produce in terms of design and use of materials. The selection of this material is based on previous studies conducted by researchers through the internet as well as.

3.2 DESIGN PROJECT



MATERIAL	FUNCTION
Cement	Binding the blocks by filling the space between the blocks.
Sand	To reduce the adhesion and strength of the mortar when drying
Water	To purpose as a lubricant for fine aggregates and coarse aggregates.
Eggshells	To strengthen the resistance of the mortar.

3.2.1 FLOWCHART FOR METHADODOLOGY



3.1.1. START

In the first week of semester 4, a lecturer provides information to students about the Final Year Project (FYP).

3.1.2 RESEARCH AND DETERMINE PROBLEMS

Research is defined as the creation of novel ideas, methods, and comprehensions through the discovery of new information and/or the inventive use of already known data. A different way to look at issue definition is to consider how the goal or ideal condition affects how serious a problem is, or even whether one is there at all.

3.1.3 FIND MATERIAL

Group members starting to do project design by thinking and discussing between We group members discussed an alternative way to innovate brick mortar by using a recyclable material that is eggshell. In order to get eggshells, we get used eggshells from restaurants in large quantities to make eggshell powder. While for cement and sand we buy it at the nearest hardware store.

3.1.4 DEVELOP MORTAR WITH EGGSHELL

We mix normal mortar and mortar mixed with eggshell according to the ratio of 1:3 which is one is cement and 3 is sand. For the mortar mixed with eggshell, we mix according to the percentage of 5% and 10% of the total ratio of the whole mortar.

3.1.5 RUN A TEST ON THE MORTAR WITH EGGSHELL

We conducted two tests for our fyp project, the first was a compression test for the purpose of measuring the strength of normal mortar and mortar mixed with eggshell at a percentage of 5% and 10%. For the second test, we conducted a water absorption test to measure the current weight of the cube and the weight of the cube after soaking for 28 days.

D) TEST 1

Compressive Strength Test

This test aims to find out the characteristics of concrete. It is for us to know if this concreting work is done correctly. In addition, it also aims to find out if the material can accommodate the load on the surface under pressure. This test is guided by the standard (MS 7.6: 1972 / British Standard BS 3921: 1985)

COMPRESSIVE TEST MACHINE IMAGE



Procedure:

- i. Remove the specimen from the water at the end of the curing period and remove excess water from the surface of the cube
- i. Specimen dimensions are taken
- iii. The surface of the test machine is cleaned
- iv. Place the specimen into the testing machine
- v. The specimen is aligned to the center of the plate surface of the testing machine
- i. The load is applied to the surface of the specimen continuously until the specimen fails
- vii. The maximum load is recorded and the test results are taken 3 times for each ratio to obtain the average load

II) TEST 2

Water Absorption Test

This test aims to find out the percentage of water permeation for concrete. If something is concrete. This test is guided by the standard (MS 7.6: 1972 / British Standard BS 3921: 1985)

WATER ABSORPTION TEST IMAGE



Procedure:

- i. Taking the weight of the mortar after removing it from the mold
- ii. Take after soaking for 7 days, 14 days and 28 days

$$\text{water absorption percentage} = \frac{\text{weight after} - \text{weight before}}{\text{weight after}} \times 100$$

3.1.6 DATA COLLECTION

For the project we will get data from the value of compressive strength and the load that the project can bear. And for the water absorption test we will take data from the water percentage calculation.

3.1.7 DATA ANALYSIS

Data collected by experiment compression test and water absorption. Data collection is the process of gathering, gauging, and assessing accurate insights for study following defined, recognised techniques. A researcher could assess their hypothesis in light of the information gathered.

3.1.8 PRODUCE REPORT

As for making the report, we explain everything related to this fyp project in terms of decision data, how to make it and the conclusions we obtained throughout the completion of this fyp project.

3.3 CONCLUSION

This project can help reduce disposal costs for waste caused by eggshells. The hypothesis for this project is reach the standard of 7.5 N/mm^2 on the 28th day. For the water absorption test, the mortar mixed with eggshell has less water absorption than normal mortar. This is good for cement because it can reduce the brittleness of cement.

CHAPTER 4: DATA ANALYSIS

4.1 INTRODUCTION

This chapter discusses the findings of the study based on the results of two tests conducted on mortar and ordinary mortar mixed with eggshell. The results of this chapter are obtained from the data of the compression test results on the 7th, 14th, 28th day conducted outside the polytechnic at BSEN Test Sdn. Bhd. As for the water absorption test, we obtained data from the initial weighing value of the cubes and the cubes were soaked after 28 days. After all the data and information is obtained, analysis is done to see the effectiveness of the study.

This project uses cement, sand, water and eggshell as an additive to the mortar.

All of the material has important use in our distributing the reaction results better and increasing the reactivity of the cement.

4.2 DATA ANALYSIS

COMPRESSIVE STRENGTH TEST :

Compressive testing shows how the material will react when it is being compressed.

Compression testing is able to determine the material's behavior or response under crushing loads and to measure the plastic flow behavior and ductile fracture limits of a material.

Compression tests are important to measure the elastic and compressive fracture properties of brittle materials or low-ductility materials. Compression tests are also used to determine the modulus of elasticity, proportional limit, compressive yield point, compressive

yield strength, and compressive strength. These properties are important to determine if the material is suited for specific applications or if it will fail under specific stresses.

Compression tests can be carried out on polymer AM parts using the following standards:

The first data was obtained from the compression strength test conducted on days 7, 14 and 28. The test was conducted using 3 types of samples with the same mixture ratio. The first sample is a normal mortar consisting of 3:1 ie cement is 1 and 3 is sand. The second sample consisted of a mixture of 5% eggshell from the total ratio of the whole mortar. We will mix the cement into 28 moulds, ie each sample has 9 moulds of its own. After that we will leave the mould for a day so that it has become hard and the next day we will open the mould and place it in a container filled with water for the purpose of soaking it for 7, 14 and 28 days.

For the first sample, which is normal cement mortar, the data obtained for the 7th day is the value for max load (kN) which is 25.9kN while the value for compression strength (N/mm²) is 10.3N/mm². While for the 5% eggshell mixture, the value for max load (kN) is 18.56kN and the value for compression strength (N/mm²) is 7.4N/mm². Next, the normal cement mortar data for the 14th day 28th day is 25.18 kN and 29.30 for max load (kN). Next 10.1 N/mm² and 10.9 N/mm² for compression strength. Next, for the 5% eggshell mixture on the 14th and 28th day, the value for max load (Kn) is 19.83 kN and 23.4 kN. Then the value for compression strength is 7.9 N/mm² and 9.4 N/mm².

RESULTS

Compressive Strength Test

Eggshell(%)	Age at test(days)	Max Load(kN)	Compression Strength(N/m ²)	Age at test(days)	Max Load(kN)	Compression Strength(N/mm ²)
0	7	25.69	10.3	14	25.18	10.1
5	7	18.56	7.4	14	19.83	7.9
10	7	14.89	6.0	14	19.78	7.9

Eggshell(%)	Age at test(days)	Max Load(kN)	Compression Strength(N/mm ²)
0	28	29.30	10.9
5	28	23.47	9.4
10	28	22.52	9.0

Minimum Compressive Strength For 28 days:7.5 N/mm²

7DAYS (0%, 5%)

BSEN Test Sdn. Bhd.

CONCRETE CUBE TEST RECORD SHEET

Customer : Politeknik Sultan Salahuddin Abdul Aziz Shah
 Project : Final Year Project (Politeknik Sultan Salahuddin Abdul Aziz Shah)

File No. : 22092826
Pro Code : POLITEKNIK (FYP)
Terms of Payment
CREDIT <input type="checkbox"/>
CASH <input type="checkbox"/>
Receipt No.
Date

Structure & Elements

Job Code 22-09727
 Date Receive 28/09/2022
 Remarks N.A

Date Cast 21/09/2022 Cement N.A Cour. Agg. N.A
 Grade MPa Admixture N.A Samples Submitted
 Slump (mm) Fine Agg. N.A Supplier Tasek Concrete Sdn Bhd

Test Machine (Tick) BSEN 001 / [A] [B] [C] [D] COPY EMAILED FAXED

Lab Use Only

CONCRETE CUBE TESTING REPORT

WITNESSED

Lab Mark	Client Marking	Date Test	Age Test	Weight (Kg)	Dimension (mm)			Load (kN)	Strength N/mm ²
					L	B	H		
22-160731	0%	28/09/22	7	0.24	50	50	50	25.69	10.3
22-160732	5%	28/09/22	7	0.24	50	50	50	18.56	7.4
22-160733	10%	28/09/22	7	0.22	50	50	50	14.89	6.0

TEST METHOD : (BS EN 12390-3:2019) - Compressive Strength of Test Specimens

NOTES

1. Cubes were tested "as received / saturated" condition.
2. Method of Testing BS EN 12390-3:2019 / MS EN 12390-3:2012
3. The cubes were tested at local ambient room temperature

REMARKS :
 Mode of Cube failure (Refer to Figure and circle an appropriate)
 Satisfactory A B C
 Un-Satisfactory 1 2 3 4 5 6 7 8 9
 [] -

Age Witness by

7	<u>[Signature]</u>

Age Tested by

7	<u>SHARAO</u>

Age Checked by

7	<u>[Signature]</u>

14DAYS (0%)

BSEN Test Sdn. Bhd.

CUBE TEST RECORD SHEET

Politeknik Sultan Salahuddin Abdul Aziz Shah
Final Year Project (Politeknik Sultan Salahuddin Abdul Aziz Shah)

File No. : 22094459
Pro Code : POLITEKNIK (FYP)

Terms of Payment
CREDIT
CASH
Receipt No.
Date

Structure & Elements Internal Job Code 22-09982
Date Receive 05/10/2022
Remarks N.A

Date Cast 21/09/2022 Cement N.A Cour. Agg. N.A
Grade MPa _____ Admixture N.A Samples Submitted
Slump (mm) _____ Fine Agg. N.A Supplier Tasek Concrete Sdn Bhd

Test Machine (Tick) BSEN 001 / [A] [B] [C] [D] COPY EMAILED FAXED

----- Lab Use Only -----

CONCRETE CUBE TESTING REPORT WITNESSED

Lab Mark	Client Marking	Date Test	Age Test	Weight (Kg)	Dimension (mm)			Load (kN)	Strength N/mm ²
					L	B	H		
22-166089	0%	05/10/22	14	0.25	50	50	50	25.19	10.1

TEST METHOD : (BS EN 12390-3:2019) - Compressive Strength of Test Specimens

NOTES
1. Cubes were tested "as received / saturated" condition.
2. Method of Testing BS EN 12390-3:2019 / MS EN 12390-3:2012
3. The cubes were tested at local ambient room temperature

REMARKS :
Mode of Cube failure (Refer to Figure and circle an appropriate)
Satisfactory A B C
Un-Satisfactory 1 2 3 4 5 6 7 8 9
[]

Age Witness by

Signature only required when customer witness

Age Tested by
14 _____

Age Checked by
11 _____

14DAYS (5%)

SEN Test Sdn. Bhd.
CUBE TEST RECORD SHEET

Politeknik Sultan Salahuddin Abdul Aziz Shah
 Final Year Project (Politeknik Sultan Salahuddin Abdul Aziz Shah)

File No. : 22094460
 Pro Code : POLITEKNIK (FYP)

Terms of Payment
 CREDIT
 CASH
 Receipt No.
 Date

Structure & Elements: Internal

Job Code: 22-09982
 Date Receive: 05/10/2022
 Remarks: N.A

Date Cast: 21/09/2022 Cement: N.A Cour. Agg.: N.A
 Grade MPa: Admixture: N.A Samples: Submitted
 Slump (mm): Fine Agg.: N.A Supplier: Tasek Concrete Sdn Bhd

Test Machine (Tick) BSEN 001 / [A] [B] [C] [D]

COPY EMAILED FAXED

----- Lab Use Only -----

CONCRETE CUBE TESTING REPORT WITNESSED

Lab Mark	Client Marking	Date Test	Age Test	Weight (Kg)	Dimension (mm)			Load (kN)	Strength N/mm ²
					L	B	H		
22-166090	5%	05/10/22	14	0.25	50	50	50	19.83	7.9

TEST METHOD : (BS EN 12390-3:2019) - Compressive Strength of Test Specimens

- NOTES**
1. Cubes were tested "as received / saturated" condition.
 2. Method of Testing BS EN 12390-3:2019 / MS EN 12390-3:2012
 3. The cubes were tested at local ambient room temperature

REMARKS :

Mode of Cube failure (Refer to Figure and circle an appropriate)
 Satisfactory A B C
 Un-Satisfactory 1 2 3 4 5 6 7 8 9

Age	Witness by

Signature only required when customer witness

Age	Tested by
14	M. Q.

Age	Checked by
14	M. Q.

28 DAYS (0%)

BSEN Test Sdn. Bhd.

CONCRETE CUBE TEST RECORD SHEET

Customer : Politeknik Sultan Salahuddin Abdul Aziz Shah
 Project : Final Year Project (Politeknik Sultan Salahuddin Abdul Aziz Shah)

File No. : 22096467

Pro Code : POLITEKNIK (FYP)

Terms of Payment
 CREDIT
 CASH
 Receipt No.
 Date

Structure & Elements

[Empty box for Structure & Elements]

Job Code 22-10557

Date Receive 20/10/2022

Remarks N.A

Date Cast 21/09/2022 Cement N.A Cour. Agg. N.A
 Grade MPa _____ Admixture N.A Samples Submitted
 Slump (mm) _____ Fine Agg. N.A Supplier Site Mixed

Test Machine (Tick) BSEN 001 / [A] [B] [C] [D]

COPY EMAILED FAXED

Lab Use Only

CONCRETE CUBE TESTING REPORT

WITNESSED

Lab Mark	Client Marking	Date Test	Age Test	Weight (Kg)	Dimension (mm)			Load (kN)	Strength N/mm ²
					L	B	H		
22-176856	0%	20/10/22	29	0.26	50	50	50	27.62	11.0
22-176857	0%	20/10/22	29	0.27	50	50	50	27.30	10.9
22-176858	0%	20/10/22	29	0.25	50	50	50	29.23	11.7

TEST METHOD : (BS EN 12390-3:2019) - Compressive Strength of Test Speciments

NOTES

1. Cubes were tested "as received / saturated" condition.
2. Method of Testing BS EN 12390-3:2019 / MS EN 12390-3:2012
3. The cubes were tested at local ambient room temperature

REMARKS :

Mode of Cube failure (Refer to Figure and circle an appropriate)
 Satisfactory A B C
 Un-Satisfactory 1 2 3 4 5 6 7 8 9

Age _____ Witness by AA

Age 29 Tested by Amirul

Age _____ Checked by AA

28 DAYS (5%)

BSEN Test Sdn. Bhd.

CONCRETE CUBE TEST RECORD SHEET

Customer : Politeknik Sultan Salahuddin Abdul Aziz Shah
 Project : Final Year Project (Politeknik Sultan Salahuddin Abdul Aziz Shah)

File No. : 22096468

Pro Code : POLITEKNIK (FYP)

Terms of Payment
 CREDIT
 CASH
 Receipt No.
 Date

Structure & Elements

[Empty box for Structure & Elements]

Job Code 22-10557
 Date Receive 20/10/2022
 Remarks N.A

Date Cast 21/09/2022 Cement N.A Cour. Agg. N.A
 Grade MPa _____ Admixture N.A Samples Submitted
 Slump (mm) _____ Fine Agg. N.A Supplier Site Mixed

Test Machine (Tick) BSEN 001 / [A] [B] [C] [D]

COPY EMAILED FAXED

Lab Use Only

CONCRETE CUBE TESTING REPORT

WITNESSED

Lab Mark	Client Marking	Date Test	Age Test	Weight (Kg)	Dimension (mm)			Load (kN)	Strength N/mm ²
					L	B	H		
22-176859	5%	20/10/22	29	0.25	50	50	50	23.47	9.4
22-176860	5%	20/10/22	29	0.25	50	50	50	23.10	9.2
22-176861	5%	20/10/22	29	0.24	50	50	50	22.75	9.1

TEST METHOD : (BS EN 12390-3:2019) - Compressive Strength of Test Specimens

NOTES

1. Cubes were tested "as received / saturated" condition.
2. Method of Testing BS EN 12390-3:2019 / MS EN 12390-3:2012
3. The cubes were tested at local ambient room temperature

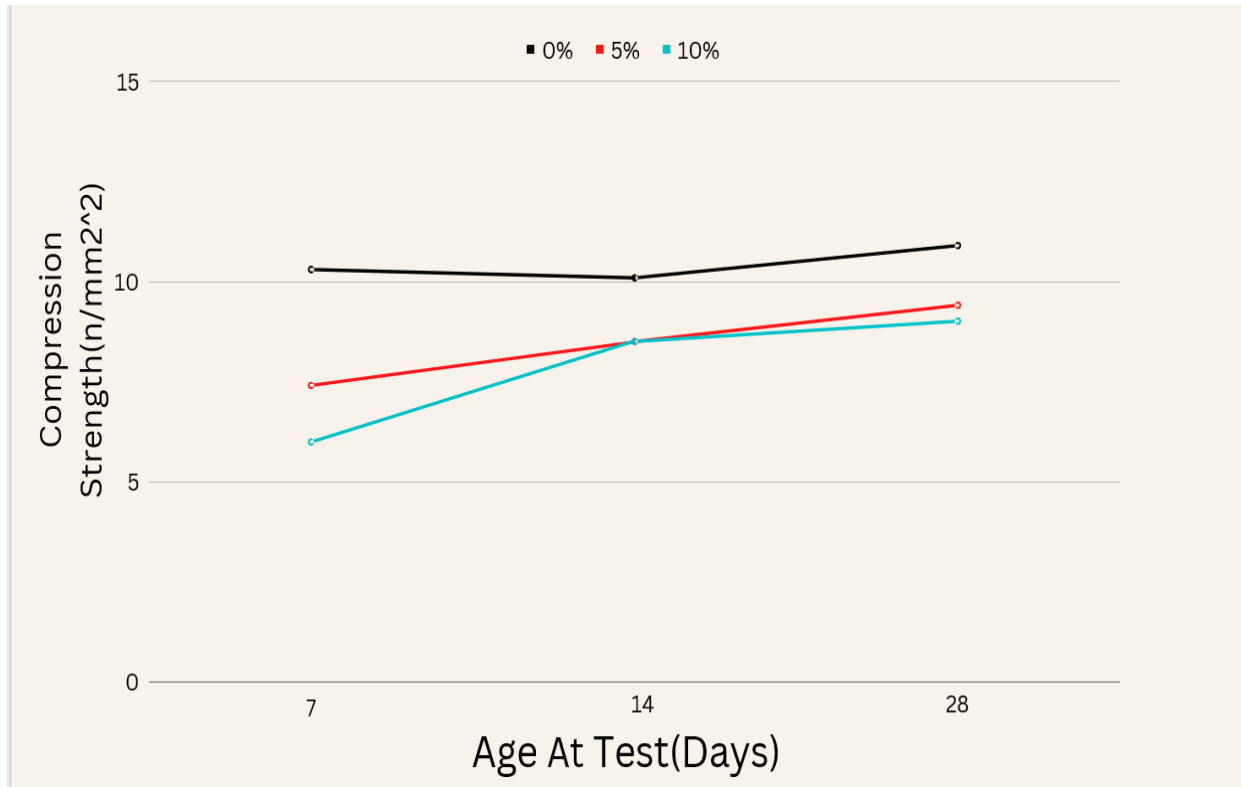
REMARKS :
 Mode of Cube failure (Refer to Figure and circle an appropriate)
 Satisfactory A B C
 Un-Satisfactory 1 2 3 4 5 6 7 8 9
 [] -

Age _____ Witness by AM

Age 29 Tested by Azmerul

Age 29 Checked by AM

GRAPH



WATER ABSORPTION TEST :

The purpose of this test is to determine the concrete's water permeability percentage. if it is made of concrete. The standard (MS 7.6: 1972 / British Standard BS 3921: 1985) serves as the basis for this test. Procedure taking the weight of the mortar after removing it from the mold. Then take after 28 days

$$\text{water absorption percentage} = \frac{\text{weight after} - \text{weight before}}{\text{weight before}} \times 100$$

The data obtained from the water seepage test on the day is as follows. For the original weight of normal cement cube is 0.251 kg and the weight after soaking for 28 days is 0.270 kg. The water percentage value for normal cement is 7.04%. While the weight of cube cement that has been mixed with 5% eggshell is 0.25 kg and the weight after soaking for 28 days is 0.259. The value for water percentage is 2.7%.





RESULTS

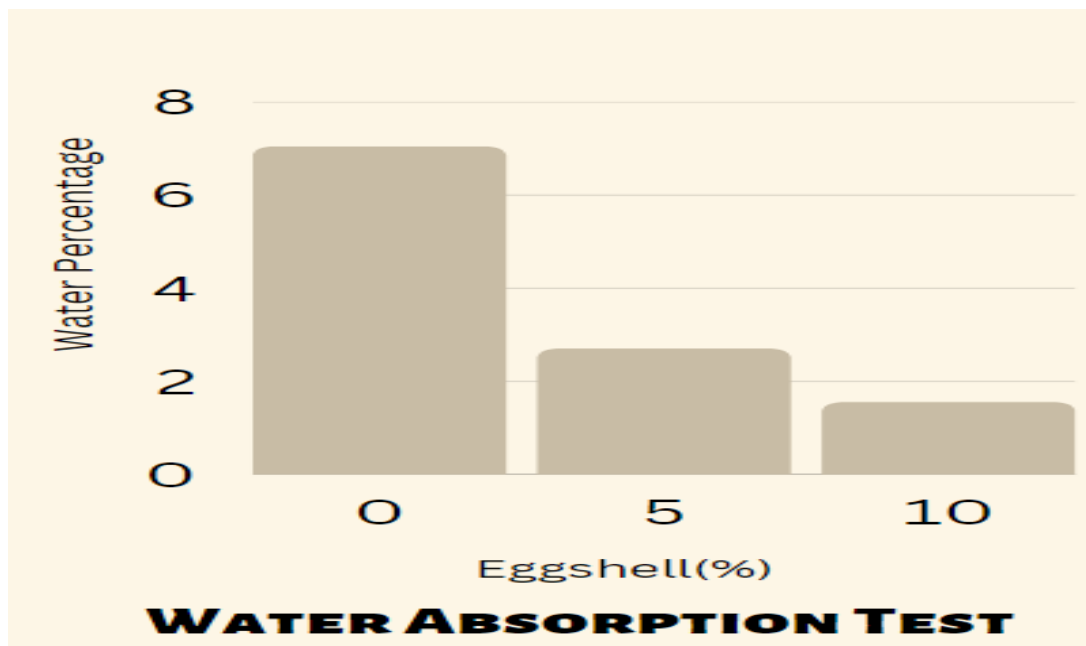
Water Absorption Test

$$\text{Water Absorption Percentage} = \frac{\text{Weight After} - \text{Weight Before}}{\text{Weight Before}} \times 100$$

Eggshell (%)	Weight Before Soak Into Water(KG)	Weight After Soak Into Water(KG)	Water Percentage
0	0.251	0.270	7.04
5	0.252	0.259	2.7
10	0.254	0.258	1.55

Water Absorption Standard:10%

GRAPH



4.3 RESEARCH

The research problem stated at the beginning of the study is a problem that will be discussed, where it becomes a question whether the results of this study can help and give options to the community to solve the existing problems as stated. According to a study conducted by Muhammad Nur Shafain bin Hut in 2014, chicken eggs are one of the waste materials produced from the industry and they contribute to environmental and disposal problems due to the continuous increase in eggshells in recent years. Therefore, the reuse of eggshell as an additive in concrete is providing a good solution to reduce environmental problems. The study was carried out into four parts, namely 0%, 5%, 10%, and 15%. Egg shell noodles must be ground into a fine powder. The objective of the noodle test is to determine the performance of the eggshell powder in terms of its strength. Mi study has been used to investigate the egg shell is concrete drop test, concrete strength test, bending test and water permeability test. From the analysis made, eggshell powder in 5% additive in concrete has a concrete strength that is 28.87 N/mm² compared to other proportions. Furthermore, it also increases in terms of flexural strength in all distributions of additions in concrete. The test results also show that egg powder has the best performance in the water permeability test which is 11.5 mm. In addition, a study conducted by Mario Diaz & Amanda Laca in 2017, agricultural wastes are some of the most emerging problems in food industries because of

their disposal cost. However, it is also an opportunity for the bioeconomy society if new uses for these residual materials can be found. Eggshells, considered a hazardous waste by UE regulations, are discarded, amounting hundreds of thousands of tonnes worldwide. This egg processing waste is a valuable source material, which can be used in different fields such as fodder or fertilizer production. Additionally, this residue offers interesting characteristics to be used in other applications, like its employment as an environment-friendly catalyst. In the present review we provide a global view of eggshell waste uses as catalyst in different processes. According to reviewed researching works, a huge variety of added value products can be obtained by using this catalyst which emphasised the interest of further investigations in order to widen the possible uses of this cheap green catalyst.

4.4 CONCLUSION

Every sample that has been tested in 2 types of tests, namely compression strength and water absorption, has shown positive results, where each of them exceeds the allowed standard value. This project may lower the cost of disposing of eggshell waste. The project's goal is to achieve the benchmark of 7.5 N/mm² on day 28. In the water absorption test, eggshell-mixed mortar performed worse than regular mortar. Because it can lessen cement's brittleness, this is advantageous.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter is the last chapter in this study. In this chapter, the researcher summarizes all discussions and research findings which has been done in previous chapters. Next to the last, the researcher put forward some recommendations that should be expressed as reflection on the entire study of this dissertation.

5.2 CONCLUSION

Before concluding this study, once again the researcher would like to emphasize that, this study has achieved the research goals, answered the research questions and met all the research objectives that were set at the beginning of the study. Based on the findings of the study, it was clearly found that the use of eggshells in the manufacture of mortar can increase the adhesion of mortar to concrete blocks. The results of the study also found that the eggshell mixture produced better adhesion strength than ordinary mortar. In the meantime, in studying and testing the strength of eggshells that should be disposed of correctly and efficiently. An inspiration was born to manage mortar that uses eggshell as an additive that was thrown away littered all over the place. It would be good if this eggshell waste is placed in a special area of the eggshell waste collection center operated by an organization that specializes in solid waste management. This is because eggshell waste is the most solid waste in Malaysia. Not only that, according to Amanda Laca and Mario Diaz in their journal entitled eggshell

waste as catalyst 2019 which states that eggshells, considered a hazardous waste by EU regulations, are discarded, amounting to hundreds of thousands of tonnes worldwide. This egg processing waste is a valuable source material, which can be used in different fields such as fodder or fertilizer production.. This shows that this matter is not something that can be taken lightly.. In this study as well, the researcher has done several tests to test the strength of the rest of the ordinary mortar and the one mixed with this eggshell. As a result of the tests

that have been carried out, the researcher found that the test strength of the sample that uses only mortar and the sample that uses a mixture of 5% concrete waste and 10% eggshell produces less strength than bias mortar and is still suitable for use in the manufacture of brick mortar because it Masil again exceeds the standard that has been set. This comparison is done to achieve the researcher's second objective, which is to determine whether the mortar mixed with eggshell is suitable for use as a mortar for binding bricks. The comment that researchers can make in this section is that the more eggshells are added in the mortar, this will further reduce its strength. Researchers also hope to be able to consider this eggshell residue as a mixture in the manufacture of brick mortar. Thus being able to innovate the existing brick mortar and make the brick mortar stick better between the brick blocks to overcome and reduce the problem of excessive and irresponsible disposal of eggshells

5.3 RECOMMENDATION

Because the focus of this study touches on the question that states whether eggshell waste is suitable or not to be used as an additive for making mortar? The answer is yes because the material has been tested in terms of its strength and water penetration to prove that it has enough strength but its strength is still less compared to normal mortar but it has already reached its standard level. So it is suggested that future studies use a lower percentage of eggshell than 5% and 10% because more eggshell mixture to the mortar will further weaken the strength of the brick mortar. Next, the next study can add another test which is the air content test for the purpose of knowing the air content in the mixture of normal mortar and mortar mixed with eggshell. If the water content test is carried out and passes the industry standard, then clearly the use of eggshell as an additive for the manufacture of mortar is very suitable to be adapted as an additive in the manufacture of brick mortar.

5.4 LIMITATIONS OF THE STUDY

In the implementation of this project, there are several problems faced by the researcher. The main problem faced is the lack of cost to conduct the project. In carrying out this project, it requires quite a lot of cost. For this project alone, the researcher has spent almost RM200 just to carry out the compressive strength test and it does not include the cost of transportation to the testing laboratory. Not only that, the researcher also had to use a

manual method to break the eggshell residue into dust that has been set to make this project successful and it takes quite a long time. In addition, the researcher experienced difficulty in obtaining the standard reading value for the mortar because the standard reading for the mortar is not so much. In addition to that, another constraint faced by the researcher in conducting this project is during the process of producing the literature review. This constraint is faced due to the lack of reference material related to the research topic. This is because most of the previous studies that were carried out only focused on the manufacture of concrete and not on the manufacture of mortar. Therefore, the lack of reference materials causes the researcher to take a long time to find reference materials that are suitable for the research topic.

5.5 SUMMARY

This section will summarize the results of the study. In the researcher's thesis entitled "Study on the Use of Egg Shells as Additives in the Production of Brick Bonding Mortar". This was carried out to test the strength of the eggshell mortar and to determine whether the eggshell residue was suitable for use as a brick binding mortar in house making. Overall, the study found that the strength of the eggshell waste mixture produced less strength than normal mortar but still reached the standard that had been set. If this study is continued with sufficient cost and a more detailed study, it is possible to obtain more satisfactory results to confirm that eggshell waste can be used as an additive in the manufacture of brick mortar.