POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH

Recycled Plastic Interlocking Brick

Name	No. Matric
Haren A/L Subramaniam	08DKA20F2001
Lugenthran A/L Letchumanan	08DKA20F2018

JABATAN KEJURUTERAAN AWAM

SESI I: 2022/2023

POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH

Recycled Plastic Interlocking Brick

HAREN A/L SUBRAMANIAM

08DKA20F2001

LUGENTHRAN A/L LETCHUMANAN

08DKA20F2018

Laporan ini dikemukakan kepada Jabatan Kejuruteraan Awam sebagai memenuhi sebahagian syarat penganugerahan Diploma Kejuruteraan Awam

JABATAN KEJURUTERAAN AWAM

SESI 2:2022/2023

AKUAN KEASLIAN DAN HAK MILIK

TAJUK PROJEK

1. Saya, HAREN A/L SUBRAMANIAM (020518011563) dan saya LUGENTHRAN A/L LETCHUMANAN (020415101195) adalah pelajar Diploma Kejuruteraan Awam, Politeknik Sultan Salahuddin Abdul Aziz Shah, yang beralamat di Persiaran Usahawan, Seksyen U1, 40150 Shah Alam, Selangor. (Selepas ini dirujuk sebagai 'Politeknik tersebut')

2. Saya mengakui bahawa 'Projek tersebut diatas' dan harta intelek yang ada didalamnya adalah hasil karya/ rekacipta asli saya tanpa mengambil atau meniru mana-mana harta intelek daripada pihak-pihak lain.

3. Saya bersetuju melepaskan pemilikan harta intelek 'Projek tersebut' kepada 'Politeknik tersebut' bagi memenuhi keperluan untuk menganugerahan Diploma Kejuruteraan Awam kepada kami.

Diperbuat dan dengan sebenar-benarnya diakui oleh yang tersebut;

HAREN A/L SUBRAMANIAM
(No. Kad Pengenalan: -020518011563) ………………………………

LUGENTHRAN A/L LETCHUMANAN
(No. Kad Pengenalan: - 020415101195) ………………………………

Di hadapan saya, MASWIRA BINTI MAHASAN (770416037298) sebagai penyelia projek pada tarikh: 07/02/2023

MASWIRA BINTI MAHASAN
Pensyarah
Jabatan Kejuruteraan Awam
Politeknik Sultan Salahuddin
Abdul Aziz Shah

………………………………………………………

ACKNOWLEDGMENTS

Thank all who in one way or another contributed in the completion of this Final year project. First, we give thanks to God for protection and ability to do work. we so grateful to the Polytechnic Sultan Salahuddin Abdul Aziz Shah for making it possible our to study here. We give deep thanks to lecturers at the civil engineering programme as a lecturer and panels. My special and heartily thanks to my supervisor, Mrs Maswira binti Mahasan who encouraged and directed us. Her challenges brought this work towards a completion. For any faults we take full responsibility. We also thank my family who encouraged me and prayed for ours throughout the time of my research. May the Almighty God richly bless all of you

Abstrak

Kini, plastik digunakan secara meluas dalam banyak aspek kehidupan seharian, termasuk pelupusan sampah, perabot, pembungkusan makanan, dan aksesori lain dan secara dominan dalam industri pembungkusan hampir 42% daripada plastik primer (Geyer, R., Jambeck, J. R., & Law, K. L. (2017).World Wide Fund for Nature (WWF) menjalankan kajian pada 2019 yang mendedahkan Malaysia menduduki tempat kedua di Asia untuk penggunaan plastik per kapita tahunan. Menurut isu itu, pendekatan kajian ini untuk menyumbang kelestarian alam sekitar dengan mengitar semula Plastik polipropilena (PP) dalam produk bata saling mengunci kami.Objektif kajian ini adalah untuk menghasilkan (PP) bata saling mengunci dan untuk menentukan kekuatan optimum bata saling mengunci (PP) Kaedah yang digunakan dalam kajian ini dengan plastik hancur (PP) kepada zarah-zarah kecil dan juga dipanaskan di atas relau pada suhu 1600c selama 30 minit sehingga ia dalam bentuk cecair. Agregat halus dan kasar dimasukkan ke dalam plastik cair dan digaul rata.Kemudian, adunan dituang ke dalam acuan yang telah kami buat sehingga kering. Kajian kami menggunakan nisbah (Agregat halus: Plastik) sebagai (1:1), (2:1) & (3:1). Kami juga menambah agregat kasar dengan nisbah (Plastik: Agregat kasar: Agregat halus) seperti (2:1:1), (2:2:1) dan (2:3:1). Penemuan kami menunjukkan nisbah (2:1:1) adalah bata saling kunci (PP) terbaik dengan kekuatan 18.7 N/mm^2 berbanding bata saling mengunci konvensional 17.43 N/mm^2. Daripada kajian ini, kami membuat kesimpulan bahawa bata saling kunci (PP) berpotensi untuk diteruskan untuk kajian lanjut dan dikomersialkan. Ini mencetuskan penyelidikan ke dalam mengitar semula plastik sisa untuk mencipta bahan binaan yang ringan dan bermanfaat kepada alam sekitar untuk mencipta dunia yang lebih bersih dan sihat.

Kata kunci : bata saling mengunci, plastik, polipropilena, agregat kasar, agregat halus, alam sekitar, dikomersialkan

Abstract

Now days, plastics is widely used in many aspects of daily life, including garbage disposals, furniture, food packaging, and other accessories and dominantly in packaging industry almost 42% of primary plastics (*Geyer, R., Jambeck, J. R., & Law, K. L. (2017).*The World Wide Fund for Nature (WWF) commissioned a study in 2019 that revealed Malaysia ranks second in Asia for yearly per capita plastic use. According to the issue, this study approach to contribute a sustainability of environment with recycled the Polypropylene (PP) plastic in ours product of interlocking brick. The objective of this study is to produce (PP) interlocking brick and to determine the optimum strength of (PP) interlocking brick. The method used in this study by crushed (PP) plastic to small particles and also heated on a furnace at temperature 160^{0}c for 30 minutes till it is in a liquid form. Fine and coarse aggregate are added into molten plastic and mixed well. Then, the mix poured into the our fabricated moulds until its dry. Our study used a ratio (Fine aggregate: Plastic) as (1:1), (2:1) & (3:1). We also added coarse aggregate with ratio (Plastic: Coarse aggregate: Fine aggregate) such as (2:1:1), (2:2:1) and (2:3:1). Our finding shows that the ratio (2:1:1) is the best (PP) interlocking brick with the strength 18.7 N/mm² compared to conventional interlocking brick 17.43 N/mm². From this study, we conclude that (PP) interlocking brick has a potential to continue for further study and commercialized. This sparks research into recycling waste plastic to create lightweight, environmentally beneficial building materials to create a world that is cleaner and healthier.

Keywords : *interlocking brick, plastic, polypropylene, coarse aggregate, fine aggregate, environmentally, commercialized*

LIST OF CONTENT

CHAPTER 1

INTRODUCTION

1.0 Introduction

Due to its lightweight and compact nature, plastic is the most used material in the world. Items made primarily of plastic are due to its widespread use, packaging—including bottles, bags, and containers—creates a disposal issue. When they are buried, non-biodegradable polymer compounds render them useless. In addition to being stiff, durable, and flexible, plastic also has the non-disposable quality.

Plastic is now being burned and deposited all over the world. They release a lot of harmful and dangerous fumes. These gases have an impact on both human and animal health. Toxic gases cause human suffering such as cancer, hypertension, and asthma, among other conditions. Plastic garbage in municipal solid waste is getting bigger and bigger every day. According to estimates, the quantity is growing at a pace of twofold every ten years. This is taking place because of the increasing rate of urbanisation, population expansion, and lifestyle development activities.

Although we can't totally prohibit people from using plastic, we can recycle and reuse it with little harm to the environment. We use this recycled plastic in a variety of fields, including manufacturing, transportation, and construction. In the construction industry, materials can account for up to 60% to 70% of a project's overall cost. The use of environmentally friendly, lightweight building materials in the civil industry is currently the subject of research. This sparks research into recycling waste plastic to create lightweight, environmentally beneficial building materials. The cost of producing construction materials can be reduced by using waste plastic to make interlocking block and to simplify the process for resolving the issue of storing waste plastic materials. It is now nearly difficult to outlaw the use of plastic, but engineers will enter a new age if they can reuse plastic trash in industrial applications and building construction.

1.1 Problem statement

Plastic is the very hazardous material and very difficult to decompose it is main problem in the world. Use of plastic is high in our daily life such as polythene bags, disposals, furniture's, packing food packets and other accessories. Plastic is varying in large and various types according to their chemical composition. So, to separation of plastic wastes and mainly big problem in front of us.

In 1950 the world produced only 2 million tonnes of plastic waste per year. By 2019, annual production had increased nearly 230, reaching 460 million tonnes. Over the period from 1950 to 2019, cumulative production reached 9.5 billion tonnes of plastic — more than one ton of plastic for every person alive today.

Data visualisations and explainers on plastic waste by country, plastic waste per person, and importantly for plastic pollution (especially of the oceans), mismanaged waste by country and by region. Overall, it's generally the case that plastic waste per person is highest in high-income countries. However, richer countries tend to have effective waste management systems meaning mismanaged waste is low. Most mismanaged waste tends to arise from low-to-middle income countries where large coastal populations and rapid industrialization means waste management systems have failed to keep pace.

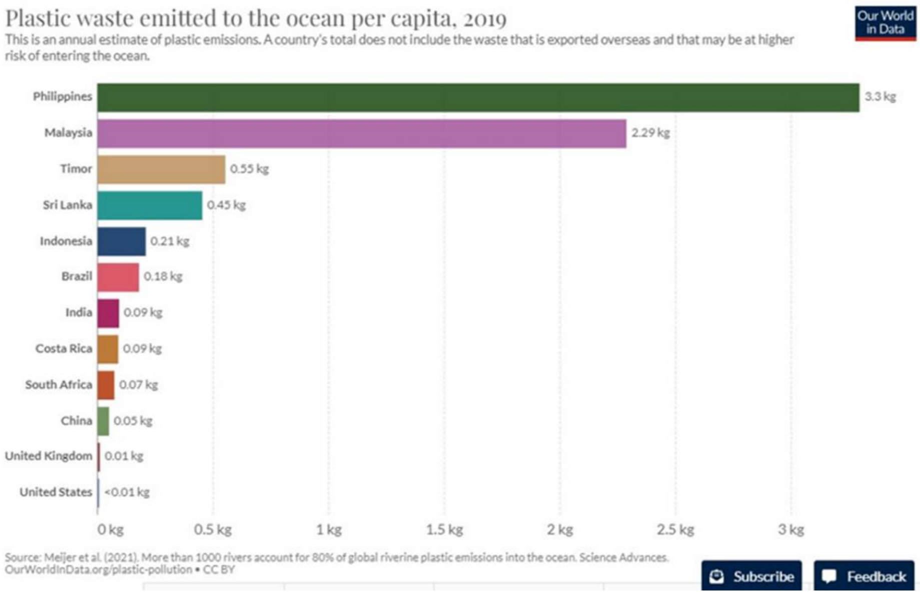


Figure 1.0 Bar Chart of Plastic Waste Emitted to the Ocean per capita,2019

According to article by Hannah Ritchie and Max Roser, which is was first published in September 2018 and iIt was updated in April 2022 based on the most recent research. Meanwhile in Malaysia, A 2019 study commissioned by the World Wide Fund for Nature (WWF) showed that Malaysia ranks second in Asia for annual per capita plastic use. At 16.78kg per person, Malaysia outranks much larger nations including China, Indonesia, the Philippines, Thailand, and Vietnam in overall generated waste. With over 1,300 plastic manufacturers, Malaysia is also one of the largest plastic production industries globally, exporting resins valued at RM30 billion in 2016 to plastic producers around the world. Noticeably, packaging takes up the biggest market share of plastic at 40% in 2008 and steadily increased over a decade to an eye-watering 48% in 2018.

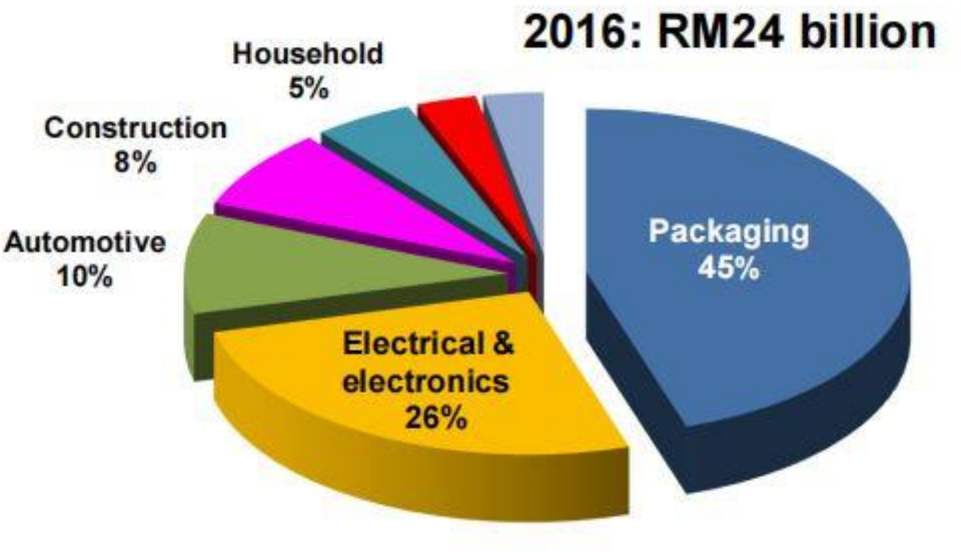


Figure 2.0 Major Market Segments for Plastic Product (MPMA 2016). (Credit: Academy of Sciences Malaysia)

Furthermore, 80% of the world's ocean plastics enter the ocean via rivers and coastlines. The other 20% come from marine sources such as fishing nets, ropes, and fleets. To tackle plastic pollution we need to know where these plastics are coming from. Previous studies suggested that a very small number of rivers were responsible for the vast majority of ocean plastics: 60% to 90% of plastics came from only ten rivers. Higher-resolution mapping and consideration for factors such as climate, terrain, land use, and distance to the ocean suggests that many smaller rivers play a bigger role than we thought. It takes 1,600 of the biggest emitting rivers to account for 80% of plastic inputs to the ocean. It is estimated that 81% of ocean plastics come from Asian rivers. The Philippines alone contribute around one-third of the global total. Since the number of contributing rivers is much higher than previously thought, we will need global efforts to improve waste management and plastic collection rather than targeting only a few of the largest rivers.

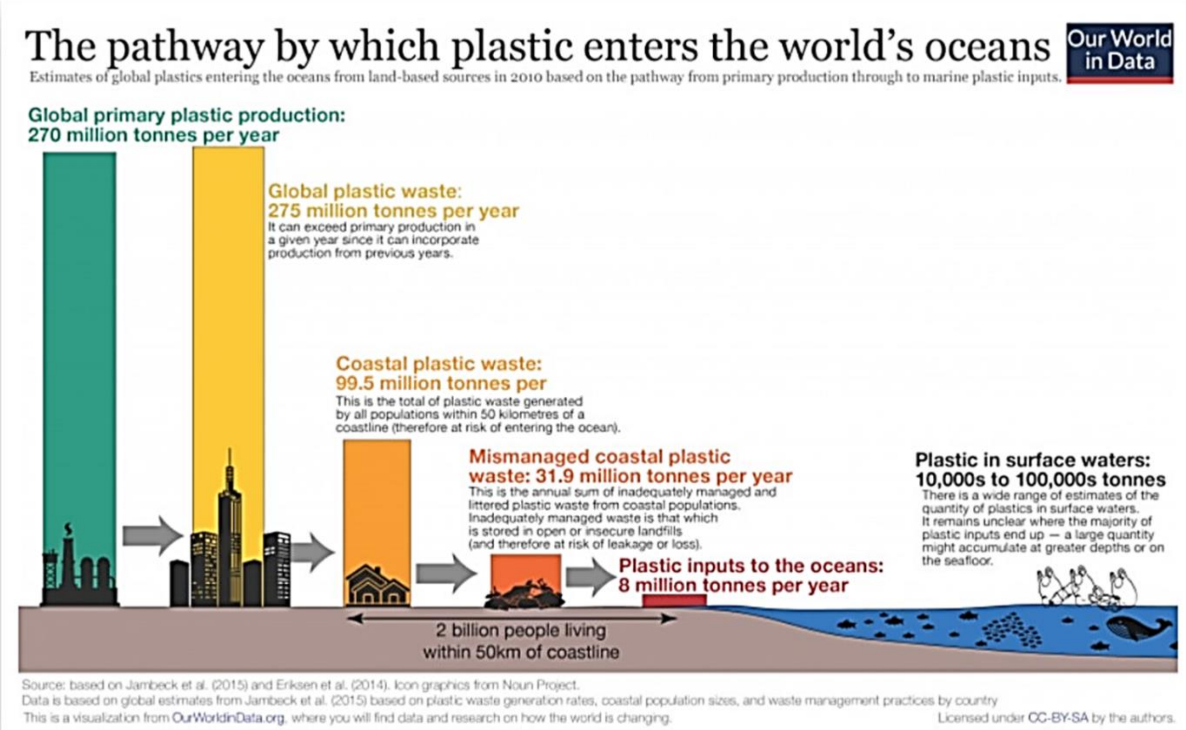


Figure 3.0 The pathway by which plastic enters the world's oceans

Greenhouse gases: when organic matter decomposes to produce methane (CH4) and carbon dioxide (CO2) — both are greenhouse gases which contribute to climate change. In some landfill sites, methane gas can be captured and 'flared' (burned) for energy production. Plastic, which is hard to break down, degrades over very long timescales (particularly under low oxygen conditions) does not contribute to this effect.

Where plastics are not handled correctly, some types of plastic — such as polyvinyl chloride; PVC — can leach chemicals such as additives and plasticiser compounds.4 A report by the European Commission aimed to provide a detailed analysis and overview of the available evidence on the behaviour of PVC in landfills.5 The study concluded that whilst leachate of substances as either non-detectable or in very low concentrations, a precautionary approach would deem this material only controllable if landfills are equipped with adequate liner and leachate treatment.

1.2 The objective of study

i. To produce interlocking block

ii. To determine optimum strength of interlocking block

1.3 The scope of study

This project is focused on the civil engineering field. This project is mainly focused for civil engineering material. This project is to produce recycled interlocking block. This project will produce mould for interlocking block and prototype with optimum ratio plastic and sand. This project will test the strength of recycled plastic interlocking block by compression test. The testing will be implemented in concrete laboratory, PSA.

1.4 The important of study

This plastic interlocking can pave the way for a better way of construction, in a less labor intensive manner and the biggest cherry on top is the reduction of plastic waste out there in our earth. This is the great power of creativity and purpose combined in a innovative solution. Waste plastic can be seen everywhere and oftentimes in abundance. You can get them for free. In developing countries, being able to build homes cheaper than usual will allow more people to have the basic need of shelter. Segregate our plastics properly so clean waste plastic can be converted to other materials more effectively.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

Literature review may be a ponder conducted based on genuine hypotheses and connected in areas related to the think about such as diary, articles, books and daily paper considers. Hence, in this chapter 2 a few hypotheses related to this consider to produce Recycled Plastic Interlocking Block.

2.1 Previous Research

1. Utilization of Plastic waste for Making Plastic Bricks

   R. S. Kognole, Kiran Shipkule, Manish Patil, Lokesh Patil, Udaysinh Survase

   In this project these waste plastics are effectively utilized in order to reduce the land space required to dump these wastes. This creates the prevention from various harmful diseases. Polyethylene (PE) bags are cleaned and added with fine aggregate at various ratios to obtain high strength bricks that possess thermal and sound insulation properties. Besides, in this paper it was concluded that the plastic sand bricks are useful for the construction industry when compared with Fly Ash bricks and 3rd class clay bricks.

2. Hazardous waste management through plastic brick

   Subhojit Chattaraj, Kaustav Das

   In this paper, some experimental test has been done on the plastic bricks to find out it's property and behaviours. The test which are conducted on plastic bricks are Compression Strength Test and Hardness Test. The brick specimens are placed in to CTM (Compression Testing machine) and gradually load is applied to the specimen. And the loads are applied gradually without any shock. The plastic brick with plastic sand ratio 1:2 showed good results (8.72 N/mm^2) compared with plastic sand ratio 1:3 (6.43 N/mm^2). Besides, two methods have been used to measure the resistance of the plastic bricks against plastic deformation. A steel rod has been used to make scratch on the brick surface and the bricks are also subjected to free fall from 6ft and 10ft. The plastic bricks showed no damage in both method.

3. Mechanical and Thermal Properties of Interlocking Bricks Utilizing Wasted Polyethylene Terephthalate

Wesam Salah Alaloul, Vivekka Olivia John and Muhammad Ali Musarat

The plastic bottles were shredded and grinded to a size of 0.75 mm and mixed with the Polyurethane (PU) and the Polymer. The mixed later casted and compacted in the interlocking brick machine mould. The tests performed on the interlocking bricks were compressive strength, impact, fexural strength and thermal conductivity for obtaining the mechanical and thermal properties. The tests values were then keyed into the Response Surface Methodology (RSM) to obtain the optimal PET and PU to verify reliability. Based on the results it is concluded that PET/PU of 60/40 ratio is suitable as non-load bearing masonry brick and recommended to be used as partition walls.

4. Recycling plastic waste materials for building and construction Materials: A minireview

Joan Nyika, Megersa Dinka

From this mini-review, it was established that the use of recycled plastics for building and construction applications is a viable solution to greening by prolonging their lifecycle and improving their value in using them as substitutes or composites for conventional building materials. By using plastic wastes as aggregates, fibers and binders, their applications can span from making bricks, blocks, tiles, asphalt, bitumen, door panels, insulation materials to concrete among other building and construction materials. The advantages of these applications are in reducing the use of natural building and construction materials, reducing waste amounts diverted to landfills and lowering environmental pollution associated with plastic waste disposal.

5. Effect in mechanical and physical properties of bricks due to addition of waste polyethylene terephthalate

Anurag Wahane, Shivendra Dwivedi and Divya Bajaj

The study involves establishment of limitation of plastic waste in a standard brick to achieve better performance and to avoid shrinkage and cracks. The properties of waste bricks were tested such as density, compressive strength, water absorption, Impact value, efflorescence, rebound hammer, penetration value and shrinkage. The article involves the sample in two categories; first category involves the cement-clay bricks and the second category have the plastic waste brick with 20 % and 25 % plastic content. The maximum strength of 20WCB bricks is 52 MPa. The plastic brick is penetrated around 7 mm after 32 min of complete setting. Around 4 % water absorption is seen in waste plastic bricks. It has been seen that the strength value of plastic brick with other masonry bricks are much better. The result demonstrates that by including smash type plastic waste into bricks can result in a significant improvement in brick performance.

6. Experimental investigation on use of recycled aggregate and waste plastic for manufacturing eco-friendly solid brick

K. Athiappan, Parthiban P., S. Sivaramakrishnan, et al.

The following tests are Compression test, water Absorption test, Hardness test, Presence of soluble salts (Efflorescence Test), Shape and size, Soundness test and Structure of brick. The crushing strength of bricks is determined by placing brick in compression testing machine. It is found that, the highest compressive strength is attained at 1:3 ratio of 28 days value 4.35 N/mm2. The mix M1 is found to be optimum. The bricks such as fly as bricks, clay bricks and rehash (plastic) bricks has satisfied results on all the tests and the fly ash bricks and rehash bricks performed better than the conventional clay bricks. The other tests such as water absorption, initial rate of surface water absorption and masonry test indicates that, rehash brick has better performance.

7. The utilisation of waste plastic by using plastic coated aggregates in bituminous mix for flexible pavements

Courage Nyoni

This research paper illuminates on how aggregates are coated by processed waste plastic, mixed with hot bitumen, and applied in the construction of roads. It highlights several tests conducted and results obtained to get to the conclusion that waste plastic is an efficient integration in road construction and rehabilitation. It notes and explains the advantages of incorporating plastic waste into the construction industry, construction of roads to specify, and at the same time names the limitations met in the construction process and use.

8. Valorization of Plastic Waste through Incorporation into Construction Materials

Daniel Tang Kuok Ho

In this paper, plastic waste is added at different proportions (1%-70%) with other materials, including non-plastic waste, followed by curing to acquire the desired properties. Plastic waste is used as a raw material to contain strength-imparting materials. The former has been reported to have good strengths (5.15-55.91 MPa), chemical, and thermal resistance, whereas the latter may impart lower strengths (0.67-15.25 MPa). Plastic waste is also used as additives for road pavement, primarily as substitutes for concrete-making materials, and was observed to produce desirable strengths (0.95-35 MPa) at appropriate proportions (0.5-25%), indicating the importance of optimizing the plastic contents in the concrete.

CHAPTER 3

METHODOLOGY

3.1 Introduction of Methodology

Starting point of study is with planning the time of study by using guntt chart. The activities was planning due to time required to make sure the product will be completed in schedule time. The point of the technique inquire about is to attain the destinations of the consider as expressed in chapter 1. Arranging is exceptionally, imperative in each think about to be conducted.

To guarantee that the arranging for each strategy is require coordinate with the targets, which already set up and to urge the same answers for each objective. The investigate strategy will be planned to realize the objective. To clarify the usage strategy of this venture more clearly with flow chart of methodology as Figure 3.1 below.

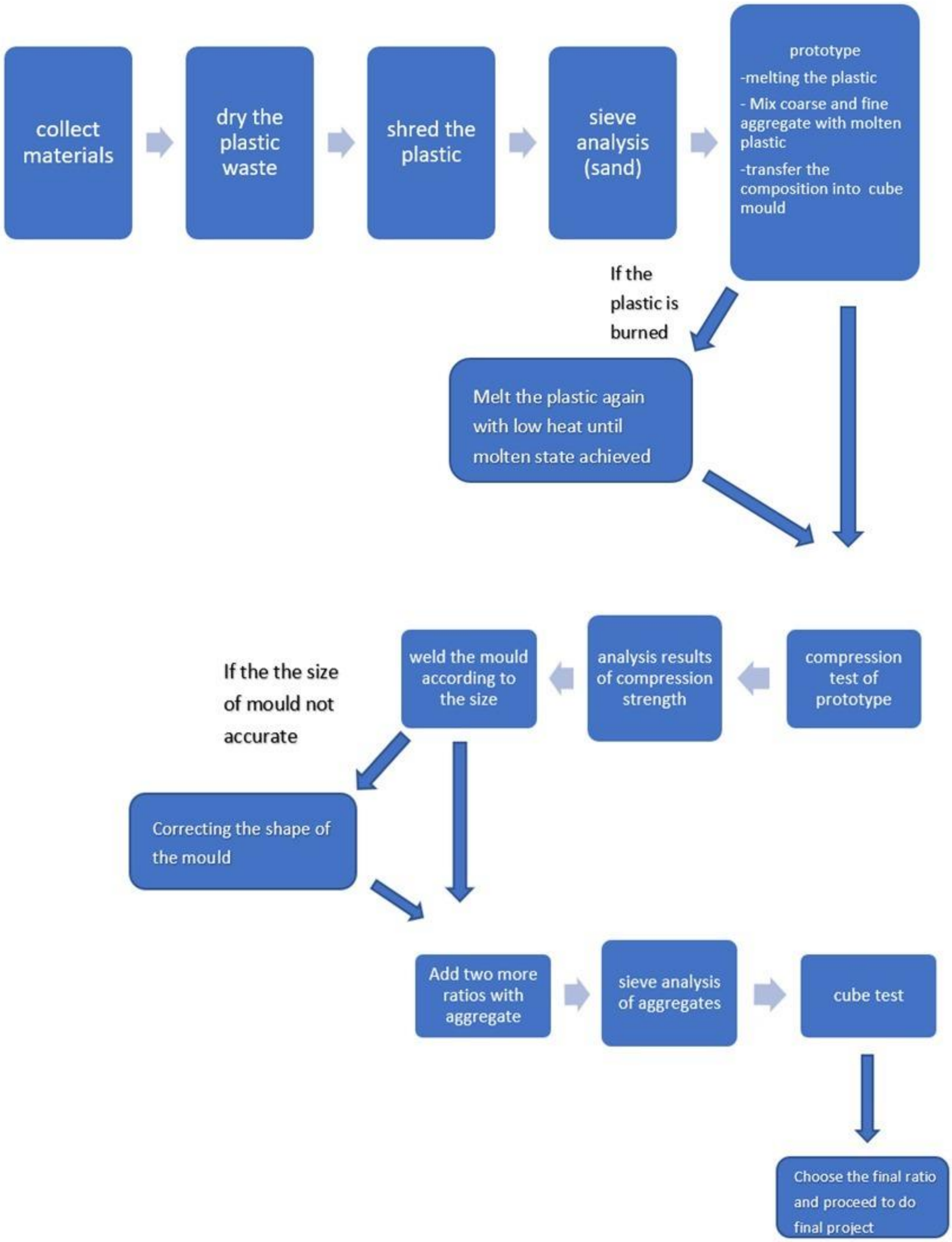
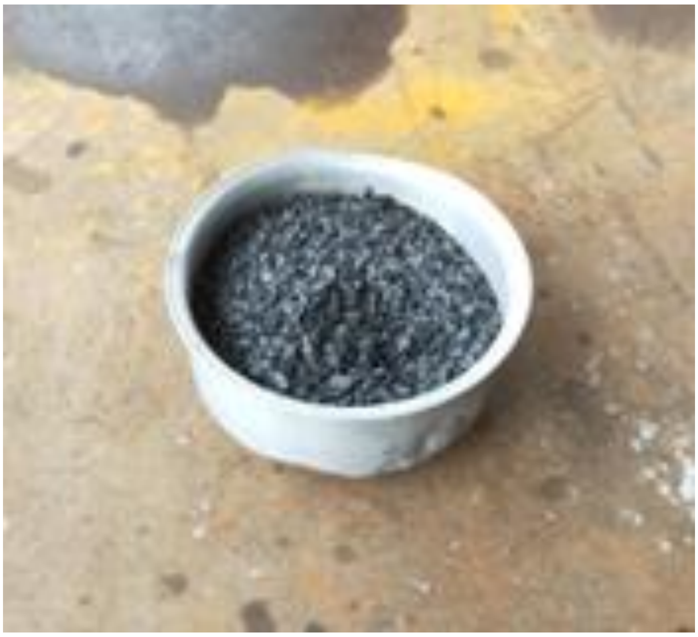


Figure 3.1 Flow chart of making Plastic Interlocking Brick

3.2 Material of Plastic Interlocking Brick

In our study, we used three basic material in order to produce the plastic interlocking brick that are plastic, sand and aggregate. Our aim of study to using the recycle plastic, so in this study we used the propylene plastic to study it characteristics to produced interlocking brick.

The materials used as shown in figure3.2 below.



Crushed Propylene plactic

Sand Aggregate

Figure3.2: material used to produce

3.3 Design of Plastic Interlocking Brick

The second steps in our project methodology, we sketch the mould design plastic interlocking brick that we try to produced. For the first design is not suitable when it design has not smooth for interlock each other. So, based on commented from supervisor and panels, we change and improve our design and produced two(2) mould for interlocking brick by using the same materials.

The making process of interlocking brick mould as below:

Step 1 (Design mould of interlocking brick)

Step 2 (order the steel plate)

Step 3 (cutting and merge the steel plate due to design). The welding process is used to produce the mould.

Cutting of steel plate

Figure 3.3 : Produce interlocking brick mould

3.4 Design of mixed recycled plastic interlocking brick

From desk study and a few discussions with supervisor, we decided to do a pilot test of the product to know the basis strength of plastic interlocking brick that will be produced exceed the minimum strength of brick. For the pilot test, we design a three (3) ratio only using a plastic and fine aggregate as shown in table 3.1 below.

Table 3.1: Design ratio for mixed of recycle plastic interlocking brick

Ratio (Plastic:Fine)
Sample 1 (1:1)
Sample 2 (1:1)
Sample 3 (1:1)
Sample 4 (1:2)
Sample 5 (1:2)
Sample 6 (1:2)
Sample 7 (1:3)
Sample 8 (1:3)
Sample 9 (1:3)

Based on the compression test result, the strength is not achieved the standard interlocking brick. So, the discussion with supervisor, we design a new ratio with added with fine aggregate. The ratio we used for the next laboratory activities as shown in table 3.2.

Table 3.1: Redesign ratio for mixed of recycle plastic interlocking brick

Ratio (Plastic:Fine: course)
Sample 10 (2:1:1)
Sample 11 (2:1:1)
Sample 12 (2:1:1)
Sample 13 (2:2:1)
Sample 14 (2:2:1)
Sample 15 (2:2:1)
Sample 16 (2:3:1)
Sample 17 (2:3:1)
Sample 18 (2:3:1)

In this study, we found that the redesign ration mixer with coarse aggregate gave better result of compression test as compared to first design ratio. So, our product is produce based on redesign ratio mixed. We do our experiment laboratory at Sri Muda Metals at Jalan Kebun, Seksyen 27, Selangor. We bring all the materials required and do the process of mixed there.

3.5 The laboratory experiment of recycle interlocking brick

The activities of experiment were implemented at two different location, which are for the first process is at concrete laboratory, PSA. Here we do a sieving process for sand and aggregate. The process as shown in Figure 3.4 below.

Figure 3.4: Sieveing process of sand and aggregate

The mixer experiment was implemented at at Sri Muda Metals at Jalan Kebun, Seksyen 27, Selangor. Here we do the weighing of materials due to design ratio used as shown in Figure 3.5, heated a crushed plastic on furnace till it is in a liquid form as shown in figure 3.6, and lastly, we mixed the sand and aggregate process by added into melted plastic and mixed as shown in Figure 3.7 below.

Figure 3.5: Weighing Materials

Figure 3.6: Melting Plastic wastes

Figure 3.7: Fine aggregate mixed with melted plastic

3.6 Recycle Interlocking brick produce

After finish of mixed process, the mixed was fill up into three (3) same sized mould until it dry into cube test for pilot testing as shown in figure 3.8 and figure 3.9 . Once it's dried the cube is removed from the mould and labelled. The procedures are repeated for different type of ratio. Repeat the steps with different ratio Plastic: Coarse aggregate: Fine aggregate such as 2:1:1, 2:2:1, 2:3:1 and Fine aggregate: Plastic as 1:1, 2:1 & 3:1.

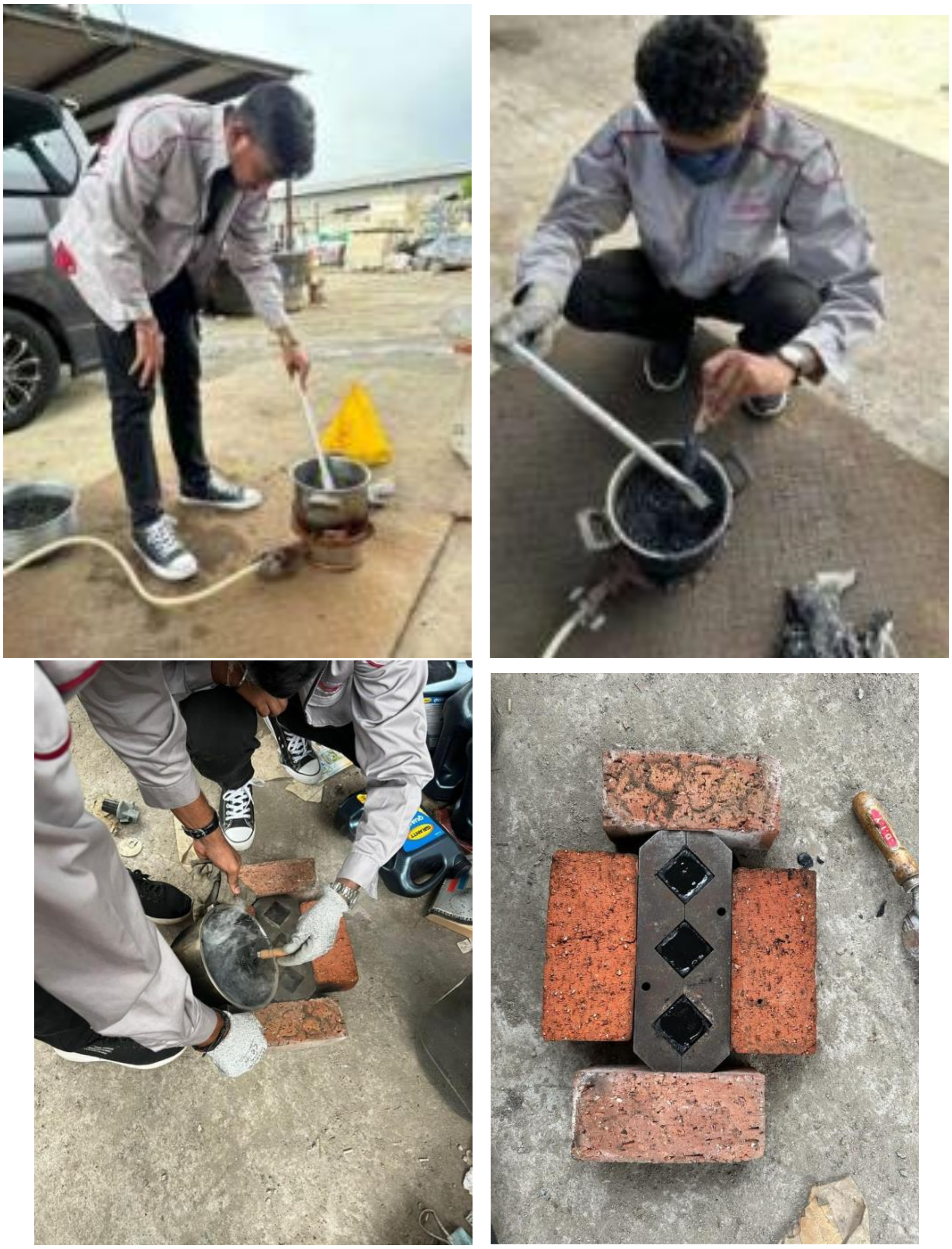


Figure 3.8: Transfer the mixed into cube test (50mmx50mmx50mm)

Fisrt ratio design mixed

Second ratio design mixed

Figure 3.9 Final product for pilot test of recycle interlocking brick

3.6 Testing of Recycle Interlocking brick produce

In this study, we test the compression test, skid resistance, density of recycle interlocking brick. Compression test was implemted at BSEN Test Sdn Bhd, jalan Rajawali 3, Bandar Puchong Jaya, Selangor. The process of testing as shown in Figure 3.10 and Figure3.11.

Figure 3.10: Compression Strength Test

Figure 3.11: Skid Resistance Test

3.7 Produce of recycle interlocking brick based on real mould

Based on the compression strength of the all sample produce, we making a final mixed ratio to produce final product of recycle interlocking brick as shown in Figure 3.12 below.

Figure 3.12: Final product of recycle interlocking brick

3.8 Finishing the product of recycled interlocking

To give our interlocking bricks some finishing touches, we used a grinding machine to remove some unnecessary portions and sand them so that all of the bricks could interlock tightly. As shown in Figure 3.12

Figure 3.12: Finishing the recycle interlocking brick surface

3.9 Added value of recycled interlocking

In added the value of our product, we painted the surface of the interlocking brick with "glow in the dark spary." We put those interlocking bricks under the sun and waited for few hours as shown in figure 3.13.

Figure 3.13: Finishing with spray glow in the dark

3.10 Final Presentation

We prepared the slide and poster for final presentation based on schedule given. According to commented from supervisor, we improve and modifying our poster for the presentation and placed an order with a reputable printing business in Shah Alam, Selangor. The next day, we visited the store to pick up our poster. The final presentation was place on May 18, 2023, in a room from 8 a.m. to 12 p.m. We delivered the final presentation's slides, and the panellists were pleased with our presentation because we fully addressed all of their concerns. The panels announced that our group had been chosen for PITEC at around 12 o'clock. The Figure 3.14 shown our location for final presentation which panelised by industrial party as a panel together with our lecturer panel.

Figure 3.13: Location of final presentation

3.11 PITEC 4 2023

We were selected from a few groups to compete in PITEC 4 2023 which is involved all departments in PSA. The PITEC 4.0 was hosted in the dewan Al-Jazari.In front of the panels, instructors, students, and friends, we presented our senior project. We were lucky to get ultimately placed third for PITEC 4.0 and second for the best poster as shown in Figure 3.14.

Figure 3.13: PITEC 4 2023

CHAPTER 4

FINDING AND ANALYSIS

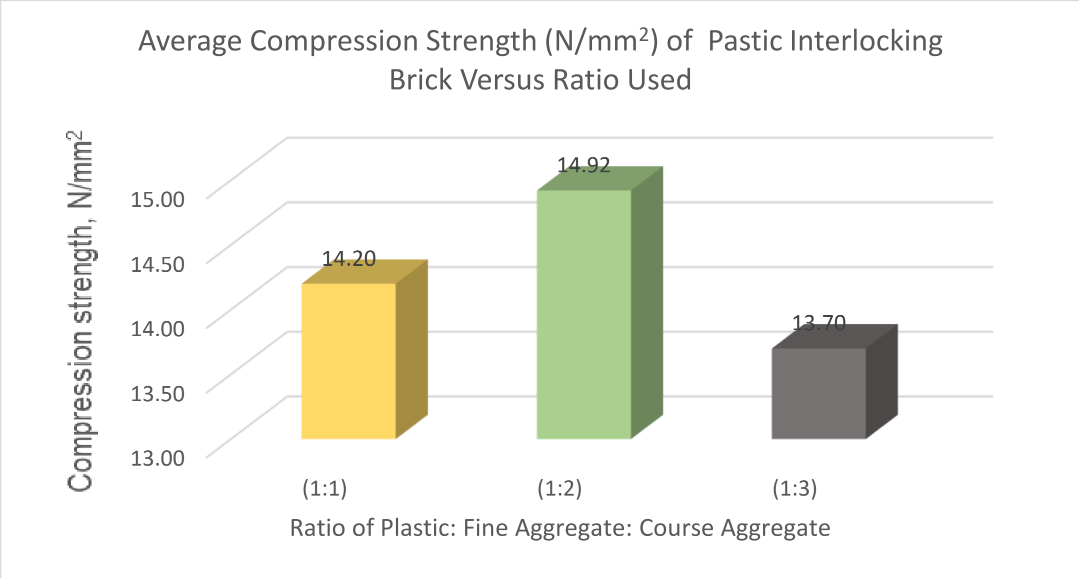
4.1 Compression testing

The finding of the study based on the testing result in laboratory. The data collected based on series of testing of the strength of the recycled plastic interlocking brick. This study using a different ratio in the production of prototypes is to determine the most optimal compression strength. Physically the prototype was tested through cube test 50mm x 50mm x 50mm. The overall data of compressive strength results for the recycled plastic interlocking brick as shown in Table 4.1.

Table 4.1: Average Compression Strength for first design ratio mixed

Ratio (Plastic:Fine)	Age at Test (Days)	Weight (kg)	Density (kg/m^3)	Max Load (kN)	Compression Strength (N/mm^2)	Average Compression Strength (N/mm^2)
Sample 1 (1:1)	4	0.15	1200	33.3	13.3	14.20
Sample 2 (1:1)	4	0.15	1200	36.6	14.6	
Sample 3 (1:1)	4	0.15	1200	36.8	14.7	
Sample 4 (1:2)	4	0.16	1280	38	15.2	14.97
Sample 5 (1:2)	4	0.16	1280	36.5	14.6	
Sample 6 (1:2)	4	0.16	1280	37.6	15.1	
Sample 7 (1:3)	4	0.15	1200	34.1	13.6	13.70
Sample 8 (1:3)	4	0.14	1120	31.2	12.5	
Sample 9 (1:3)	4	0.15	1200	37.5	15	

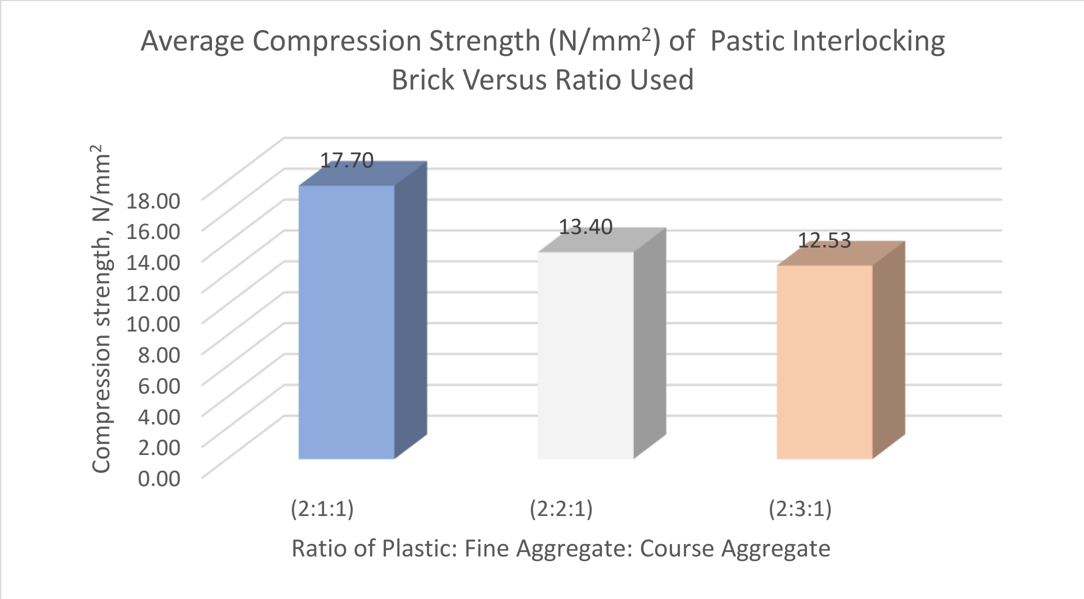
From the data of first design ratio, it shows that the sample of design ratio 1:2 (pastic: fine aggregate) is maximum average compression strength i.e. 14.92 N/mm^2 .



While for the second design ratio (added with the aggregate), the compression strength is more than first design ratio mixed. For the second design ratio, the average compression strength is 18.70N/mm^2. It shows that more than 20% increasing of compression strength.

Table 4.1: Average Compression Strength for second design ratio mixed

Ratio (Plastic:Fine: course)	Age at Test (Days)	Weight (kg)	Density (kg/m^3)	Max Load (kN)	Compression Strength (N/mm^2)	Average Compression Strength (N/mm^2)
Sample 10 (2:1:1)	4	0.19	1520	40.1	16	18.70
Sample 11 (2:1:1)	4	0.18	1440	46.6	18.6	
Sample 12 (2:1:1)	4	0.17	1360	53.6	21.5	
Sample 13 (2:2:1)	5	0.202	1610	29.3	11.7	13.40
Sample 14 (2:2:1)	5	0.183	1460	34.5	13.8	
Sample 15 (2:2:1)	5	0.21	1680	36.8	14.7	
Sample 16 (2:3:1)	5	0.193	1550	33.4	13.4	12.53
Sample 17 (2:3:1)	5	0.208	1670	32.5	13	
Sample 18 (2:3:1)	5	0.21	1680	28	11.2	



As overall, all the samples were taken to do cube test. Based on our analysis, plastic and fine aggregate ratio such as (1:1), (2:1) and (3:1) shown compression strength average of 14.2 $N/mm2$, 14.97$N/mm2$ and 13.7$N/mm2$ respectively. Meanwhile when coarse aggregate were added with ratio such as (2:1:1), (2:2:1) and (2:3:1) shown compression strength average of 18.7$N/mm2$, 13.4$N/mm2$ and 12.53$N/mm2$ respectively. Based on these findings, we concluded that ratio (2:1:1) shown the optimum compression strength compared with conventional interlocking brick.

CHAPTER 5

CONCLUSION

5.0 Conclusion

In conclusion, the usage of recycled plastic interlocking bricks offers a sustainable alternative to traditional building materials while presenting a possible answer to the world's plastic waste problem. These bricks may be used to build buildings like walls, pavements, and even houses thanks to their interlocking construction. This initiative emphasises the significance of environmentally friendly building methods that attempt to lessen the negative effects of construction activity. We can drastically lower the quantity of plastic trash in landfills and promote a greener future by employing recycled plastic interlocking bricks. Although there are still issues to be resolved, such as cost and production scalability, the advantages of this technology are apparent. Waste plastic, which is readily available everywhere, may be used to make bricks. Plastic interlocking brick can contribute to a cleaner, healthier world by lowering environmental pollutants. Brick made with plastic instead of cement use less cement in their construction. Plastic interlocking brick provide clients a different brick choice at a reasonable price. Plastic interlocking brick do not absorb any water. After comparing plastic interlocking brick to cement interlocking brick, we can come to the conclusion that they are useful for the construction industry.

However, during making of the Polypropene (PP) Recycled Plastic Interlocking Brick, we find out that melting plastic release harmful gases which could affect the environment and health. Therefore, we recommend find an alternative way of melting plastic which could reduce the release of harmful gases. This will create an opportunity of experimenting and producing different type construction material made from plastic. For example, recycled plastic beam, recycled plastic column and etc.

CHAPTER 6

REFERENCES

References

1. Anurag Wahane, S. D. (n.d.). *Effect in Mechanical and Physical Properties of Bricks due to addition of waste polyethylene terephthalate.*
2. Ho, D. T. (n.d.). *Valorization of Plastic Waste through Incorporation into Construction Materials.*
3. Joan Nyika, M. D. (n.d.). *Recycling Plastic Waste Materials for Building and Construction Materials: A Minireview.*
4. K. Athiappan, P. P. (n.d.). *Experimental Investigation on use of recycled aggregate and waste plastic for manufacturing eco-friendly solid brick.*
5. Nyoni, C. (n.d.). *7. The utilisation of waste plastic by using plastic coated aggregates in bituminous mix for flexible pavements.*
6. R. Bhushaiah, S. M. (n.d.). *Study of Plastic Bricks Made From Waste Plastic.*
7. R.S Kognole, K. S. (n.d.). *Utilization of Plastic Waste for Making Plastic Brick.*
8. Subhojit Chattaraj, K. D. (n.d.). *Hazardous Waste Management Through Plastic Brick.*
9. Subramanian, P. (n.d.). *Plastics recycling and waste management in the US.*
10. Wesam Salah Alaloul, V. O. (n.d.). *Mechanical and Thermal Properties of Interlocking Bricks Utilizing Wasted Polyethylene Terephthalate.*