

The Effect of Plastic Pellet Substitution on Fine Aggregate and Gypsum Waste Substitution in Cement on the Compressive Strength of Lightweight Concrete

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ABSTRACT

Concrete is an important constituent material in a construction, concrete also has the constituent materials such as cement, aggregate, and water. However, the use of such compound materials can make an impact on health and environment, as cement production can produce CO₂ emission gases, and the aggregate use resulting from mining activities can damage the environment in a long period of time. The experimental method, which is ways to reveal the causal relationship between two or more variables through careful experiments. These two forms are: exploratory experiments (aimed at the problem and hypothesis) and development experiments (aimed at proving hypotheses to make common generalizations.. Results of the test that has been conducted that strong press concrete on the 7th day with a strong result of the highest press obtained from a variation D of 9.76 MPa with a mixture of plastic seeds 0.6% and the waste of the 10%. Results of tests that have been conducted that strong press concrete on the 14th and 21st days with strong results of the highest press obtained at a variation of C amounted to 5.10 MPa on the 14th and 5.25 MPa on the 21st day with a mixture of 0.6% plastic seeds and a 5% waste of the range. The result of the test has been conducted that strong press concrete on the 28th day with a strong result of the highest press obtained from A Variation of 12.43 MPa with a mixture of 0.5% plastic seeds and a 5% of the waste of the. For the results of the overall variation that meets the quality of concrete with a target of K-125 on the 28th day of the variation A of 12.43 MPa, variation B of 10.60 MPa, C Variation of 11.32 MPa, D Variation of 10.21 MPa.

Keywords :

Gypsum Waste Compressive Strength, Lightweight Concrete, Plastic Seed.

1. Introduction

Concrete is one of the constituent elements of most vital buildings ranging from the column, brick, paving until the road is made of concrete so that the use of concrete tends to be high. Concrete is often used as the main buffer material in a building then it takes good quality (Prayogo et al., 2019).

In some types of concrete, we recognize the presence of mild concrete. Light concrete is a concrete that is generally made of mild aggregates, where this lightweight aggregate is the aggregate with a maximum weight dry oven dried contents of 1100 kg/cm³. The weight of light concrete content ranges between 1360-1840 kg/cm³ and can be regarded as a boundary of the actual lightweight concrete, although its value sometimes exceeds (Siswoyo et al., 2017).

Concrete has its constituent materials, cement, aggregate, and water. However, in certain conditions requires another enhancer that is additive/admixture so that the concrete can be optimal. Cement, aggregate, and water are concrete constituent materials that can be obtained from nature by mined. If it is continuously needed, do not cover the possibility if the natural resources can be depleted even during a long period of time.

Now time time researchers have done various kinds of research with the aim of finding alternative materials to be used substitute elements in the concrete, one of which is to do the substitution or arguably mixing concrete constituent materials with other materials, such as mixing wood powder waste with fine aggregate or a mixture of plastic waste as a substitute for abrasive aggregate material.

Plastic has a difficult to decompose properties where plastic takes hundreds of years to be able to decompose perfectly (Teressa, 2017), there are some researchers who have already done research on plastic utilization substitution such as (Kusuma, 2019) "has researched that the maximum strong press rate occurs in the plastic composition of 0.4% at 11.91 MPa with an increase of 27.1% compared with the , (Supratikno & Ratnanik, 2019) "has researched that the most excellent mix portion is in processed aggregate plastic waste by 25% with a strong press of 10.14 MPa. Use of concrete structures that direct contact with sulfuric acid compounds will affect the strong quality of concrete press Karna sulfuric acid can make concrete into corrosion (Suhana & Asmayanti, 2015). Corrosion has been known for a long time and very harmful. The word corrosion is derived from the Latin *corrodere* which means metal destroyer or rusty (Supardi, 1997).

According to Hardjito (2007) cement production technology in Indonesia tends to wasteful energy and cause CO₂ emissions to contribute to global temperature rise. In connection with this, it is done research as an effort to find other sources as an alternative ingredient of cement substitute, in this case one of the alternative materials that can be used is the waste of the material obtained from industrial waste or construction so that it can be utilized into cement substitution material.

Based on the results of the explanation above then, the research is titled "Influence of Plastic grain substitution on fine aggregate and the substitution of the waste of the the plant in cement to strong concrete press".

2. Metodologi

The method of research is how to know something to find, develop or test the truth systematically, logically and empirically using scientific methods. Surahman, (2016), so in this research the authors will use the experimental method, which is to use ways to reveal causal relationships due to two or more variables through careful experiments.

At this time the sand is used for the mixture of concrete manufacture derived from Cimangkok, gravel derived from cigudeg, cement used cement type I, plastic seed used in the Polyproplane, the waste is derived from the waste of the home industry is taken in the region Cibinong. This research is conducted by using Mix Design which refers to the national standard that is SNI 03-2834-2000.

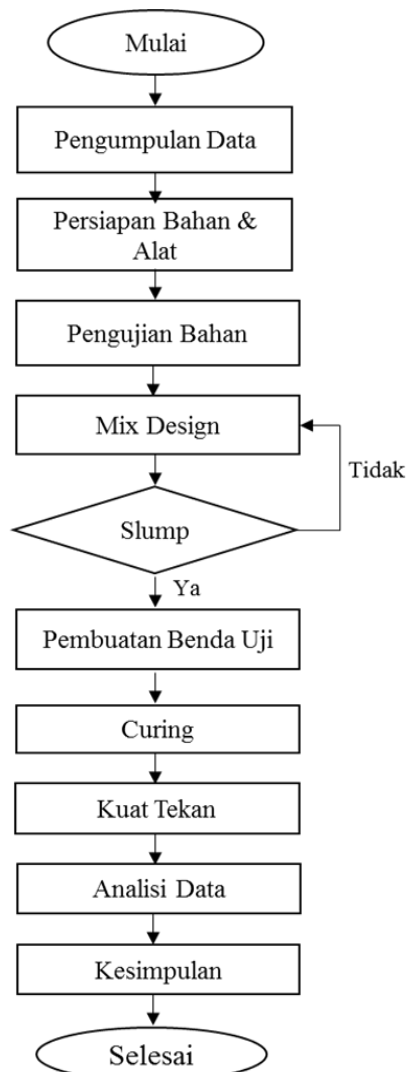


Figure 1. Flowchart
Source: Processed researchers

In the early stages of the study began with preparing the tools and materials to be used. For the next stage of preparation of tools that will be used in the laboratory is ensured in good condition and calibration has been done before, after the stage of preparation of the tool is completed carried out further testing on the matrial

material that will be used and continued with the planning of the calculation of mix design using Microsoft Excel software with calculations referring to SNI 03-2834-2000. Then do a trial mix and slump test. If the value of the slump test is in accordance with the planned then done concrete grafts using a cube diameter 15x15x15 cm. After the age of concrete for 24 hours, concrete will be opened from the mold and continued by curing the Eudora into a tub containing water. In this process concrete samples will be in the soak for 7, 14, 21, 28 days before the test carried out a strong concrete press, after the life of concrete is reached then concrete will be removed from the tub and then will begin a strong testing concrete press and will be obtained the strong data press its.

- a. Cement that will be used in this research is the cement Jakarta weighing 40 kg/zak where cement is a Portland cement type I.
- b. Sand Sands used in this research came from Cimangkok area.
- c. gravel that will be used in this study obtained from Cigudeg.
- d. The plastic beans used in this research use Polyproplane type (PP).
- e. The waste of the plant used in this research is derived from industrial waste in the area of Cibinong.
- f. Water used in this study is a water in the laboratory.

Table 1. Material needs to make 1 M3 of concrete

Materials	Kg/m ³
Cemen	375
Water	225
Fine aggregate	787
Gross aggregate	961

Place and Time

1. Place : This research will be conducted in the laboratory Wika Concrete Rapid train Jakarta-Bandung Plan Halim.
2. Time : This research will begin from June to July 2020.

3. Results and Discussion

3.1. Results of Plastic Seed Gradation Analysis

The following is the result of plastic grain gradation analysis with fineness modulus of 7.00.

Table 2. the result of plastic grain gradation analysis

Saringan	Berat Tertahan (gram)	Berat Bahan Kering : 500,0 gr			
		Jumlah Berat Tertahan	Jumlah Persen		Lewat
			Tertahan		
No. 4	0,00	0,00	0,00	100,00	0,00
No. 8	500,00	500,00	100,00	100,00	0,00
No. 10	0,00	500,00	100,00	100,00	0,00
No. 12	0,00	500,00	100,00	100,00	0,00
No. 20	0,00	500,00	100,00	100,00	0,00
No. 40	0,00	500,00	100,00	100,00	0,00
No. 80	0,00	500,00	100,00	100,00	0,00
No. 100	0,00	500,00	100,00	100,00	0,00
No. 200	0,00	500,00	100,00	100,00	0,00
PAN	0,00	500,00	100,00	100,00	0,00

FM = 7,00

3.2. Results of The Waste Gradation

Here are the results of the gradation of the waste of the, the fineness modulus 3.44.

Table 3. Results of the waste gradation

Saringan	Berat Tertahan (gram)	Jumlah Berat Tertahan	Berat Bahan Kering : 500 gr	
			Jumlah Persen Tertahan	Lewat
9.52 (3/8")	-	-	0,00	100,00
No. 4	10	10,00	2,00	98,00
No. 8	60,00	70,00	14,00	86,00
No. 10	40,00	110,00	22,00	78,00
No. 12	30,00	140,00	28,00	72,00
No. 20	90,00	230,00	46,00	54,00
No. 40	80,00	310,00	62,00	38,00
No. 80	90,00	400,00	80,00	20,00
No. 100	50,00	450,00	90,00	10,00
No. 200	30,00	480,00	96,00	4,00
PAN	20,00	500,00	100,00	0,00

Fineness Modulus 3,44

3.3. Results of Slump Test Scores

Here is the results of the slump test.

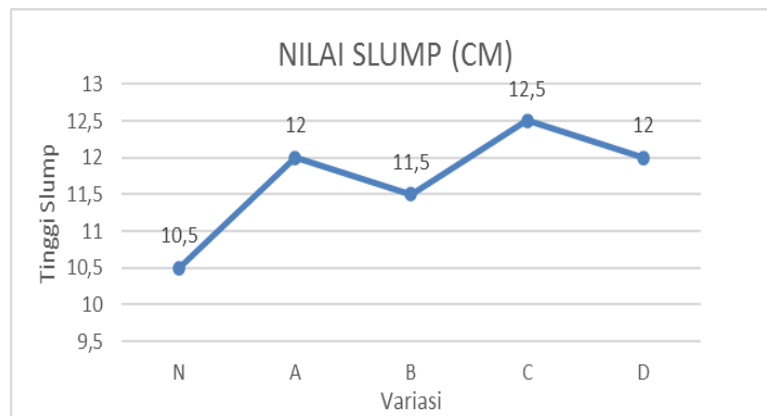


Figure 2. the results of the slump test

From the results of the slump test above with a target of 10 ± 2 cm, it is obtained the normal concrete value (N) of 10.5 cm, concrete with a variation of plastic beans 0.5% + The waste of A 5% (A) of 12 cm, concrete with a variation of plastic seeds 0, 5% + waste of a 10% (B), 11.5 cm, concrete with a variation of plastic beans 0.6% + waste of a 5% (C) of the amount of 12.5 cm, concrete with a variation of plastic beans 0.6% + waste of a 10% (D) of 12 cm.

3.4. Strong Concrete Press Test Result

Here are the results of strong concrete press testing:

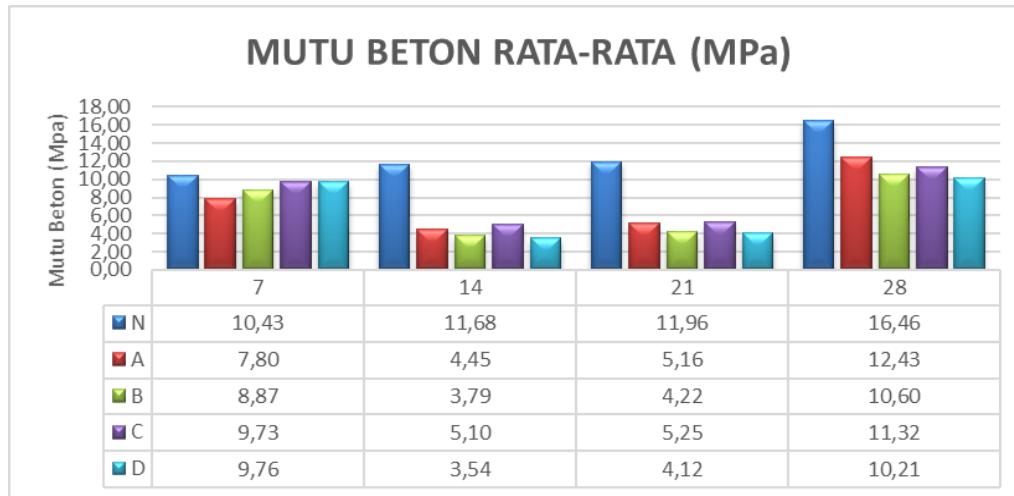


Figure 3. The results of strong concrete press testing

From the data of strong test result press overall variation then it is known that the highest press strong on the 7th day is a variation D with a mixture of 0.6% plastic seeds and the waste of the 10% of the range with strong press of 9.76 MPa, For Strong press high on the 14th and 21st days is a variation of C with a mixture of 0.6 plastic seeds and a 5% of the waste of the of the-5.25 5.10 , for the highest strong press on the 28th day is a variation A with a mixture of 0.5% plastic seeds and the waste of the 5% of the range, for the overall results of the variation that meets the quality of concrete with the target K-125 is present on the 28th day is a variation of 12.43 MPa, variation B of 10.60 MPa, variation C of 11.32 Mpa.

4. Conclusion

- The use of plastic beans are closed with a fine aggregate and the use of the waste of the power in the substitution with cement can be strong press.
- Results from the tests that have been conducted that strong press concrete on the 7th day with a strong result of the highest press obtained from a variation of D 9.76 MPa with a mixture of 0.6% plastic seeds and a 10% of the waste of the.
- Results of tests that have been conducted that strong press concrete on the 14th and 21st days with strong results of the highest press obtained at a variation of C amounted to 5.10 MPa on the 14th and 5.25 MPa on the 21st day with a mixture of 0.6% plastic seeds and a 5% waste of the range.
- Results of the test that has been conducted that strong press concrete on the 28th day with a strong result of the highest press obtained from A Variation of 12.43 MPa with a mixture of plastic seeds 0.5% and the waste of A 5%.
- For the overall results of the variation that meets the quality of concrete with the target of K-125 on the 28th day of variation A of 12.43 MPa, variation B of 10.60 MPa, C Variation of 11.32 MPa, D Variation of 10.21 Mpa.

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Biografi

Muhammad Galuh Firdaus is a student of the University of Mercubuana Bekasi with a civil Engineering study program. Before majoring in civil engineering, at the previous level of SMK Negeri 1 Cibinong, with the Department of Image Engineering, the author graduated from SMKN in 2015 then immediately went to study at the Bandung State Polytechnic in 2015, during the lecture of active writers as a member of the association. In the year 2017 the writer continued his education at the University of Mercu Buana Bekasi majoring in civil engineering, during the lecture of the writers once participated in the seminar event as a division of events. With this research the authors hope research can become something of learning and hope for the next study is well developed.

Agyanatha Tua Munthe was a lecturer from the University of Mercubuana Bekasi, Mr. Agyanatha had studied at Universitas Atmajaya Yogyakarta, majoring in civil engineering and graduated in the year 2004 with a bachelor degree in engineering. The father of Agyanatha continued his studies at the Gadjah Mada University in Yogyakarta, majoring in civil engineering and graduated in 2006 with the title of technical magisterial. In the years 2007 – 2010 Mr. Agyanatha worked at PT. INDALEX (MASPION GROUP) and served as a site engineer. PT. DUTA SARANA PERKASA (Dusaspun) in 2010 – 2013 served as Technical Sales Engineer M-System, PT CIPTA MORTAR UTAMA (CMU) in 2013 March-2013 December served as the wife. Manager of Technical External Development, then in 2014 – 2016 served as Jr. Manager Product Management. PT BOSTIK INDONESIA in 2016 – 2017 served as Senior Technical Consultant and Support Sales. PT. MASJAYA SEJAHTERA in 2017 until now serves as Project Manager.