UTILIZATION OF HVS WASTE PAPER AS A SIMPLE BRICK MIXING MATERIAL

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INTRODUCTION AND OBJECTIVE

Waste is a big problem everywhere, especially in developing countries. All waste, both organic and non-organic, can cause environmental pollution. HVS paper is paper that is commonly used in government, private, and school agencies. Its use is often not properly supervised. Errors in making documents due to writing errors, incorrect writing formats, or other problems that make us unknowingly turn waste or waste without any other use. The easiest way to get rid of HVS paper waste is to burn it. However, there are side effects arising from paper burning activities, namely air pollution.

According to Rahmadhon [4], paper concrete is a material made from a mixture of paper and Portland cement. The paper used is waste paper which is processed into pulp with the aim of facilitating the process of mixing the mixture. The pulp contains Silica Dioxide (SiO) 2.35%, Aluminum Oxide (Al2O3) 7.70%, Magnesium Oxide (MgO) 3.62%, Calcium Oxide (CaO) 56.38%, Ferric Oxide (Fe2O3) 1, 68%. Where these oxides are the basic ingredients to form cement clinker, such as Tricalcium Silicate (C3S), Dicalcium Silicate (C2S), Tricalcium Aluminate (C3A), Tetracalcium Aluminate Ferrite (C4AF). The more paper pulp that is mixed in the concrete, the smaller the weight or volume of the concrete, so that the concrete becomes lighter.

What if the existing research results are applied to brick making in accordance with SNI 03-0349-1989. Do the bricks with HVS paper waste still meet the standards required in SNI 03-0349-1989, especially with regard to water absorption and the compressive strength of the bricks?

The purpose of this research is to apply the manufacture of bricks with HVS paper waste and see the effect of adding HVS paper waste to the brick mixture in testing the water absorption and compressive strength of the bricks.

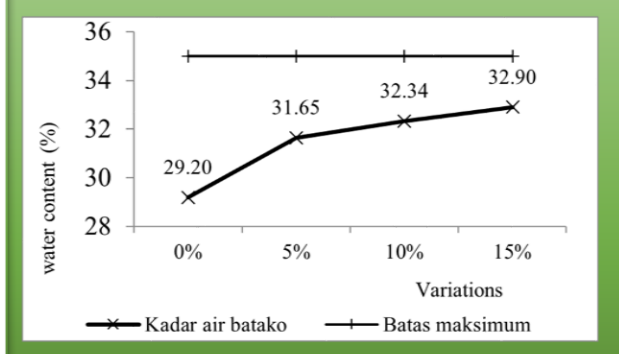
METHODS

1. The brick samples are planned with the basic ingredients for making bricks, namely Conch cement, Samboja sand, PDAM water, and HVS paper waste with variations of 0%, 5%, 10% and 15% by weight of the sand used.
2. The HVS paper waste used is HVS paper waste that has become pulp. Making HVS paper pulp is by cutting HVS paper into small pieces, then soaking it in water for 1 □ 24 hours. The soaked paper is then mashed with a mixer so that a really smooth pulp is obtained. To reduce excess water content, the pulp is squeezed first.
3. Planning for a mixture of bricks based on the Technical Guidelines issued by the Ministry of Public Works in 1986. Namely the ratios of cement, sand and water are 25%, 70% and 5%.
4. Method of making bricks, prepared and weighed according to the variations planned for each mortar. Then the ingredients are put one by one into the mixer and rotated until the mixture is evenly mixed. After that, the mixture is poured into brick molds. The compaction process is carried out by pressing or hitting with an iron stick in order to obtain solid and dense results. After that, the specimen is removed from the mold and placed on a flat surface.
5. The way to treat concrete bricks that have been printed is to store them in a place that is protected from direct sunlight and rain. The test object is placed in a place that does not absorb water and the top of the test object is covered with plastic.
6. To test the absorption capacity of bricks, the specimens are soaked in clean water at room temperature for 24 hours. Then the test object was removed from the immersion, and the remaining water was allowed to drain for ± one minute. Then the surface area of the test object is wiped with a damp cloth, to reduce excess water on the test object. After that the test object was weighed. Then the specimens were dried at 105 ± 5°C, until their weights were not different in the two weighings.
7. Testing of the absorption capacity of bricks was carried out at the age of 3 days with a total of five specimens for each variation.
8. For testing the compressive strength of bricks, the specimens are placed on a pressing machine with an adjustable pressing speed. The speed of suppression from the start of giving the load until the test object is destroyed. The compressive strength of the specimen is calculated by dividing the maximum load when the specimen is crushed by the gross compressive area.
9. The compressive strength of bricks was tested at the age of 7, 14 and 28 days.
10. The number of test objects for each variation is 5 test samples.
11. The planned brick is of class II quality, namely 70 kg/cm2.
12. The total number of specimens made in this study was 80 specimens, with details of 20 specimens for absorption testing and 60 specimens for compressive strength testing.

RESULTS

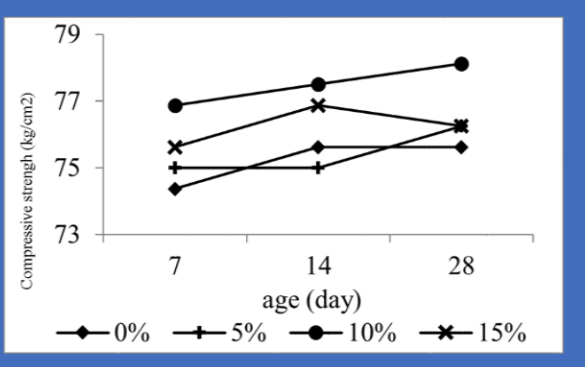
Table 1 Brick composition

Variation (%)	Sand (kg)	Cement (kg)	Water (lt)	Paper waste (kg)
0	84	30	6	0
5%	84	30	6	4,2
10%	84	30	6	8,4
15%	84	30	6	12,6



Picture 1 Brick Absorption Test Results

The greater the amount of HVS paper used, the greater the brick's water absorption capacity. This is due to the high water absorption capacity of HVS paper. However, of all variations of the brick test specimens, the absorption capacity of the bricks was still within the limits required by SNI 03-0349-1989, namely a maximum of 35%.



Picture 2 Graph of brick compressive strength testing for each variation

Based on the results of the analysis, the addition of HVS paper to the brick mixture can increase its compressive strength. The addition of HVS paper will be more effective in increasing the compressive strength of bricks at a variation of 10% by weight of sand.

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RESUME CONCLUSIONS

HVS paper waste can be used in a mixture of bricks. With variations in the addition of HVS paper waste 0%, 5%, 10%, and 15% by weight of the sand, it was found that the water content of the bricks increased as the HVS paper waste was added. This happens because apart from sand, HVS paper is also a material that easily absorbs water. However, the addition of water content in the bricks still meets the requirements of SNI 03-0349-1989 concerning concrete bricks for wall pairs, which requires the maximum water content of class II bricks to be 35%.

The addition of HVS paper waste to the brick mixture can actually increase the compressive strength of the bricks. From the addition of HVS paper waste with variations of 0%, 5%, 10%, and 15%, it was found that the highest quality of bricks was achieved in bricks with a variation of 10%. When compared to bricks without HVS paper or 0% HVS paper waste, the compressive strength of 5% and 10% HVS paper waste bricks is 0.83% higher and 10% HVS paper waste bricks are 3.31% higher.