A Comparative Analysis of the Quality of Concrete Blocks Produced from Coconut Fibre, Oil Palm Empty Fruit Bunch, and Rice Husk as Filler Material

Background

- The accumulation of coconut fibre (CF), oil palm empty fruit bunch (OPEFB), and rice husk (RH) every year can reduce the fertility of the soil and water absorption, and causes soil and water acidification. Much of the husks produced from the processing is either burnt in open air for heat or being sent to land fill as a waste. However, both methods are creating enormous CO2 emission to the atmosphere. This causes the environmental problem to disposal due to its abundance.
- One of the effort to overcome this problem is by using the waste as a filler material for concrete blocks. This effort is in line with the Increasing demand of the building materials that had come into concern of public and related industries.
- A comparative study of the quality of concrete blocks produced from OPEFB, RH, and CF as filler material based on the Indonesian National Standard (SNI) was discussed in this research.

Sand

Cement

OPEFB

RH

CF

Water

Concrete Blocks Mixes

Mold

OPEFB

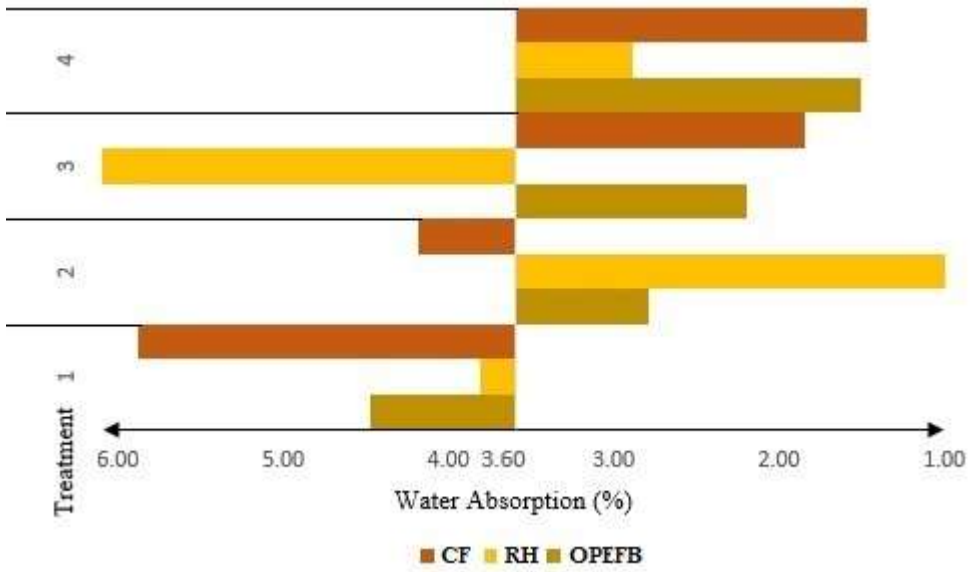
RH

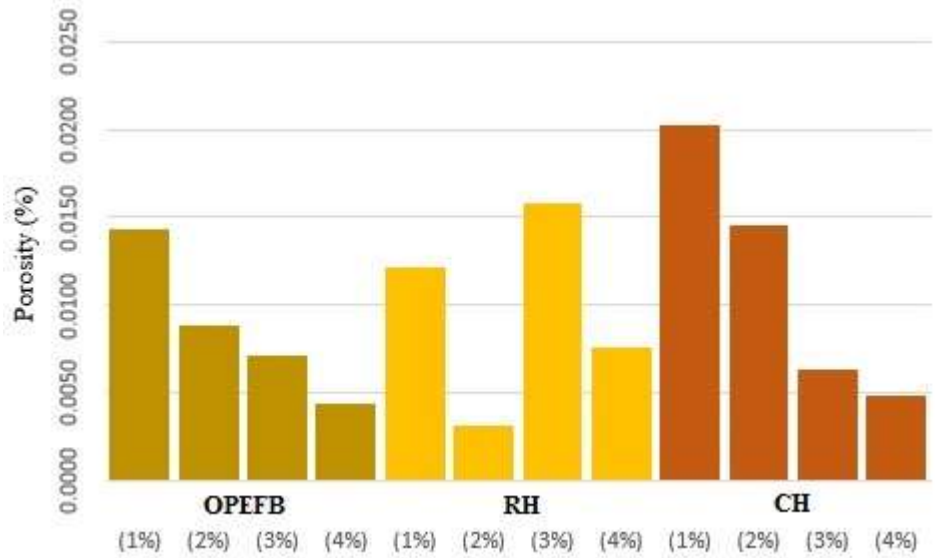
CF

Design of concrete mixes

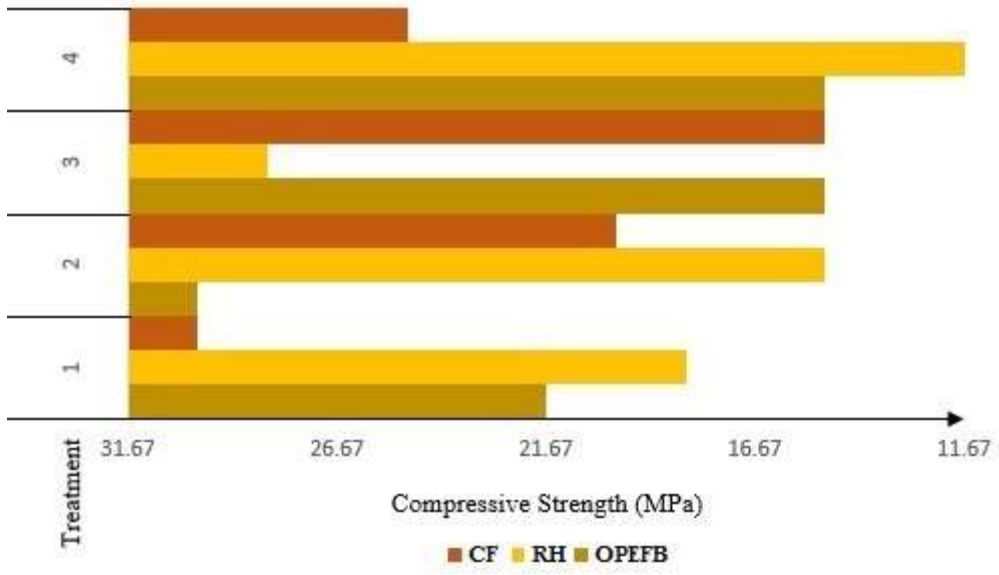
Treatment	Waste (% of sand)	Waste (Kg)	Cement (Kg)	Sand (Kg)	Water (Kg)
Treatment 1 (control specimen)	0	0	0.555	2.775	0.37
Treatment 2	1	0.028	0.555	2.747	0.37
Treatment 3	2	0.056	0.555	2.72	0.37
Treatment 4	3	0.083	0.555	2.692	0.37
Treatment 5	4	0.111	0.555	2.664	0.37

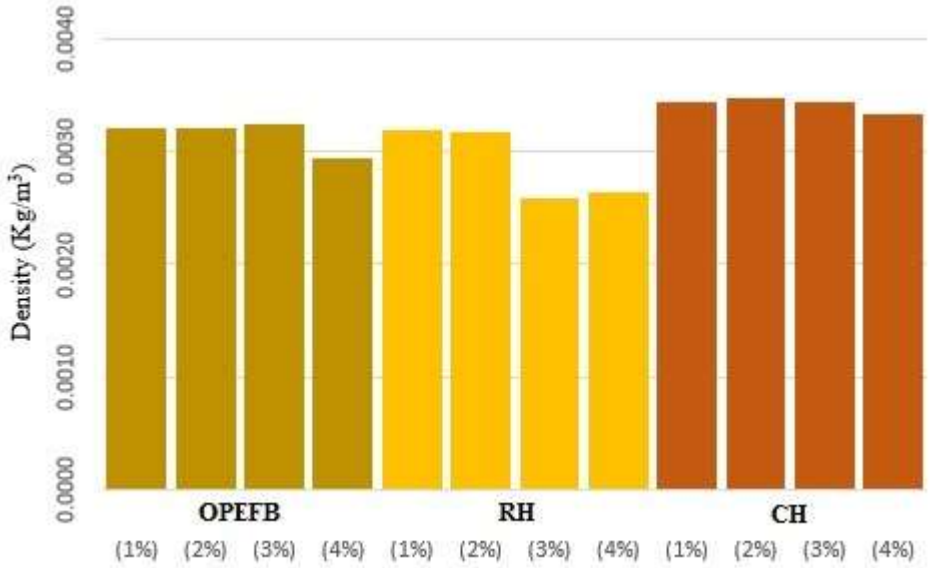
The water absorption and porosity among CF, RH, and OPEFB





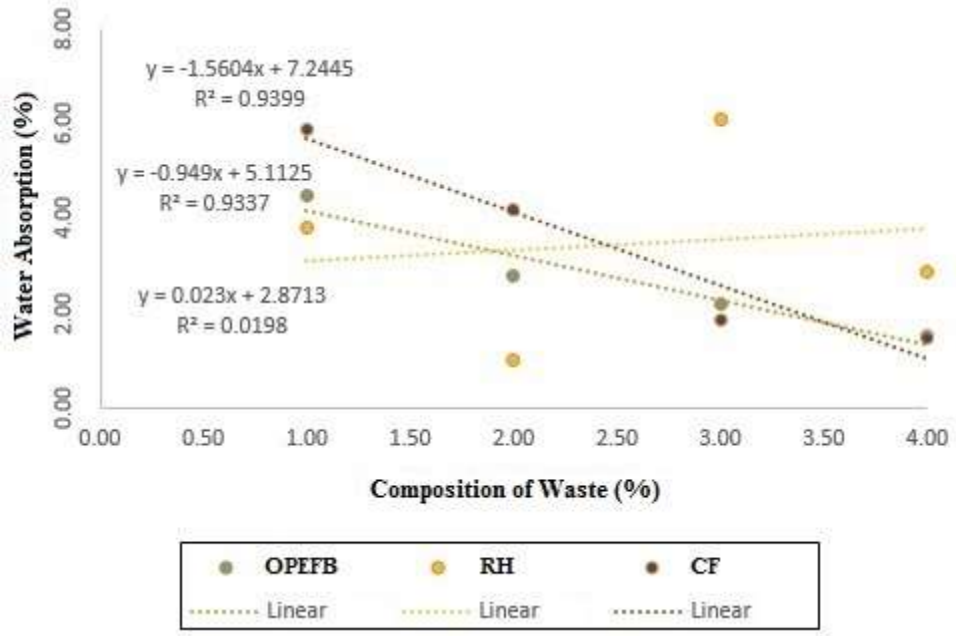
The compressive strength and density among CF, RH, and OPEFB

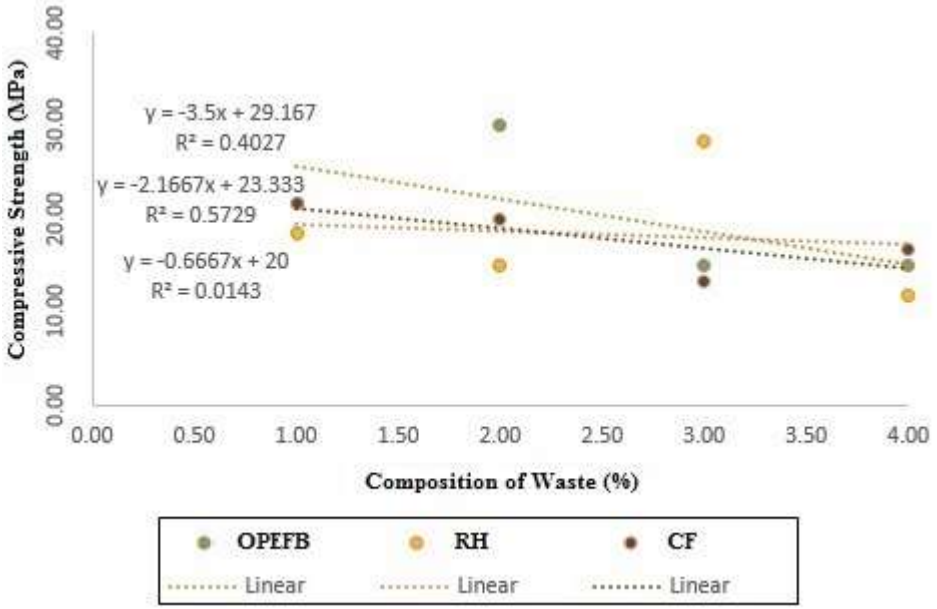




Statistical Analysis

Correlation between composition of waste on water absorption and compressive strength





Completely Randomized Designs (CRD)

- There are no significant differences of OPEFB composition variation on the water absorption with calculated F (2.386) < table F (4.066) and the compressive strength with calculated F (2.355) < table F (4.066) for a significance level of 5% ($\alpha = 5\%$).
- There are a significant differences of RH composition variation on the water absorption with calculated F (32.023) > table F (7.591) for $\alpha = 1\%$ and also for RH composition variation on the compressive strength with calculated F (4.148) > table F (4.066) for $\alpha = 5\%$.
- There is a significant difference of CF composition variation on the water absorption with calculated F (33.644) > table F (7.591) for $\alpha = 1\%$. Whereas there is no significant difference of CF composition variation on the compressive strength with calculated F (0.937) < table F (4.066) for $\alpha = 5\%$.

Least Significant Different (LSD)

- LSD calculations is used based on the results of completely randomized designs, if the results revealed that there is a significant difference between means of waste composition on the water absorption and compressive strength, then LSD can be used, and vice versa.
- LSD analysis revealed that treatments of RH for composition of waste 1%, 2%, and 3% are good treatments according to the compressive strength on SNI 03-0691-1996. Treatment for composition of 1% included in category B, while for composition of 2% and 3% in category C.
- The best treatment for RH with composition of waste of 2% and treatments of CF with composition of 3% and 4% included in quality A based on water absorption level on SNI 03-0691-1996. In context of waste management, the more waste can be recycled, the more amount of waste can be reduced, therefore, the best treatment for CF is with composition of 4%.

Conclusion

- The results revealed that the quality of concrete blocks with the composition of CF (1% and 2%), OPEFB (1% and 2%), and RH (1%) meet the requirements of SNI 03-0691-1996 criteria in category B for parking paver and the maximum composition of each waste materials (3% and 4%) still comply with SNI 15-2094-2000 in class 100 and 150 for the block walls.

- Statistical analysis revealed that the best treatments for compressive strength was RH (1%) and for water absorption it was RH (2%) and CF (4%).

THANK YOU FOR YOUR ATTENTION