

# DEVELOPMENT OF OIL PALM RUSK ASH USED AS POSSIBLE COMPONENTS INTO BLENDED CEMENTS

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## ABSTRACT

The main objective of this research is to investigate the use of waste material as a partial cement replacement in concrete. The palm oil husk ash is considered as a waste material derived from the manufacture of oil palm, and has been selected as the cement replacement material for this study. The concrete mixture with this palm oil husk ash as a partial cement replacement material has been investigated to identify the engineering properties.

For engineering, concrete specimens of 100mm x 100mm x 100mm cubes and 100mm x 100mm x 500mm prisms were cast in accordance to relevant British Standard and the mix proportion following the method proposed by the Environment Department of United Kingdom. Various engineering parameters were studied which include compressive strength, flexural strength, and density.

From the result of laboratory test, the engineering properties of concrete with palm oil husk ash as a partial cement replacement compared well with the conventional concrete, thus revealed that this waste material from the oil palm production has a great potential to be used as a building material in the future building industry.

**Keywords:** concrete, cement, cement replacement

## Result and Discussion

### *Compressive Strength*

The compressive strength results are given in Tables 1 and illustrated in Figure 1. Concrete with palm oil husk ash generally had lower strength than normal concrete at early ages, but the difference reduced towards 28 days. At 90 days, Concrete with palm oil husk ash had higher strength than normal concrete.

Table1 : Compressive strength concrete with palm oil husk ash as a cement replacement

Specimens	Concrete grade	Compressive Strength (MPa)					
		Age (days)					
		3	7	14	28	90	180
0%	30	23.47	26.63	33.64	37.58	41.71	42.03
5%	30	19.90	21.76	26.69	30.49	37.37	42.31
10%	30	17.87	18.54	20.31	24.01	30.62	41.21
20%	30	15.31	17.49	20.14	24.69	32.01	42.33
50%	30	10.99	12.2	16.51	19.52	25.09	35.62

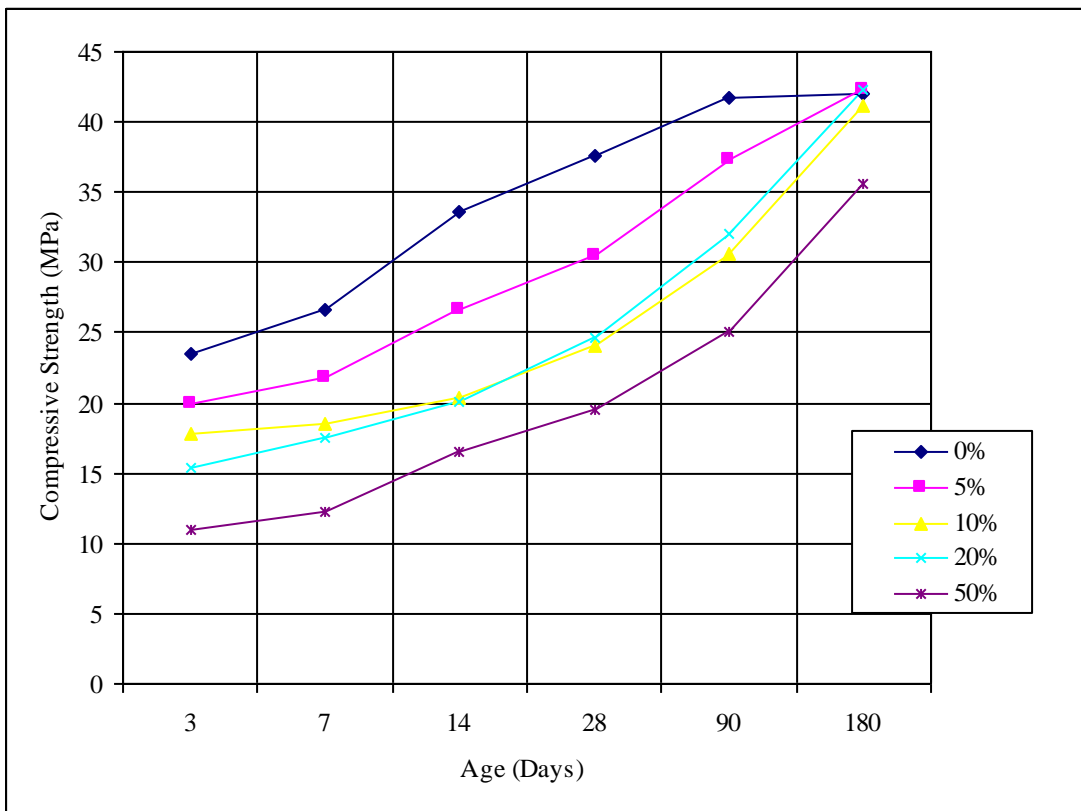


Figure 1: Compressive strength concrete with palm oil husk ash as a cement replacement

### *Flexural Strength*

The flexural strength results are given in Tables 2 and illustrated in Figure 2. Concrete with palm oil husk ash generally had lower strength than normal concrete at early ages, but the difference reduced towards 28 days. At 180 days, Concrete with palm oil husk ash had higher strength than normal concrete.

Table 2 : Flexural strength concrete with palm oil husk ash as a cement replacement

Specimens	Concrete grade	Flexural Strength (MPa)					
		Age (days)					
		3	7	14	28	90	180
0%	30	23.47	26.63	33.64	37.58	41.71	42.03
5%	30	19.90	21.76	26.69	30.49	37.37	42.31
10%	30	17.87	18.54	20.31	24.01	30.62	41.21
20%	30	15.31	17.49	20.14	24.69	32.01	42.33
50%	30	10.99	12.2	16.51	19.52	25.09	35.62

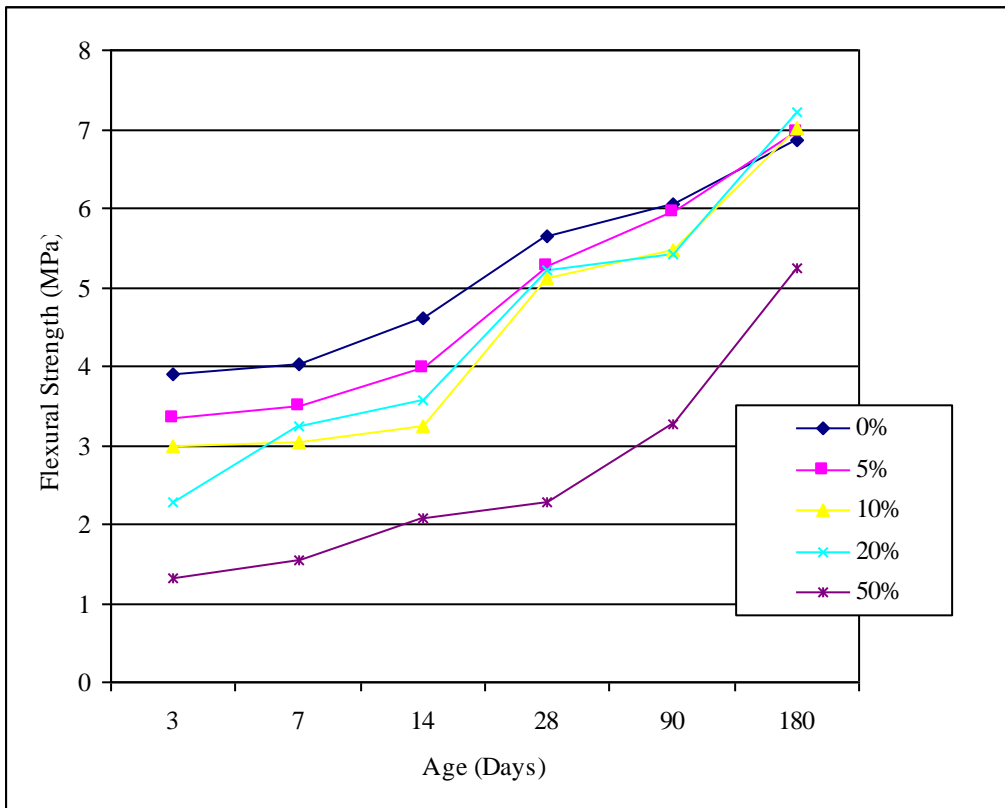


Figure 2: Tetnsile strength concrete with palm oil husk ash as a cement replacement

### Density

The density results are given in Tables 3 and illustrated in Figure 3. Concrete with palm oil husk ash generally had lower strength than normal concrete at early ages, but the difference reduced towards 14 days. At 28 days, Concrete with palm oil husk ash had higher density than normal concrete.

Table 3 : Density concrete with palm oil husk ash as a cement replacement

Specimens	Concrete grade	Density (kg/m <sup>3</sup> )					
		Age (days)					
		3	7	14	28	90	180
0%	30	2352.2	2381.4	2391.3	2397.2	2397.5	2459.6
5%	30	2310.7	2345.7	2405.7	2429.3	2488.7	2488.9
10%	30	2384.7	2390.4	2409.1	2417.6	2425.2	2467.2
20%	30	2390.4	2384.7	2404	2411.6	2425.6	2436.5
50%	30	2342.8	2334.8	2335.4	2363.4	2376.3	2382.7

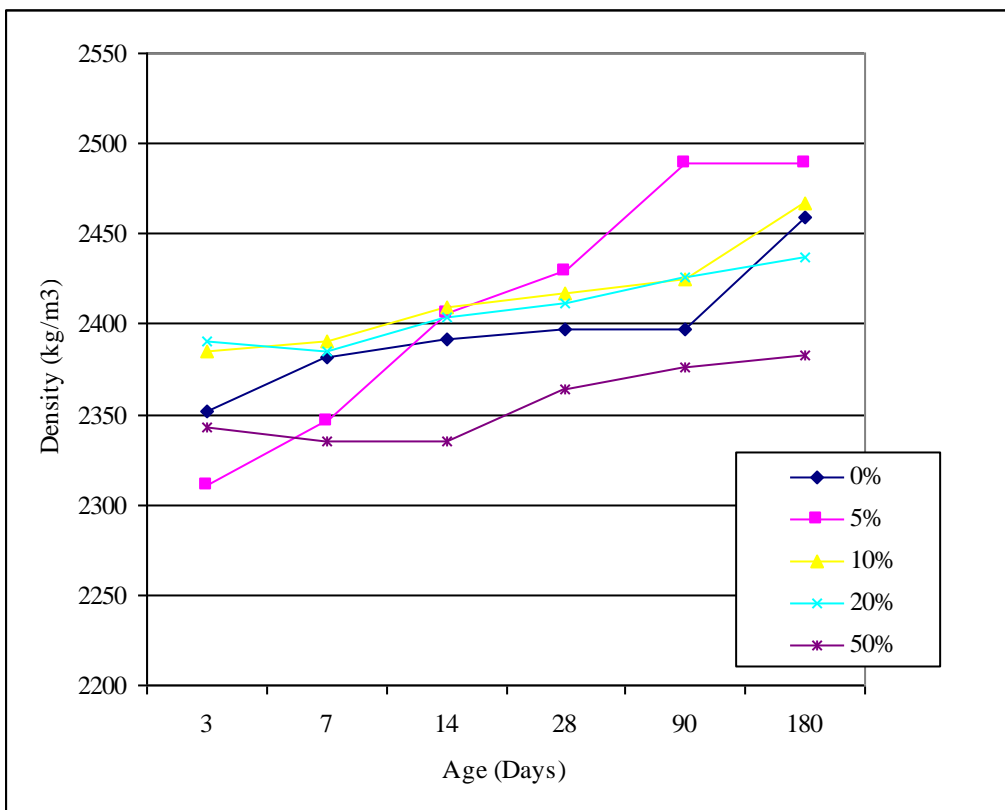


Figure 3: Density concrete with palm oil husk ash as a cement replacement

### Conclusions

Palm oil husk ash has been shown to be highly reactive when used as a cement replacement material. From the results, the ideal level of percentage of cement replacement is 20%.

## References

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