

Concrete Sludge of Batching Plant (CSBP) As Recycled Material in Concrete

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ABSTRACT

Key players of construction industries prefer to use ready-mix concrete as one of the supplied materials for their projects. In conjunction with this, production of fresh concrete from batching plants is increasing consistently as the development of construction industries. Unfortunately, more than 8 tons of fresh concrete waste can be produced and return to the batching plants. In addition, most of the batching plants dispose the concrete waste on the ground or discharging them at the landfill. Thus, this research aims in correlating the strength response to the contribution of Concrete Sludge of Batching Plant (CSBP) as recycled materials and additives in the manufacturing of concrete. In this study, the different replacement levels in percentage of CSBP which are 0%, 10% and 20% to cement weight were adopted. The compressive strength of concrete specimens was performed in accordance with the BS EN 12390: 2009. The result revealed that the compressive strength of the CSBP concrete with 20% cement replacement is observed to gain the strength comparable than those of control specimens by the value of 41.6 N/mm² at 28 days of age. It can be confirmed that CSBP concrete can be used as the potential of recycled material in the conventional concrete to support the green and sustainable approach in construction industries and to solve the issues of overloaded concrete sludge produce by batching plant.

KEYWORDS: Batching Plant, Concrete Sludge, Construction Waste, Recycled Material, Strength Performance

1 INTRODUCTION

In Malaysia, fresh concrete from batching plants commonly used for most construction projects. The production of fresh concrete from batching plants is in line with the increasing of construction development activities in this country. The increasing production of fresh concrete at batching plant, will keep increasing the amount of fresh concrete waste or as it is called concrete sludge. As the concrete sludge has a high potential to damage the environment, a method for the utilization of the returned ready-mixed concrete were presented throughout this study [1].

Toward this aim, an in-depth literature review was performed as a methodological approach. Thus, the main target during this research study is to create a new mix design concrete with Concrete Sludge of Batching Plant (CSBP). The CSBP will replace certain percentage amount of fine materials in common concrete mix design. The Uniaxial Compressive Strength Machine (UCS) will be used to measure and compare the compressive strength value of normal concrete with new concrete with CSBP. According to the compressive strength result, the potential application of concrete with CSBP will be recognized for civil engineering purpose. Then, the issues of overloaded sludge at the landfill will be reduced.

2 OBJECTIVE

The objective of the research is to determine the compressive strength value of concrete that contains CSBP. Hence, to identify its potential to be used in civil engineering industries.

3 SIGNIFICANCE (S)

The concrete mix is designed as a conventional concrete because through the comparison that have been made, it shows the potential of the recycled concrete to be use in any of the civil engineering construction industries as a green and sustainable approach [2]. Furthermore, this study will help the batching plant to reduce or to prevent the discharge of concrete sludge to the landfill and yet to expand the management of construction waste environmentally.

4 METHODOLOGY/TECHNIQUE

Study in 2015 shows that concrete that contain 15-30% of recycled fresh concrete waste is ideal for producing normal strength concrete [3]. Thus, in this study, 10-20% of fine aggregates was replaced as the recycle aggregates and the strength was compared with the normal concrete [4]. The concrete mix also is designed as a conventional concrete which to be achieved 30 N/mm² of compressive strength at the age of 28 days because through the comparison that will be made, it can show the potential of the recycled concrete to be use in any of the civil engineering construction industries as a green and sustainable concept.

5 RESULT

The development of the compressive strength of concrete mixtures containing different replacement level of CSBP is illustrated in Fig. 1. On the day 1, the 10% CSBP concrete shows a growth of compressive strength compare to the 20% CSBP concrete. However, through days 7 until days 28, the compressive strength of 20% CSBP produces similar value compare to the control sample. On the other hand, 20% CSBP concrete has achieved its design compressive strength as early as days 7. The compressive strength at days 28 for 10% CSBP concrete was 37.3 N/mm² compare to the 20% CSBP concrete which was 41.6 N/mm². The presence of 10% - 20% CSBP produces a significant development of strength and 20% CSBP achieves the highest rate of compressive strength and comparable with control mix up to 28 days of curing by the value of 41.6 N/mm². This result shows good performance for the incorporation of CSBP in concrete mixes that might be attributed to the high value of pozzolanic reactivity of CSBP.

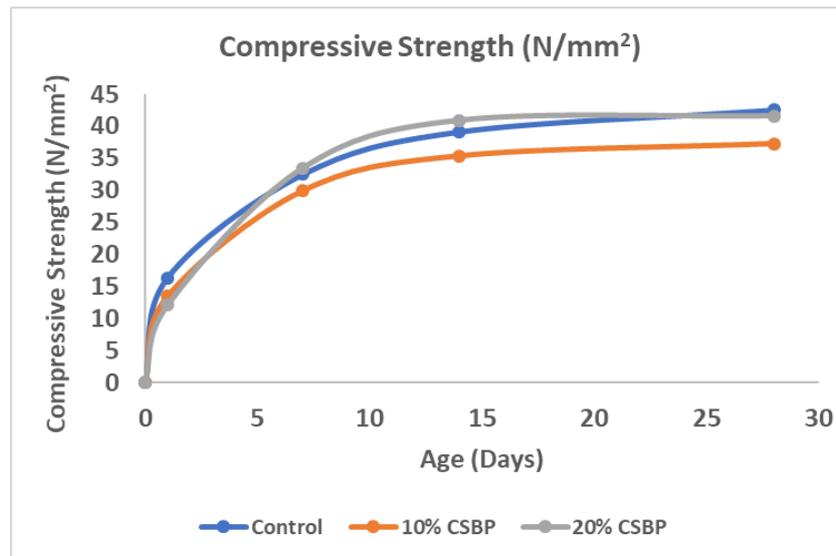


Fig. 1: The Compressive Strength Development of Concrete with CSBP Content.

6 CONCLUSION

In conclusion, the replacing proportion of cement with CSBP up to 20% is found to be a factor towards compressive strength. By blending of CSBP, concrete mix exhibited favourable and equivalent compressive strength than those of control specimens. In addition, the CSBP can be use as the potential of recycled material in the conventional concrete to support the green and sustainable approach in construction industries. Therefore, the selection of suitable methods of recycling the waste concrete sludge from batching plant can save and enhance the sustainability of the overall environment and affect society in a good way.

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