Effect of POFA fineness on durability of high strength concrete

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Palm oil fuel Ash (POFA) a waste from palm oil mill was used as the sole partial cement replacement material in a high strength concrete. An ordinary Portland cement concrete mix termed (PO) and two POFA concrete mixes with different fineness termed (POFA 45 and POFA 10) at 20 % replacement by weight of cement were the specimens in this study. The compressive strength, acid and chloride resistance of concrete were investigated. It was found that POFA with the higher fineness presented a better strength and durability characteristics than the other specimens.

Keywords: POFA, waste, partial cement replacement, high strength concrete, durability.

In many developed countries, concerns on waste production, resource preservation and reduced material cost have focused attention on reusing solid wastes. Waste materials, when properly processed can meet certain design specifications of some constructions. So recovering useful materials from agricultural and industrial wastes not only offers environmental gains, but also helps preserve natural resources. It has therefore become necessary that the research efforts in using various types of solid wastes gain greater attention.

Malaysia is the world’s largest palm oil producer and is likely to maintain this position over the next one and half decade. Therefore, it will be producing palm oil fuel ash (POFA) in large quantities. POFA is produced by combusting pressed palm fibre and shells to generate electricity, and is disposed off as a landfill material causing environmental problems.

A previous study on POFA has highlighted that this ash being light and fine is easily carried away by the wind causing smog on a humid day. Fugitive POFA reduces visibility, creates traffic hazard and becomes a health hazard. However, using it in building products could help reduce the ash disposal. Thus, for lowering the environmental pollution, many researchers have tried to use POFA in concrete.

The work initiated by Malaysian researchers at the Faculty of Civil Engineering, Universiti Teknologi Malaysia has identified this ash as a pozzolanic material. A study elsewhere has also highlighted that this ash possess pozzolanic properties. Researchers have concluded that using up to 30 % POFA as cement substitute improves the strength and durability of plain concrete.

High strength concrete containing POFA have been studied for compressive strength, durability, sulphate resistance and drying shrinkage. Early investigation