

Optimization of Palm Oil Fuel Ash (POFA) Content as Cement Replacement Based on Strength and Porosity

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Abstract. The usage of agricultural waste in form of ashes as one of the constituent materials in concrete has been studied in recent years. Palm Oil Fuel Ash (POFA) is one of the largest agricultural wastes produced in Malaysia that contain high amount of silica with pozzolanic properties. The mass production of POFA are typically disposed to open area and in turn can generate environmental issues and health hazards. Due to the waste disposal problem, a number of initiatives have been done by utilizing POFA into various construction materials including as substitute to Ordinary Portland Cement (OPC) in concrete production. This paper discusses on the water absorption properties and compressive strength of concrete by utilizing POFA in several series of cement replacement. OPC was replaced by POFA at 2.5%, 5%, 7.5% and 10% in these series of mix design. Control OPC concrete sample was also prepared for comparison. The samples were prepared in 100 mm cubic moulds and tested for compressive strength and water absorption for 7, 14 and 28-day curing ages. Three replicates were prepared for each concrete mix and for each test conducted. The results stipulated that the higher percentage of POFA replacement decreased the compressive strength and increased the water absorption amount of concrete mixture over different concrete ages.

Introduction

Malaysia is one of the largest palm oil producers in the world, with approximately 41% of world palm oil production and 47% of world exports, according to Malaysian Palm Oil Council (MPOC) [3]. One of the agricultural waste used in concrete is Palm Oil Fuel Ash (POFA) [1]. According to [2] POFA is one of the largest agricultural wastes produced in Malaysia that contain high amount of silica and high pozzolanic reaction. Therefore, agricultural waste may have the potential to be utilized and used as a replacement material especially for construction industry in order to reduce environmental problems that derives from the excessive amount of waste production.