Abstract

This research studied the effect of concrete containing admixture when mixing with sludge water from ready-mixed concrete plants, which are Italian-Thai industry complex, Asia Concrete Products Co., Ltd. and TPI Concrete Co., Ltd. The testing admixtures consist of fly ash, superplasticizer (ASTM C494 type F), waterproof admixture (ASTM C494 type A) and water reducing and retarding admixture (ASTM C494 type D). The testing procedures were as follow, 1) Testing the basic properties of relevant materials which are aggregate, cement, water, sludge water, sludge powder, fly ash and chemical admixtures. 2) Determine the optimal total solids content of sludge water by testing of cement paste mixing with sludge water. The vary constant of testing is the percentage of total solids content in sludge water of between 0.5%, 2.5%, 5%, 7.5%, 10%, 12.5% and 15%. 3) Testing concrete mixing with sludge water having a total solids selected from step 2. The concrete testing of both fresh and harden states are workability, water content in mix proportion, unit weight, air content, slump loss, compressive strength, flexural strength, modulus of elasticity, length change, water permeability and chemical resistance.

Basic properties testing results of material shown the specimens were passed the criteria of standard. The chemical contents of sludge water from 3 factories were in range of ASTM C94. The chemical proportion of sludge powder was between of cement type I and fly ash, but sludge powder has more loss of ignition value. The XRF and XRD method give a similar result of chemical proportion of sludge powder but the XRF method has more practically for sludge powder testing. The magnified picture of sludge power shown sludge powder consisting of small particle of aggregate, fly ash and hydration products and the surface of particles were rugged and small cavity. The average size of sludge powder was bigger than cement type I powder. Testing results of cement paste mixing with sludge water shown that total sold contents of sludge water effects to compressive strength of 7 days-age and setting time. The specimen having a total solid contents of range 52,700 to 61,300 mg./l. have testing results passing the standard criteria of ASTM C94.

Testing results of concrete testing with this research criterion shown the specimen mixing with sludge water containing total solid content of range 51,200 to 57,534 mg./l., were less of concrete workability resulting in requiring more water content in mix proportion, decreasing unit weight and air content, accelerating the setting time, reducing the mechanical and durability properties of concrete. Dosage of chemical admixture recommended by the manufacture was affected by sludge water resulting in failing the criteria of ASTM C494. Comparison of concrete mixing with sludge water between specimen of no admixture and specimen containing admixture shown the specimen containing admixture has better testing results.