



## Assessment of the compressive strength of concrete with considering two problems: kerosene polluted sand aggregates and Makran Sea water

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### **Abstract**

The leakage of oil products would result in contaminating the sands which are used in the concrete industry. In this study, the effect of sands contaminated with kerosene on the compressive strength of conventional normal weight concrete has been evaluated in two exposure conditions. Kerosene (0, 2, 4, 6 and 8%, by weight of sand) was used to contaminate sand to prepare concrete specimens. Produced specimens were submerged in clean potable water (CPW) and Makran sea water. To evaluate the effect of kerosene soaked environment on compressive strength of concrete, a number of 12 uncontaminated samples were immersed in kerosene. 11% strength reduction in uncontaminated samples immersed in sea water was shown. A reduction up to 27% in the concrete compressive strength was occurred in 2% kerosene contaminated samples in the both exposure conditions studied. Subjecting concrete to kerosene soaked environment was not significant, however using contaminated sand adversely affect the compressive strength of concrete. Careful attention in design and analysis of concrete that has been produced from kerosene contaminated sand (KCS) should be considered.

**Keywords:** Kerosene, Compressive strength, Concrete, Exposure conditions

### **1. INTRODUCTION**

The most commonly used material in the construction industry is Concrete. Concrete is a mixture of cement, water, fine aggregate and coarse aggregate, which hardens to a stone-like mass [1]. In addition to high strength, ease of production, low cost, good compatibility with other materials especially with steel, durability under aggressive conditions are some benefits of this material [2]. Among factors affecting the compressive strength of concrete are water/cement ratio, mix ratio, degree of compaction, type of cement, aggregate grade, design constituent, mixing method, placement, curing method and the presence of contaminants [3].

Over the last two decades, the incidents of oil leakage have been increased significantly. Leaking of hydrocarbon from crude oil products storing and transporting systems, oil piping vandalism, drilling and oil exploration activities are some reasons for hydrocarbon contamination [4]. Such continually leakage results in increasing the amount of hydrocarbon contamination in soil and the environment. Using such impacted soil in concrete construction would influence the concrete properties.

A number of researchers have investigated the effect of hydrocarbon impacted sand on different properties of concrete. Attom et al. [5] studied the effect of contaminated sand with two crude oil products, i.e. kerosene and diesel, on the compressive strength of conventional normal weight concrete. The crude oil products were added by different percentage including 0.5, 1, and 1.5% (by weight, dry basis) to contaminate the mix.

Ajagbe et al. [4] studied the effect of Crude Oil Impacted Sand (COIS) on the compressive strength of concrete. They produced 147, 100 mm concrete cubes (21 control and 126 contaminated samples) with concrete mix of 1:1.8:2.7 and w/c of 0.5. The compressive strengths of cubes were determined at ages 3, 7, 14, 28, 56, 84, and 168 days. In order to contaminate the sand, crude oil of 2.5, 5, 10, 15, 20 and 25% (by weight of sand) was used. Hamad et al. [6] investigated the effect of used engine oil on properties of fresh and hardened concrete. Diab [3] investigated the impact of used engine oil on the compressive strength of low- and high-strength concrete.