



## Experimental Investigation of the Densification Properties of Clay Soil Mixes with Tire Waste

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Received 07 October 2018; Accepted 19 January 2019

### Abstract

The annual increase in production of industrial wastes, including scrap tire, has created several challenges for societies. Incorporating the wastes as raw materials has been proposed in different industries, using waste tire as physical additives and investigating the geotechnical properties of this mixture can reduce the environmental pollution, as well as offering economic and technical benefits. Clay soils are abundant in southern regions of Tehran where scrap tire is also produced in large quantities every year. Therefore, provided the chance, incorporating these wastes into the soil mix is significant as regards both geotechnical properties and environmental considerations. As a fundamental means of investigation in construction activities, in particular road construction, the compaction test is useful in determining the maximum density and the optimum moisture content of the soil. In this study, considering that this research has not yet been investigated for Tehran clay and has environmental benefits while having engineering application, the optimum moisture content and maximum dry density of the clay mixed with two types of additives (waste tire powder and granules) at various mass fractions (2, 4, 6, 8, 10, 20, and 30 wt%) using standard compaction tests were investigated. The results suggested that the variations of the optimum moisture content and the maximum dry density in both clay mixes demonstrate a certain and predictable trend as the waste content increases. In other words, by increasing the percentage of waste in the mixture, the optimum moisture content is increased, and this increase in the mixture of the tire powder and clay is more than granule and clay. In addition, by increasing the percentage of waste, the maximum dry weight of the mixture was reduced, and this reduction in the mixture of tire powder and clay is almost higher than that of tire granule and clay. Furthermore, relations were presented to estimate the maximum density and the optimum moisture content of the mix to be applied in practice.

**Keywords:** Tehran Clay; Tire Powder; Tire Granule; Compaction; Geotechnical Properties; Environmental Geotechnics.

### 1. Introduction

Our inclination toward urbanization and automation increased the generation of all types of wastes including paper, tire, metals, glass, and plastic. There are different methods of waste control, among which are reusing, burning, and burying. Aside from some of these methods that are damaging to the environment, the industrial reuse of wastes is a notable approach in both technical and environmental terms, a subject which has been addressed by several researchers. Waste tire accounts for a large portion of wastes today and controlling and reusing it offers several environmental benefits [1].

Site investigation and site characterization for civil engineering projects is of great importance and has been studied by various researchers [2, 3]. After site investigation and site characterization as need, if the soil is not suitable for the

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 <http://dx.doi.org/10.28991/cej-2019-03091251>

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