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An Experimental Study on the Effect of Tire Powder on the Geotechnical Properties of Clay Soils

Davood Akbarimehr [a], Esmael Aflaki [b*]

[a] PhD Student, Department of Civil and Environmental Engineering, Amirkabir University of Technology, Tehran,Iran.

[b] Associated Professor, Department of Civil and Environmental Engineering, Amirkabir University of Technology, Tehran, Iran.

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Abstract

With respect to the increasing production of tire wastes, the use of these wastes as an additive in civil engineering has always gained attentions of researchers due to their positive effects on material properties and reduction of environmental problems. Clay soils, as problematic soils, have always caused geotechnical problems including high Atterberg limits and consequently low workability. Tire powder, as one of the products of tire wastes, lacks clay cohesion and it can be effective in altering the plasticity of clay soils. As no comprehensive study has been conducted in this regard specifically on Tehran clay soil yet, this research studies experimentally the effect of adding different percentages of tire powder to clay soil at the Atterberg limits of clay soils with two different types of plasticity. More over according to previous studies, the effect of tire powder on other geotechnical properties of clay soils and the advantages and disadvantages of using tire powder in clay soils are discussed. The results indicate that addition of tire powder to clay soils has positive effects on reducing the Atterberg limits, increasing efficiency, and improving resistance, permeability, swelling reduction, and settlement properties, and reducing soil density and it can be used as an additive in improving clay soils.

Keywords: Tehran Clay; Waste Tire; Atterberg Limits; Geotechnical Properties.

1. Introduction

Urban life and its development have led to the production of abundant wastes. Production of wastes and consequently the environmental problems caused by their control and disposal are among the world issues. There are different methods to control the wastes including burying wastes in landfills, burning, separating, and reusing them. Some of the methods, including burial of wastes may lead to very adverse environmental impacts such as environmental pollution and occupation of the lands suitable for agricultural and industrial activities. One appropriate method to control wastes is their reuse in various industries; it reduces the volume of final waste and realizes sustainable development objectives. With the increasing development of urban and interurban transportation, waste tires are considered one of the waste, which have caused many problems, especially from an environmental point of view for human societies, and controlling the pollution caused by them is significant [1].

Soil improvement to improve the physical and mechanical properties of soil has always gained attentions. In these methods, soil properties are evaluated using necessary tests and field tests if necessary. If soil geotechnical properties fail to meet the requirements of a proper design, improvement methods will be applied in the next step to improve its properties. There are several methods for improving soil properties including the use of piles, chemical grouting, micro piles, physical and chemical methods, compaction, and dynamic compaction [2]. Selection of an improvement method depends on soil type and the required geotechnical properties of soil. Physical and chemical methods are of the best

* Corresponding author: eaflaki@aut.ac.ir

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