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Processing and AVO Analyses of Marine Reflection Seismic Data from Vestfjorden, Norway

Octavio García Moreno

INSTITUTIONEN FÖR
GEOVETENSKAPER

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About 20 reflection seismic lines were recorded in Vestfjorden, near Lofoten, Norway in 1973. Line B-20-73 was shot across strike in the southern part of Vestfjorden and shows a passive margin type basin of about 3km depth. A number of clear reflections are observed within the basin. In this project a reproduced section that was reprocessed in 1989 was done. After performing some improvements to the previous data processing, an AVO attribute analysis study was done. The purpose of these analyses was to obtain information on the physical nature of the reflecting interfaces. The resulting investigation was successful in some aspects. Although improvements were obtained, the resulting section wasn't accurate enough to execute a proper AVO analysis. Nevertheless, AVO analysis arrives to some important results.

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APLICACIONES GEOTÉCNICAS DE LOS NEUMÁTICOS FUERA DE USO TROCEADOS (NFUT)

POR

ING. OCTAVIO GARCIA MORENO

SUPERVISADO POR

Dra. María Teresa Mateos García

TESIS DE MASTER DE INGENIERÍA GEOLÓGICA

UNIVERSIDAD COMPLUTENSE DE MADRID

2008

María Teresa Mateos García
Dra. Geología, Master en Ingeniería Geológica

CERTIFICA:

Que ha revisado el trabajo de investigación realizado por el Ing. Octavio García Moreno,

Madrid, 01 de Abril de 2008

Firmado: María Teresa Mateos García

Resumen

Estudios realizados en Estados Unidos y Europa acerca de las propiedades geotécnicas de los Neumáticos Fuera de Uso Troceados (NFUT), han mostrado que estos representan una alternativa como relleno ligero para la obra civil, presentando ventajas técnicas, medioambientales y económicas. Especialmente resaltan su baja densidad y su alta permeabilidad, sin perder los requerimientos mínimos en cuanto a capacidad portante y resistencia, en comparación con los suelos granulares convencionales (arenas, gravas, etc.). Estas ventajas, los hacen idóneos para su utilización como relleno para terraplenes en zonas con cimientos inestables y sistemas de recolección de lixiviados de vertederos. Tras una compilación bibliográfica y ensayos geotécnicos de laboratorio, se diseñaron pruebas piloto a gran escala, cuya auscultación reveló detalles acerca de los parámetros tanto de diseño como constructivos de este tipo obras, adaptando así esta tecnología a la normativa y procedimientos habituales utilizados en España.

Abstract

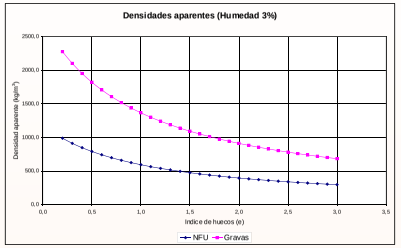
Studies conducted in the United States of America and Europe about the geotechnical properties of Shredded Scrap Tires (SST) have shown that they represent a good option as light weight fill for civil construction due to their technical, environmental and economic advantages. Particularly, stand out their low density and high hydraulic conductivity, without losing the basic requirements as regards bearing capacity and strength, in comparison with standard soils (sand, gravel, etc.). These advantages make SST especially suitable for their use in embankments with unstable foundation and landfill's leachate collection systems. Bibliographic compilation and geotechnical laboratory essays were followed by big scale pilot tests, monitoring of which revealed details concerning design and construction parameters as regards this type of public works, resulting in the adaptation to the Spanish regulations of this technology.

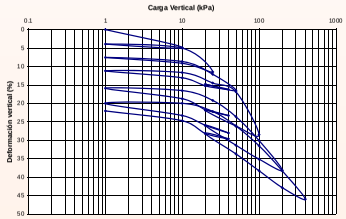
APLICACIONES GEOTÉCNICAS DE LOS NEUMÁTICOS FUERA DE USO TROCEADOS (NFUT)

REALIZADO POR: ING. OCTAVIO GARCIA MORENO

PROPIEDADES BÁSICAS

G_{NFU} = 1,15
w_{NFU} = 3%



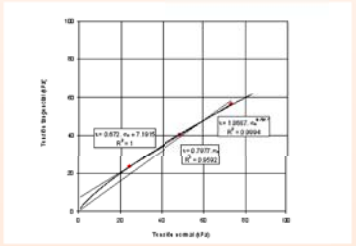


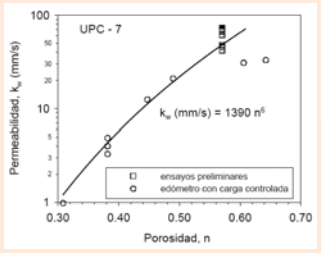
COMPRESIBILIDAD

C_C = 0,11—0,25
C_S = 0,11
C_R = 0,19

RESISTENCIA AL CORTE

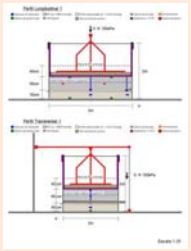
C = 7 kPA
Φ = 34º





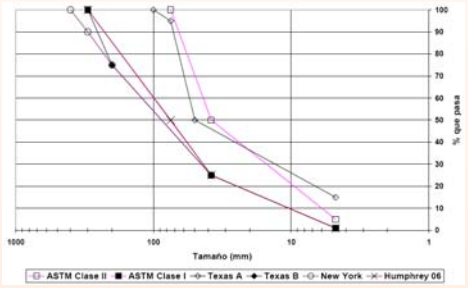
CONDUCTIVIDAD HIDRÁULICA

K = $5x10^{-6}$—$1x10^{-1}$ (M/S)
¿DARCY?

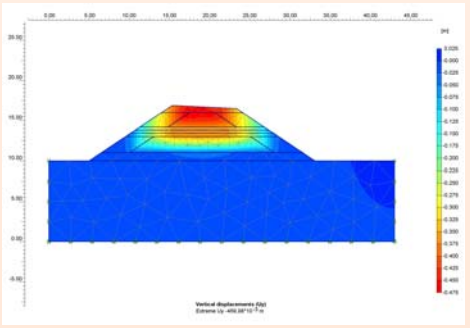


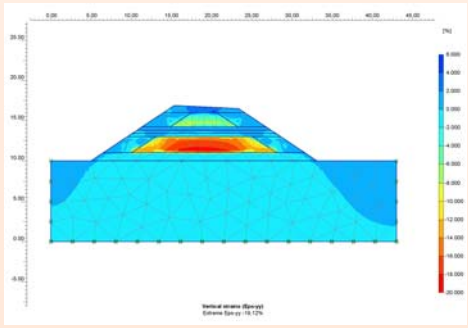
ASTM D6270:

- CAPAS MÁX 3M ESPESOR
- CUEBIERTA SUELO > 1,5M
- 4-6 PASADAS COMPACTADORA
- GEOTEXTIL DE PROTECCIÓN
- MATERIAL LIBRE DE IMPUREZAS



ANÁLISIS DE LA DEFORMACIÓN (MÉTODOS FINITOS)





COMPENSACIÓN DE TIERRAS: 2,5M^3 X METRO LINEAL (SECCIÓN TIPO I)

Use of tire derived aggregate in landfill's drainage systems

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ABSTRACT

Studies conducted in the United States of America about the geotechnical properties of Tire Derived Aggregate (TDA) have shown that they represent a good option as light weight fill for civil construction due to their technical, environmental and economic advantages. Particularly, stand out their low density and high hydraulic conductivity, without losing the basic requirements as regards bearing capacity and strength, in comparison with standard soils (sand, gravel, etc.). These advantages make TDA especially suitable for their use in landfill's drainage systems.

This paper includes a bibliographic compilation about this application. A state of the art has been completed after geotechnical laboratory essays and the design of big scale pilot tests. Some aspects regarded to the design such as deformability, lixiviate generation and clogging of the drainage system filled with TDA are shown, as well as the preliminary calculations of its long term performance.

Monitoring of the big scale pilot test will reveal details concerning design and construction parameters as regards this type of public works, resulting in the adaptation to the Spanish and European regulations of this technology.

The project budget is partially granted by the Environmental Ministry of Spain.

Keywords: tires, landfill, drainage systems

1 INTRODUCTION

Applications of the Tire Derived Aggregate (TDA) have become recently very attractive for civil construction due to their economical, environmental and technical advantages. This study is focused in their geotechnical advantages, especially their high hydraulic conductivity, which makes them particularly suitable for their use as drainage granular material within landfills drainage systems.

Several research projects regarded to TDA drainage properties have been developed in Europe and U.S.A., with the aim of reducing the landfill construction costs, especially in which concern to soils and groundwater protection. In particular, studies conducted by Humphrey, et al. (2003) and Jesionek, et al. (1998) concluded that due to the high hydraulic conductivity that TDA have shown in their experiments, they might be suitable for their use in landfills drainage systems.

In order to develop this technology in agreement with the Spanish regulations, bibliographic and laboratory research have been made, concluding with the design of a large scale prototype, which will simulate the actions occurring in a landfill leachate drainage layer. The prototype will reproduce the evolution of a landfill drainage system across its service life taking in consideration the possible worse circumstances and using very valuable information acquired from relative projects about TDA mechanical behavior, carried out by this research team (Mateos et al., 2008)

2 PREVIOUS RESEARCH ABOUT TDA HYDRAULIC CONDUCTIVITY

Hydraulic conductivity can be defined as a unit hydraulic gradient water flux under laminar conditions through a cross-plane unit area of a porous media at

Results from the construction of a road embankment with tire derived aggregate

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ABSTRACT

This paper shows the results obtained from the construction of a road embankment employing tire derived aggregates (TDA) close to Madrid. The embankment is about 100m long and between 2 to 10m high. It was built over fluvial sediment from Jarama river. In this case soil foundation deformation was considered negligible. The embankment was instrumented with two principal purposes: to measure the deformability of the TDA layers and their temperature.

Data obtained from the embankment auscultation were analyzed with a finite element model in order to obtain realistic values of the deformation modulus of TDA layers. This analysis shows that the settlement recorded in TDA layers of this embankment is similar to data published in previous works about this topic and also they agree with laboratory test results performed with the same material, simultaneously to this project, by the Geotechnical Laboratory of CEDEX (Ministerio de Fomento).

This project is partially granted by the Environmental Ministery of Spain.

Keywords: Tires, embankment, deformability, lightweight fill.

1 INTRODUCTION

The increase of used tire waste generation -about one tire per person and year- and the implementation of new regulations which forbide the disposal of tires either in municipal solid waste landfills or in debris landfills are the main causes of the rise in nowadays shredded tires management problems. Therefore, it seems important to develop environmentally safe applications in order to improve tire derive aggregate (TDA) management according to actual needs.

In that sense, geotechnical applications such TDA filled embankments and TDA backfilled walls seems to be reliable, due to two main advantages: they use a large amount of the waste –thousands of tons of residue may be employed in a single project- and, since they are lighter than traditional construction soils, they can substitute alternative and more expensive lightweight fill materials (expanded clay, polystyrene).

The TDA filled embankment construction have been extensively developed and applied in the State of New York (U.S.A.), meanwhile in other states such California, the initiative have been applied in a more restrictive way, focusing on solving embankments foundation problems in soft soils areas. These applications are based on a ASTM standard (D-6270), which includes recommendations on building methods, geometrical considerations of TDA layers and granulometry of TDA shredded tires. The resultant embankment is a kind of layered body filled with TDA and soil. The natural soils employed in this type of fill must also fulfill the requirements of this standard.

This paper shows some of the main results obtained from the construction of a TDA embankment in a road close to Madrid. This work belongs to a broad project granted by the Environmental Ministery of Spain which also includes laboratory testing and theoretical approaches. This project have been developed by the Polytechnic University of Catalonia (UPC), Acciona i+D and Iberinsa.