



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم



MONA MAGHRABY



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم



شبكة المعلومات الجامعية التوثيق الإلكتروني والميكروفيلم



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جامعة عين شمس التوثيق الإلكتروني والميكروفيلم

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Using Rice Husk Ash in Hot Asphalt Concrete Mixes

A Thesis

Submitted to the Public Works Department

Faculty of Engineering

Ain Shams University

For the Fulfillment of the Requirements of M. Sc. Degree

In Civil Engineering (Highways and Traffic)

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B.Sc. in Civil Engineering, July 2017

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DEDICATION

This work took a part of my life. I wish to dedicate this thesis to

My father's spirit

This thesis is dedicated to those who contributed to educating, encouraging and supporting me to be able to fulfill this work

To my Mother ...

To my Sister

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The author carried out the work included in this thesis, and no part of it has been submitted for a degree or a qualification at any other scientific entity.

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Abstract

Rice husk ash (RHA) is a by-product generated from burning the rice ash. As known, burning rice husk is one of the most environmental problems in Egypt. It has negative effects on human health and life. Burning rice husk is the main cause of what is called "black cloud", which has negative influences on the environment and human health.

Thus, in this study, RHA was used in asphalt mixes as a replacement of mineral filler to reduce limestone dust (LSD) consumption and improve the engineering properties of Hot Mix Asphalt (HMA). The main aim of replacing mineral filler is enhancing the performance of asphalt mixes and producing an economical asphalt mix. For this purpose, five different mixes were prepared. These mixes are, the control mix which has 0% RHA, while the other modified mixes contain 25, 50, 75 and 100% RHA as a percentage of the filler weight. Optimum bitumen content (OBC) was determined using Marshall test, also all Marshall parameters (Stability, Air Voids, Voids in Mineral Aggregate, Unit Weight and Flow) were examined. Indirect Tensile Strength Test (IDT) and Wheel Tracking Test (WTT) were conducted and their results were analyzed.

Dynamic modulus ($|E^*|$) is considered an important parameter used in mechanistic-empirical pavement design. The $|E^*|$ is measured at different temperature/frequency combinations. Dynamic modulus ($|E^*|$) and phase angle (δ) are used for the visco-elastic characterization of HMA. Thus, these properties were measured for mixes with and without RHA. The results indicate that RHA has the potential to be used as partial substitution of LSD mineral filler in

pavement construction. Adding RHA enhances Marshall stiffness, reduces rut depth and increases indirect tensile strength values. Further, a significant change has been occurred in OBC for all mixes and the optimum replacement ratio is recorded as 50% RHA: 50% LSD. Finally, mixes containing RHA show higher dynamic modulus values and flow number.

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