INFLUENCE OF ADDITION OF POLYMERS ON BITUMINOUS MIXTURES

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1979

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A Thesis Submitted to
FACULTY OF ENGINEERING
AIN SHAMS UNEVERSITY
for
The Degree of Master of Science in
Civil Engineering, (Highway Engineering)

CAIRO - EGYPT

1985

APPROVAL SHEET

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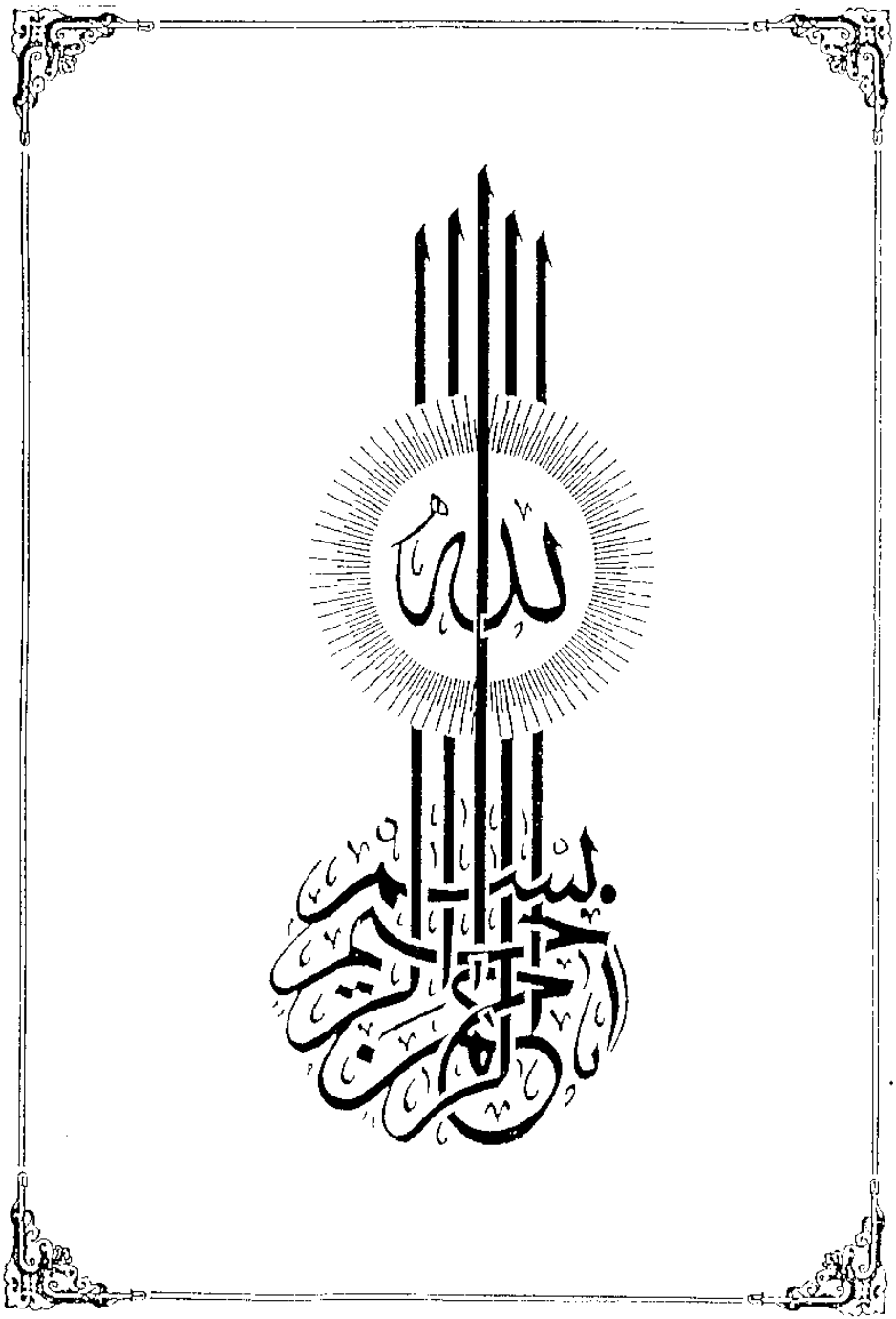


ACKNOWLEDGEMENT

I wish to express my deepest gratitude and sincer thanks to my thesis advisors, and research supervisors. Prof. Dr. MOHAMED FAYEK HOWEEDY, and Prof. Dr. MOHAMED FAROUK EZZAT. Their guidance, Simulating discussions, immeasurable support, and continous encouragement throughout the course of this work were highly appreciated.

My special thanks, and appreciation are extended to ENG. MAHMOUD TALAAT, of the Highway Research, and Training Center in Cairo, for his great assistance, and fruitful time during the preparation of this work. I have benefited from the vital information, in his liberary.

I would like also to acknowledge the great help tender to me by the staff of the Highway Research, and Training Center in Cairo, and the staff of the Petroleum Research Institute.

I would like to thank Prof. Dr. MOHAMED SALAH EL-DIN EL-HAWARY, to whome I owe special thanks for his continous encouragement throughout the preparation of this thesis.

Special thanks to my wife for her continous support and help during the preparation of this work.

Finally, I wish to dedicate this thesis to the spirit of my late brother, HAFFEZ, in appreciation of his sacrifice. For everything, he did for me, I shall be forever indebted and grateful.

CONTENTS

CHAPTER (I)

INTRODUCTION

Asphalt is produced in EGYPT at two refineries factories, the first is located at ALEXANDRIA which refines WESTERN DESERT petroleum and the second is at SUEZ which refines SINAI and EASTERN DESERT petroleum.

Asphalt produced from SUEZ refinery has relatively low wax content (5.05 to 6.50%). Asphalt produced from ALEXANDRIA refinery has a relatively high wax content (3.48 to 21.10% by weight). High wax content contributes to the increase in failure of flexible pavement in EGYPT, and consequently significant increase in maintenance cost is resulted. That initiated the necessity for detailed studies of improving quality of asphalt cement containing high percent of wax.

The purpose of this research is to study the effect of adding synthetic plymer on the properties of asphalt cement and bituminous concrete mixes.

The objective of the investigation is to determine the most suitable type and percent of synthetic polymer to improve the properties of asphalt cement and asphaltic mixtures.

Two types of asphalt cement were tested: Asphalt cement (60-70) and asphalt cement (150-200) produced from WESTERN DESERT petroleum (ALEXANDRIA refinery).

The investigation incorporates also the following tasks:

1. The effect of polymers on the asphalt cement properties
2. The effect of polymers on the asphalt concrete mixes properties.
3. The effect of the improved asphalt cement properties on the properties of the asphalt concrete mixes.
4. The most suitable polymeric materials to be used as an additive to the waxy asphalt.

The study will yield recommendations and guidelines for using local waxy asphalts in road construction with an adequate performance after improving of its properties.

CHAPTER (II)

LITERATURE REVIEW

1. GENERAL:

Asphalt is the product of distillation process of crude oil.

Asphalt used in road construction throughout EGYPT has been mainly produced in the refineries using local crude oils obtained from GULF SUEZ area.

Also, different crude oils obtained from the WESTERN DESERT oil fields are presently being used.

Crude oil was found in the WESTERN DESERT and was produced commercially in the sixties.

Another two types refineries were erected near ALEXANDRIA, namely ALEXANDRIA refinery and EL-NASR refinery on the desert road to CAIRO.

Due to the war of SUEZ, the SUEZ refinery stopped production in 1968 and the refineries at ALEXANDRIA started to produce asphalt from the western crudes used in manufacturing asphalt in a mixture of Garding, Alamein, Yedema and Rassak oil crudes.

It was found that the behaviour of asphalt cement in road construction was not the same for the asphalt produced from the western and eastern crudes, in spite that they were both complying to the standard penetration grade specifications for asphalts.

CU/MIT, 1980, concluded in their study that there are many types of failures occurred to the pavement constructed with the western asphalt, this was attributed later due to the paraffinic waxy nature of the western crudes. For this reason and according to the demand of the Road and Bridges Authority, ALEXANDRIA asphalt was not used.

In about 1975, asphalt was produced again in the SUEZ refinery and the CAIRO refinery stopped production. The eastern crudes used in manufacturing asphalt at SUEZ are either mixture of land and sea Belayium crudes, in SINAI, or a mixture of Asal and Sidri crudes, in SINAI.

Studies should be carried to improve the western asphalt at NASR refinery of ALEXANDRIA.

The location of the oil fields in EGYPT is given in figure (II-1).

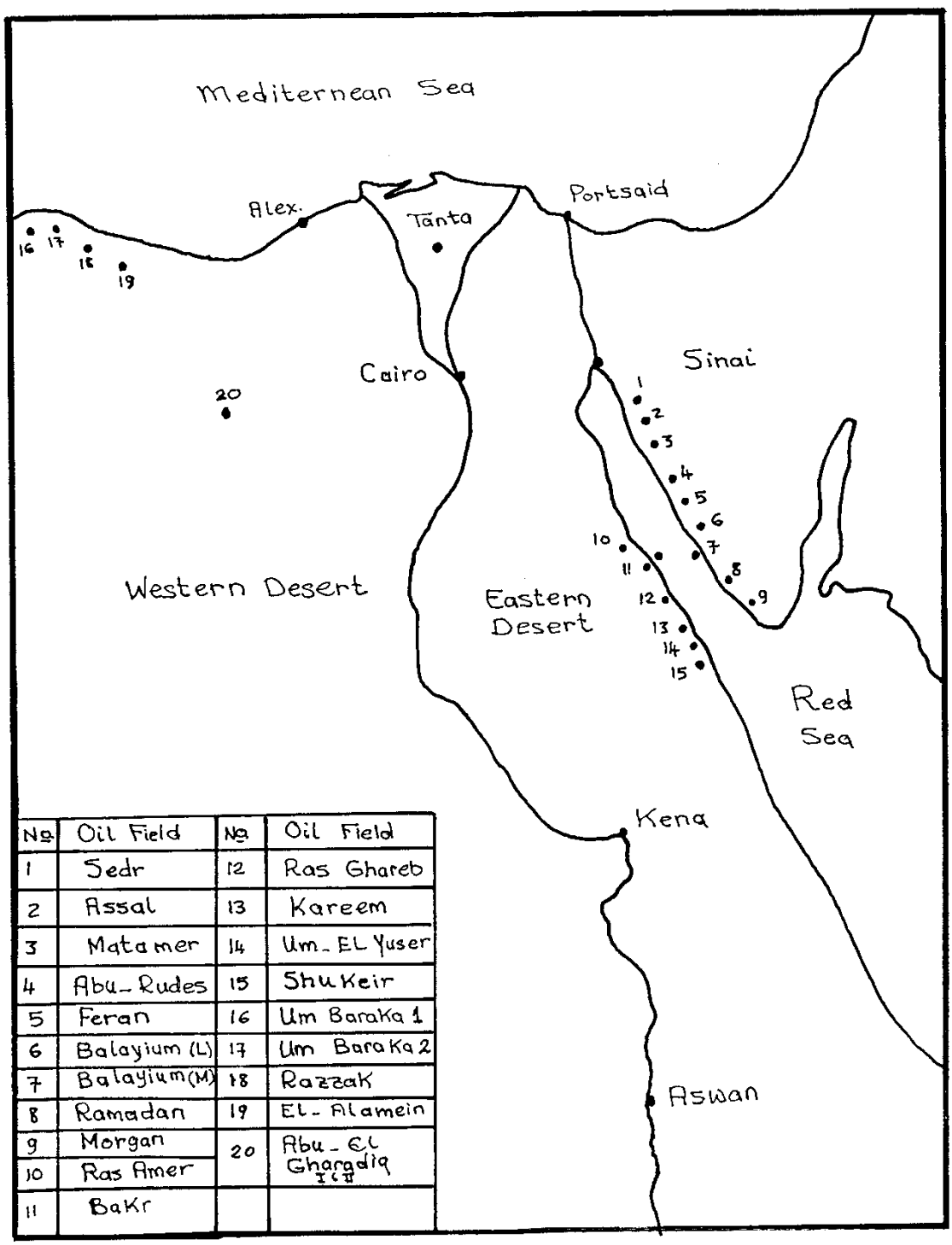
The yearly production of asphalt obtained from oil fields untill 1983 is given in Table (II-1).

As a result of policy of mixing asphalts obtained from different oil fields, the produced asphalt cement has a relatively high wax content, and exhibits several performance problems when used in road constructions.

TABLE (II-1) TOTAL YEARLY ASPHALT PRODUCTION IN EGYPT

Year	1976	1977	1978	1983
Production	135,000	148,000	193,000	200,000

Source: M. I. M. Shaker, PH. D., 1983.



No	Oil Field	No	Oil Field
1	Sedr	12	Ras Ghareb
2	Assal	13	Kareem
3	Matamer	14	Um. EL Yuser
4	Abu-Rudes	15	Shukeir
5	Feran	16	Um Baraka 1
6	Balayium (L)	17	Um Baraka 2
7	Balayium(M)	18	Razzak
8	Ramadan	19	El-Alamein
9	Morgan	20	Abu-El Gharadiq I & II
10	Ras Amer		
11	Bakr		

FIG. (II - 1) Major Oil Fields In Egypt.

2. PAVEMENT PERFORMANCE PROBLEMS:

In the early seventies, production from SUEZ refinery was halted because of the SINAI occupation, and the asphalt cements were produced from WESTERN DESERT crude oil fields in EGYPT.

Reports puplished by CAIRO UNIVERSITY/MIT, 1980, "Performance Of Paraffinic Asphalt Cement In Egyptian Road Construction", indicated that the WESTERN DESERT asphalt caused serious performance and construction problems, which can be summerized as follows:

1. The pavement mixtures were very fluid when laid.
2. Pavement showed greater tendency to flushing under heavy traffic loads, which increased during hot summer days.
3. Severe creep deformations occurred under traffic loads.
4. Remarkable increase in the frequency of transverse cracking was observed.
5. The adherence of the bitumen to the aggregates and the resistance of asphaltic mixtures to water were poor due to the effect of wax content in the asphalt.