INVESTIGATION OF RENEWAL OF SHAFTS BY WELDING

A THESIS

Submitted in Partial Fulfilment
of the Requirements of the Degree of Master

In

MECHANICAL ENGINEERING
(Production Engineering)

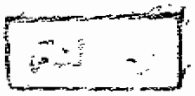
By

MOHAMED TALAAT KAMEL ELMESTEKAWI

(B.Sc. Engineering, 1974)

Under Supervision of

Prof. Dr. AHMED SALEM
Prof. Dr. MOHAMED TAHA
Assoc. Prof. Dr. AHMED HESSIEN



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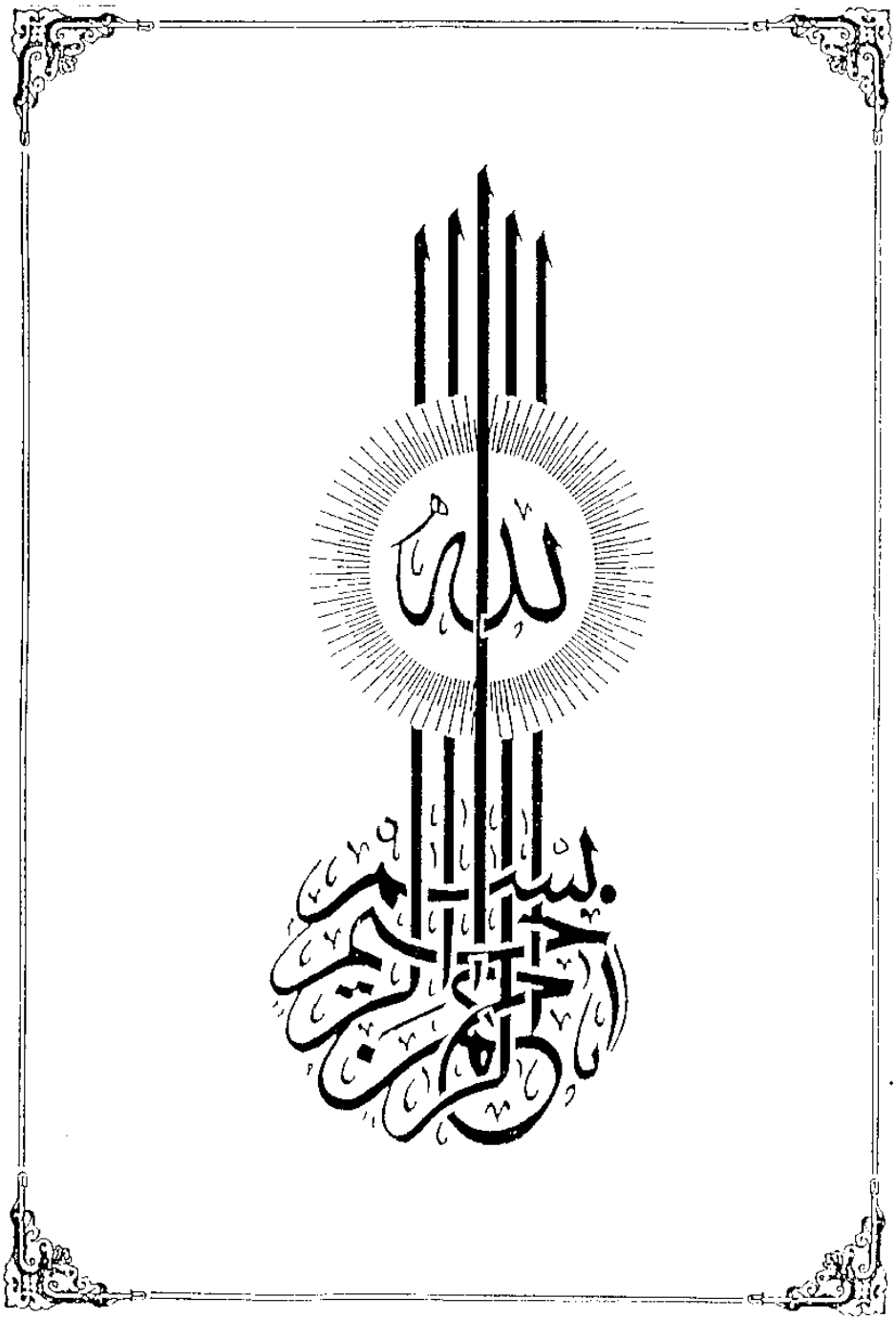

DEDICATION

TO MY LATE FATHER WHO ENCOURAGED AND ASSISTED ME STRONGLY IN LIFE, IN GENERAL, AND TO MY DEAR WIFE WHOSE LOVE AND SUPPORT ENABLED ME TO WORK HARD.

ACKNOWLEDGEMENT

I wish to express my sincerest appreciation to my supervisors in the Department of Design and Production Engineering: ***Prof. Dr. AHMED SALEM EL-SABBAGH, Prof. Dr. MOHAMED TAHA, and Assoc. Prof. Dr. AHMED HESSIEN,*** *for their guidance, assistance, fruitful discussions and help.*

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CONTENTS

PAGE

ABSTRACT

ABSTRACT

The work represents a study of the possibility of renewal of shafts and axles by deposit welding. The experimental work was carried out on specimens of the arm of the road wheel of a vehicle.

Renewal was carried out by the deposition of filler metal on the surface of the shaft to regain the surface properties and dimensions necessary to meet the service and assembly requirements.

Manual arc welding with coated electrodes for surfacing was used in the experiments.

Several kinds of electrodes for deposition of the surface layers were chosen from different sources.

The carbon content in the steel of the road wheel arm is 0.43%, therefore a preheat treatment for the arm was essential. This was done at 225°C prior to surfacing process.

No distortion due to surfacing, so residual thermal stresses were encountered because of the nearly uniform heating and the rigidity of the arm.

Hardness, wear resistance and microstructure investigations were made for the choice of the suitable electrode.

Results indicated that the proper electrode to renew the road wheel arm is "Gridur 45" with composition 0.17%C, 6.25% Mn, 27.8% Cr, 2.46% Ni, 0.0319 Si and 0.031% S and the suitable technique for welding is one layer coil-shaped beads.

INTRODUCTION

1- INTRODUCTION:

Design and production has to ensure the necessary properties of vehicle components in the form of dimensions, geometry, finish, accuracy of machining, etc..... based on service conditions and service life. All these properties are specified by the designer to ensure the performance suitable for the working conditions during service life.

By exploitation, vehicle components are changed due to wear as it deviates from the specified limits. Due to the excessive wear, the adequate performance of the vehicle deteriorates.

From the technical point of view it is necessary to replace those worn components either by new parts or by renewing them. In the developing countries new parts are to be imported from abroad in most cases. In many cases lot of difficulties arise, either due to non-availability of the required part in the market or by manufacturer or it needs long time to import it. Beside these difficulties it is in most cases costly. Egypt as one of the developing countries had suffered during the last 25 years from such troubles. It is therefore necessary to think about some solutions concerning that problem. One of the logical solutions is to save the worn parts by renewing

them. This should be done at any way on scientific and economical basis. The purpose of this thesis is to present results obtained on the renewal of the arm of the vehicle road wheel by welding and to optimise the renewal process.

LITERATURE REVIEW

2- LITERATURE REVIEW:

2-1 Definition and General Description of Surfacing:

In general, the base metal and size of a mechanical component are decided by strength requirements, while the surface properties are decided by the service working conditions, environmental requirements and life time required.

Surfacing in general is the deposition of filler metal or alloy on the surface of a worn part to obtain or regain certain desired properties, dimensions and surface quality. This can lead to life extention of that part which may not otherwise have all the properties necessary for an engineering application. It may also be used to replace metal which has worn out or corroded away with new layers. The overlay may contribute corrosion and wear resistance, toughness or antifriction properties.

2-2 Principles of Surfacing:

Hardfacing is usually achieved by depositing filler metal or alloy after melting by means of arc or gas fusion welding processes.