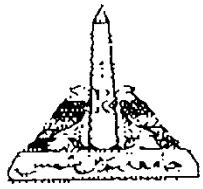

AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING

IMPROVEMENT OF THE PERFORMANCE OF I C E AT DIFFERENT OPERATING CONDITIONS USING ADVANCED METHODS OF ELECTRONIC IGNITION

by

FIKRY Mohamed ABO EL FOUTOH EL SAYED
B. Sc Automotive Engineering, 1977
M. Sc Mechanical (power), Engineering, 1990

A thesis Submitted In Partial Fulfillment of The Requirements of the Degree of Doctor of Philosophy In Mechanical (power) Engineering

Supervised by

Prof. Dr. Ahmed Hassan Bawady
Automotive Engineering Department
Faculty of Engineering
Ain Shams University

Dr. Abdul Aziz Morgan
Mechanical Power Department
Faculty of Engineering
Ain Shams University

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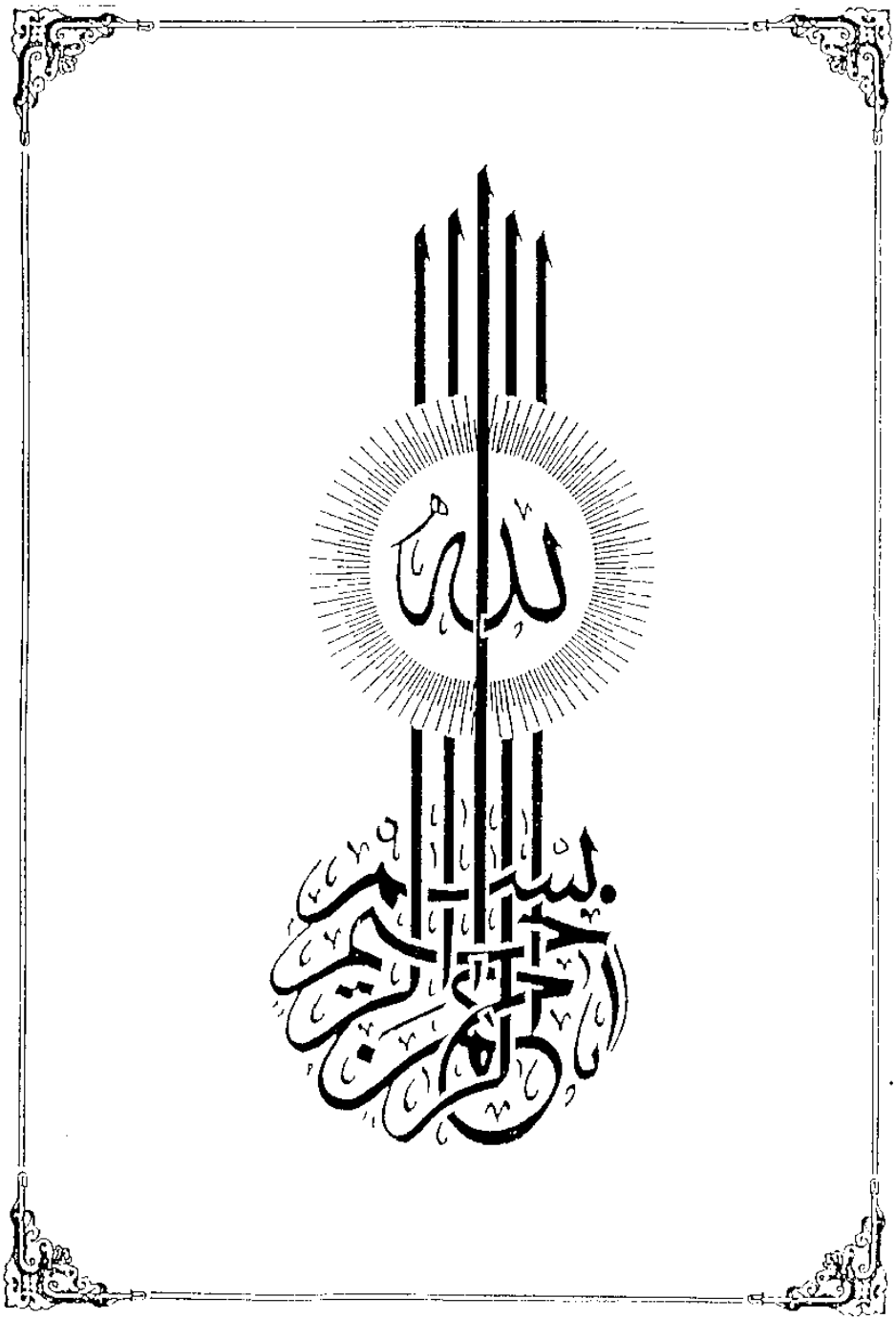

Ain Shams University
Faculty of Engineering

Ph. D. Thesis

Name : ***Fikry Mohamed Abo El-Foutoh El-Sayed***

Degree : **Ph.D.**

Thesis Title : Improvement of the Performance of I.C.E. at Different Operating Conditions Using Advanced Methods of Electronic Ignition.

Examination committee	**Signature**
1-Prof. Dr. Mahmoud Moustafa Ghonaim Professor of Mechanical Engineering Faculty of Engineering Ain Shams University	M. M. Ghonaim
2-Prof. Dr. Mohsen. Salem Radwan Professor and Associate Dean. Faculty of Engineering at Mattaria University of Helwan	M. S. Radwan
3-Prof. Dr. Ahmed Hassan Bawady Professor of Mechanical Engineering Faculty of Engineering Ain Shams University	H. Bawady

Statement

This dissertation is submitted to Ain Shams University for the degree of Doctor of Philosophy in Mechanical Engineering.

The work comprised in this thesis was carried out by :

Fikry Mohamed Abo El-Fotouh El-Sayed in the period from 11/1992 to 2/1998.

No part of this dissertation had been submitted for a degree at any other university.

Date : 25 /2/1998
Signature :
Name : ***Fikry Mohamed Abo El-Fotouh El-Sayed***

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ABSTRACT :

Lean mixture combustion is considered as one solution for the reduction of exhaust emissions because of the low concentration of nitrogen oxides as well as carbon monoxide in the exhaust gas. Also it reduce the fuel consumption.

The purpose of this work is to construct an ignition system suitable to be used with lean mixtures which leads to less pollutants in the engine exhaust as well as better engine efficiency and power .

a) The first stage was directed to design and construct a modified electronic ignition system with improved specifications, such as; two energy levels for the spark (high, 111 mJ / low, 84.5 mJ), wider spark gap, sensitive for the mixture strength (lean / rich), automatic spark advance and spark energy change.

b) In the second stage a series of tests was conducted on a Peugeot S I E of four cyolinders having 1976 cm3 swept volume and maximum power of 58 kW (1968), once with the conventional Spark Ignition System and then with the modified electronic system .

The effects of spark plug and ignition system variables upon the engine performance were investigated.

In this study, the effecs of spark plug gap width, spark energy, and spark duration were investigated for various engine air-fuel ratios, especially, in the lean mixture region.

In addition to studying each variable independently, the interactions between the variables were also investigated experimentally.

The engine performance parameters measured were: exhaust emissions, specific fuel consumption, engine speed roughness of operation and engine power.

Results showed that the engine produced a better performance with the modified high spark energy ignition system, especially if the spark

plug gap was increased to about 1.25 mm. In this case, the engine produced lower exhaust emissions, lower specific fuel consumption, smoother engine operation, and higher engine power.

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