

AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING

**A STUDY OF THE EFFECT OF
EXHAUST GAS RECIRCULATION ON THE
PERFORMANCE AND COMBUSTION OF DIESEL ENGINES**

By

52183

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A thesis

Submitted in Partial Fulfilment for The Requirement of
The Degree of Master of Science

in Mechanical Engineering

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I. D

Supervised By

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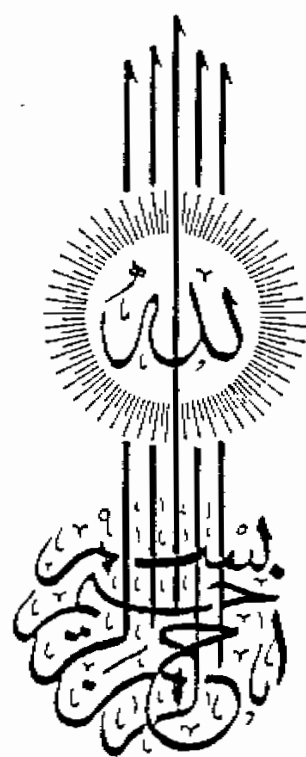
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قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا
عَلَّمْتَنَا إِنَّكَ أَنْتَ الْعَلِيمُ الْحَكِيمُ .
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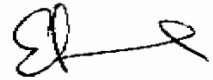


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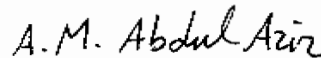
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STATEMENT

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

The work included in this thesis was carried out by the author in the Department of Energy and Automotive, Ain Shams University, from (27/12/1991) to (15/11/ 1995).

No part of the thesis has been submitted for a degree qualification at any other university or institution.

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

*In the Name of God Most Merciful
Most Compassionate*

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I present this work to my mother and my wife, whose understanding, encouragment and sacrific could never be paid back.

The first part of the paper discusses the importance of the research and the objectives of the study. It then proceeds to a literature review, followed by a description of the methodology used. The results of the study are presented in the next section, followed by a discussion of the findings and their implications. The paper concludes with a summary of the main points and a list of references.

The research was conducted in a systematic and rigorous manner, following the principles of good research practice. The data collected was analyzed using appropriate statistical methods, and the results were presented in a clear and concise manner. The findings of the study are discussed in detail, and their implications for practice and policy are explored. The paper is well-structured and easy to read, and it provides a valuable contribution to the field of research.

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Abstract

Ibrahim El-Dsoky Taha El-Keiy. A study of the effect of exhaust gas recirculation on the performance and combustion of Diesel engines. Degree of Master of Science. Ain Shams University / Faculty of Engineering. Department of Mechanical Power Engineering, 1995.

Experimental work has been carried out to investigate the effect of varying exhaust gas recirculation (EGR) on the performance and combustion developments of four stroke, six cylinder, Diesel engine. Special arrangements were constructed and then used in the experimental testes by which the EGR percentage could be controlled. During each test, measurement of engine air mass flow rate, EGR mass flow rate, fuel mass flow rate, speed, power and exhaust gas temperature were taken. Also the time of the delay period was computed from the knowledge of the cylinder pressure at specified crank angle positions and using Krigar - Borman method for calculation of Apparent Fuel Burning Rate (AFBR).

Due to the practical need of the interface between computer simulation model of apparent fuel burning rate and the pressure measurements, a data acquisition system has been used to record and analyze the test results at specific EGR percentages (0, 5, 15, 25, 40%), within reasonable range of engine running conditions.

Experimental results confirmed that EGR percentage has a great influence on the delay period, maximum pressure inside the cylinder, specific fuel consumption and engine power. At low EGR percentage up to 10% the delay period decreases for all engine speeds specially at part load. However at high EGR percentage over 20%. The delay period increases. The peak cycle pressure gradually declines as EGR percentage increases up to 20%, then it drops sharply as EGR becomes over 20%. The specific fuel consumption decreases by 3% at most as EGR percentage increases up to 5%. Meanwhile it has no effect on the engine power. As EGR percentage increases from 5% up to 15% the engine

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power slightly decreases without any remarkable change in the specific fuel consumption. The engine power and specific fuel consumption deteriorate as EGR percentage increases more than 25%.

Therefore an improvement in the specific fuel consumption as much as 3% is achieved corresponding to 5% EGR percentage. The recommended range of the EGR is from 5 to 15%. The use of EGR more than 25% adversely affect engine power and specific fuel consumption.

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the 1990s, the number of people in the UK who are aged 65 and over has increased by 1.5 million, and the number of people aged 75 and over has increased by 1.2 million (Office of National Statistics 1999). The number of people aged 65 and over is projected to increase to 6.5 million by 2011, and the number of people aged 75 and over to 4.5 million (Office of National Statistics 1999).

There is a growing awareness of the need to develop services to meet the needs of older people, and a number of initiatives have been developed to address this need. The Department of Health (1999) has published a strategy for older people, which sets out the government's commitment to improve the lives of older people, and to ensure that they are able to live independently and actively.

The strategy identifies a number of key areas for action, including: improving the health and social care services available to older people; promoting the independence and active participation of older people; and ensuring that older people are able to live in their own homes and communities. The strategy also identifies a number of key challenges, including: the need to develop services that are able to meet the needs of older people who are living with long-term conditions; the need to develop services that are able to meet the needs of older people who are living in care homes; and the need to develop services that are able to meet the needs of older people who are living in the community.

The strategy also identifies a number of key principles, including: the need to ensure that services are able to meet the needs of older people who are living with long-term conditions; the need to ensure that services are able to meet the needs of older people who are living in care homes; and the need to ensure that services are able to meet the needs of older people who are living in the community. The strategy also identifies a number of key objectives, including: to improve the health and social care services available to older people; to promote the independence and active participation of older people; and to ensure that older people are able to live in their own homes and communities.

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