PERFORMANCE OF TWO STAGE COMBUSTORS BURNING NATURAL GAS

By

Ragab Abou Bakr Mahmoud Mohammed

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
Mechanical Power Engineering

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Under the Supervision of

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Approved by the
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Title of Thesis:
Performance of Two Stage Combustors Burning Natural Gas

Key Words:
Combustion; Premixed mixture; partially premixed; Emissions, Stage combustion

Summary:
The current thesis aims to investigate the different parameters affecting the performance of two stage air combustors burning natural gas. The burner consists of two horizontal and concentric pipes which deliver fuel and primary air to the mixing zone. The fuel injected radially inside the primary air stream and then the mixture enters the primary zone combustion at the rich mixture condition. First of all, in the start stage of combustion, products of primary zone are mixed with a secondary air injected from fifteen holes distributed around the primary combustion zone to complete the combustion process. The aim of this process is to produce flames with low emissions. During the experiments, the maximum flow rates of fuel and air was adjusted to have control on the flame stability and extinction limits, The burner was tested to specify suitable mixing zone length. The measurements were carried out at various loads using seven primary air ratios at maximum fuel flow rate and total excess air.

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Dedication

Special thanks to my wife Hoda Ali and my children zeyad, Mazen and Hamza. Dedicate the thesis to my mother and to the spirit of my father.

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