



شبكة المعلومات الجامعية  
التوثيق الإلكتروني والميكرو فيلم

# بسم الله الرحمن الرحيم



**MONA MAGHRABY**



شبكة المعلومات الجامعية  
التوثيق الإلكتروني والميكروفيلم



# شبكة المعلومات الجامعية التوثيق الإلكتروني والميكروفيلم



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التوثيق الإلكتروني والميكروفيلم

# جامعة عين شمس التوثيق الإلكتروني والميكروفيلم

## قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها  
علي هذه الأقراص المدمجة قد أعدت دون أية تغييرات



## يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار



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**AIN SHAMS UNIVERSITY**

**FACULTY OF ENGINEERING**

Mechanical Power Engineering

**PULSATING FLOW EFFECTS ON THE COMBUSTION  
CHARACTERISTICS**

A Thesis submitted in partial fulfillment of the requirements of the degree  
of

Doctoral of Philosophy In Mechanical Engineering

(Mechanical Power Engineering)

**BY**

**Ahmed Mohamed Mustafa Sayed**

Master of Science in Mechanical Engineering

(Mechanical Engineering)

Faculty of Engineering, Cairo University, 2016

Supervised By

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**Associate. Prof. Dr. Ahmed Mohamed Taher**

CAIRO, EGYPT  
(2021)



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# Statement

This thesis is submitted as a partial fulfillment of Doctoral of Philosophy In Mechanical Engineering Faculty of Engineering, Ain shams University.

The author carried out the work included in this thesis, and no part of it has been submitted for a degree or a qualification at any other scientific entity.

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# Thesis Summary

An investigation was performed to increase the heat transfer rates from methane flames while simultaneously minimizing the soot and NO<sub>x</sub> emissions at extensive firing rates. The partially premixed flames responded favorably to the strain rate and the increase in temperature-soot interactions across the two reaction zones. Inverse flames with under-ventilation increased the temperature-soot interaction. Shifting the peak turbulent kinetic energy into the lean side in normal flames increased both the radiation and convection heat transfer rates respectively by 13 and 9%. On the other hand, shifting the peak turbulent kinetic energy into the rich side reduced the NO<sub>x</sub> emissions. Exciting two concentric streams increased the turbulent kinetic energy and provided an innovative control of the pulsation effects. The soot growth and oxidation rates were thus controlled by setting the phase shift between the two streams at 20° and the corresponding frequency ratio at 4.0 such that the total



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