الاية

قال تعالى :-

﴿ قُل لَّوْ كَانَ الْبَحْرُ مِدَادًا لِّكَلِمَاتِ رَبِّي لَنَفِدَ الْبَحْرُ قَبْلَ أَن تَنفَدَ كَلِمَاتُ رَبِّي وَلَوْ جِئْنَا بِمِثْلِهِ مَدَدًا﴾ سورة الكهف(109)

صدق الله العظيم

DEDICATION

First of all, we thank the almighty God, for obvious reasons, but especially for the countless blessings that he has poured upon us and our families and his protection throughout the studying period. Without his guidance and inspiration, our effort would have been in vain.

With debt of gratitude, which is too immense to express adequately in words. We would like to thank DR. Tag Alsir Hassan Hassan for his guidance and advice towards the completion of this work. We also thank him for his acceptance to be our supervisor. Not only have we learnt a lot from his scientific knowledge and experience but also his kindness and humbleness have had an indelible impact on our lives.

Finally, our cordial thanks are extended to our parents for their prayers, love and encouragement throughout our lives.

المستخلص

يهدف هذا البحث إلى تصميم محرك ديزل رباعي الأشواط. ثم زيادة القدرة الحجمية وتقليل حجم المحرك بإضافة شاحن توربيني، ومن ثم دراسة التغييرات في درجة الحرارة وبقية الخواص التشغيلية بعد إضافة الشاحن التوربيني.

بعد تصميم المحرك تم إضافة شاحن توربيني بغرض زيادة القدرة الحجمية وتقليل حجم المحرك، ولكن ظهرت مشكلة جديدة وهي إرتفاع درجة حرارة المحرك، لذا تم تصميم نظام تبريد يناسب المحرك بعد اضافة الشاحن التوربيني لتقليل درجة حرارة المحرك. ثم تم رسم التصميم باستخدام برنامج SOLIDWORKS لإظهار تركيب المحرك وأجزاءه الأساسية.

Abstract

This research aims to design a four stroke, compression ignition engine. Increase the volumetric power and Reduce the size of the engine by adding a turbocharger, then study the effects on the Temperature and other engine parameters after adding the turbocharger.

After the engine was designed, a turbocharger was added to increase the volumetric power and to reduce the engine displacement. But a new problem arises, which is an increase the engine temperature, for this a cooling system has been designed to reduce the excess temperature. A drawing in SOLIDWORKS was made to show the engine structure and basic parts.

TABLE OF CONTENTS

List of figures:-

For engine with turbocharger

List of symbols:-

R_c	Compression ratio
N	Crankshaft rotational speed
N_o	Power out put
L_o	Air fuel ratio in $\mathrm{kmole_{air}/kg_{fuel}}$
l_o	Air fuel ratio in $\mathrm{kg_{air}/kg_{fuel}}$
M_1	Amount of air charge
α	Stoichiometric ratio
M_2	Amount of exhaust gases
T_o	Ambient temperature
P_o	Ambient pressure
ΔT	Temperature different due to residual
ρ_o	Ambient air density
ΔP_a	Pressure drop in intake stroke
η_V	Volumetric efficiency
P_r	Exhaust gases pressure
γ_r	Coefficient residual burned gas
T_r	Temperature of the exhaust gases
T_a	Temperature at the end of intake stroke
P_c	Pressure at the end of compression stroke
T_c	Temperature at the end of compression stroke
mc_v	Molar heat capacity
μ_o	Fuel mixing ratio
μ	Ratio of changing working body in diesel
H_{mix}	Heat adding by the combustion
T_z	Temperature at the end of combustion stroke
λ	Coefficient of increasing pressure by the combustion
P_z	Pressure at the end of combustion stroke
δ	Expansion coefficient
P_b	Pressure at the end of expansion stroke
T_b	Temperature at the end of expansion stroke
$\grave{P}_i$	Theoretical mean indicated pressure
ρ	Expansion ratio
P_i	Mean indicated pressure
η_i	Indicated efficiency
g_i	Indicated fuel consumption

P_m	mechanical loss in pressure
P_e	Mean effective pressure
η_m	Mechanical efficiency
η_e	Effective efficiency
g_e	Effective fuel consumption
V_{litter}	Volume of the engine in letter
V_h	Volume of one cylinder
D	Cylinder bore
S	Stroke
V_{pm}	Mean piston velocity
A_p	Piston cross section
M_e	Effective torque
G_f	Total fuel consumption
N_{litter}	Volumetric power
T_{o_2}	Temperature after the turbocharger
P_{o_2}	Pressure after the turbocharger
S_x	The displacement of the piston
ζ	Ratio between the crankshaft diameter and length of connected rod
θ	Crank angle
ω	Angler engine velocity
V_x	Velocity of piston at any crank angle
a_x	Acceleration of piston at any crank angle
F_1	Initial force
m	Mass of all bodies that have a leaner velocity
M	Torque
F_t	Total force acting in crankshaft
r	The crankshaft raids
F_g	Gas force
t_c	Thickness of the piston crown
σ_t	Tension stress
H	Height of piston
$T_{w_{out}}$	Water temperature out of the engine
ΔT_w	Water temperature deferent in cooling system
T_{w_m}	Mean water temperature
$T_{a_{in}}$	Ambient air temp
$T_{a_{out}}$	Air temperature out of the radiator

T_{a_m}	Mean air temperature
Q_w	Heat reject from the engine by the cooling system
$\dot{m}_w$	Water flow rate
A	Radiator area
$\dot{m}_a$	Air flow rate
N_{fan}	Power required in fan
w_a	Air velocity in front of the radiator
A_{fan}	The fan area
D_{fan}	Diameter of the fan
u_{fan}	Air speed at fan outlet
n_f	Fan rotational speed

List of tables: