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**STUDY AND THEORETICAL INVESTIGATION OF VARIABLE GEOMETRY
TURBO CHARGER (VGT) FOR LOWER EMISSIONS AND IMPROVED
CHARACTERISTIC AND EFFICIENCY**

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**A project submitted in partial
fulfilment of the requirement for the award of
the Degree of Bachelor of Mechanical Engineering (Thermal-Fluid)**

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May 2006

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which I have clarified their sources”**

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Specially dedicated to my family, beloved, friends and companion..

.....

ACKNOWLEDGEMENT

Specially dedicated to my beloved parents, Mr. Paramasiban & Mrs Suppu Lechmee for their guidance that they showed to me, the comments and suggestions over the past few years. Without them, who am i.....

To my supervisor Mr.Kothwal, for giving me ample guidance and for always making time for me each time I needed help. To my batch mate and class mate of Kutkm. With the shared and effort from them, this thesis could not be completed on time.

Last but not least, the Almighty God who always give me the right way of life and chance to start and finish this thesis with healthy.

ABSTRACT

This project is carried out about the “Study and Theoretical Investigation of Variable Geometry Turbo Charger (VGT) for Lower Emissions and Improved Characteristic and Efficiency”. The main purpose of this project is to research about turbo charger and study theoretically about turbo charger. The other purpose is to find out the lower emissions and improved characteristic and efficiency of the Turbo Charger. There a many type of turbo charger in market but there are only few is use in Malaysia legally.

ABSTRAK

Kajian projek ini meliputi kepada memahami serta mengkaji mengenai “ Turbo Charger” secara terperinci. Dimana melalui projek ini juga, kita dapat mengkaji mengenai perbezaan geometri pada “ Turbo Charger”. Dengan menggunakan formula-formula serta pengiraan secara teori, masalah-masalah pada reka bentuk pada “ Turbo Charger” dapat ditentukan serta dapat mencari cara penyelesaian yang terbaik. Dengan kaedah ini, kecekapan pada “ Turbo Charger” dapat ditingkatkan. Melalui kertas kerja ini juga, ciri-ciri “ Turbo Charger” juga dapat diperbaiki. Terdapat pelbagai jenis “ Turbo Charger” di pasaran tempatan, dimana segelintir sahaja digunakan secara sah.

TABLE OF CONTENT

CHAPTER	CONTENT	PAGE
	SUPERVISORY VERIFICATION	
	DECLARATION	ii
	DEDICATION	iii
	ACKNOWLEDGEMENTS	iv
	ABSTRACT	v
	ABSTRAK	vi
	LIST OF CONTENTS	vii
	LIST OF FIGURES	xv
CHAPTER 1	INTRODUCTION	
	1.1 Overview	1
	1.2 Problem Statement	2
	1.3 Objectives of Project	2
	1.4 Scopes and limitation of the Project	2
	1.5 Literature Review	3
	1.6 Schedule of Task/ Gantt chart	5
CHAPTER 2	THE HISTORY OF THE AUTOMOBILE	
	2.1 Introduction	7
	2.2 Working of stem Engine	10

CHAPTER 3**TURBO CHARGER**

3.1	Introduction of Turbo Charger	12
3.2	History of Turbo Charging	13
3.3	Turbo Charger Components	15
3.3.1	Turbine Housing	15
3.3.2	Wheel	16
3.3.3	Compressor Cover	16
3.3.4	Compressor Wheel (Impellor)	17
3.3.5	Bearing Housing	17
3.3.6	Bearing Systems	18

CHAPTER 4**TURBO CHARGER TURBINE**

4.1	Introduction	19
4.1.1	Operating Characteristic	20
4.2	Turbo Charger Bearing System	23
4.2.1	Radial Bearing System	23
4.2.2	Axial Thrust Bearing System	24
4.2.3	Oil drawn	24
4.2.4	Sealing	25
4.2.5	Water Cooling	25
4.3	Turbo Charger Compressor	26
4.3.1	Operating Characteristic	26
4.3.2	Surge Line	27
4.3.3	Choke Line	27
4.4	Turbo Charger Control System	28
4.4.1	Control by Turbine-Side by-pass	28
4.5	Turbo Charger Camshaft	29
4.5.1	Pressure Different	29
4.5.2	Valve Overlap	30
4.5.3	Valve Lift	32
4.5.4	Roller Camshaft	32

4.6	Turbo Charger Placement	33
4.6.1	Heat	33
4.6.2	Heat Retention	33
4.6.3	Plumbing	34

CHAPTER 5

HOW THE TURBO UNIT WORKS

5.1	Introduction	35
5.1.1	The Turbine Side	36
5.1.2	Ups and Down	37
5.2	Principles of Turbo Charger	39
5.2.1	Suction	41
5.2.2	Compression	41
5.2.3	Expansion	42
5.2.4	Exhaust	42
5.2.5	Swept Volume Enlargement	42
5.2.6	Increase in Engine RPM	42
5.2.7	Turbo Charging	43
5.2.8	Mechanical Super Charger	43
5.2.9	Exhaust gas turbo charging	44
5.2.10	Design Details	44
5.2.11	Reliability	46
5.2.12	Lag	47
5.2.13	Boost	49
5.2.14	Applications	49
5.3	The Turbo Section	50
5.3.1	Compression Section	51
5.3.2	The Oil Supply	51
5.3.3	The Piston Ring Seals	52
5.3.4	Advantages of Exhaust Gas Turbo Charging	53

CHAPTER 6**TURBO CHARGER TROUBLESHOOTING**

6.1	Introduction	54
6.1.1	Common Symptoms	56
6.1.2	Engine Troubleshooting	56
6.1.3	Visual and Mechanical Checks	57
6.1.4	Turbine Wheel and Turbo Housing Checks	58
6.1.5	Compressor Wheel and Compression Housing Checks	59
6.1.6	Rotating Assembly Check	60
6.1.7	Check Radial and Axial Bearing Clearances	60
6.1.8	Wastegate Assembly Checks	62
6.1.9	Method to assembly Turbo Charger	63
6.1.10	Safety factor of Turbo Charger	64
6.2	Troubleshooting	65
6.2.1	Black Smoke	65
6.2.2	Blue Smoke	66
6.2.3	Boost Pressure too High	66
6.2.4	Compressor / Turbine Wheel Defective	67
6.2.5	High Oil Consumption	67
6.2.6	Insufficient Power Boost / Boost Pressure too Low	67
6.2.7	Oil Leakage at Compressor	68
6.2.8	Oil Leakage at Turbine	69
6.2.9	Turbo Charger acoustic noise	69
6.3	How to Rebuild	70
6.3.1	Disassembly	70
6.3.2	Turbo Balancing	72
6.3.3	Reassembly	72
6.3.4	Replacing the Turbo Charger	73

6.4	Recommendation	74
6.4.1	Advantage is Good for Turbo Charger	74
6.4.2	Disadvantage is Bad for Turbo Charger	75
6.4.3	Failure Diagnosis	75

CHAPTER 7**DEVELOPMENT, MATCHING, AND TESTING**

7.1	Development	76
7.2	Matching	77
7.3	Testing	78
7.3.1	Containment Test	78
7.3.2	Low-Cycle Fatigue Test (LCF test)	79
7.3.3	Rotor Dynamic Measurement	79
7.3.4	Start-Stop Test	79
7.3.5	Cyclic Endurance Test	80

CHAPTER 8**THE CONCEPT OF FORCED INDUCTION**

8.1	Introduction	81
8.1.1	The Boost Controller	82
8.1.2	Conventional Boost Controller	83
8.1.3	The Blow of Valve	84
8.1.4	Forge Diverter / Dump Valve	85
8.1.5	The Wastegate	86
	8.1.5.1 Internal Wastegate	87
	8.1.5.2 External Wastegate	87
	8.1.5.3 Atmospheric/Divorced Waste gate	88
	8.1.6 Light Pressure Turbo (LPT)	88
8.2	Variable Turbine Geometry (VTG)	89
8.3	Lower Emissions	92
8.3.1	High efficiency radial turbine	92
8.3.2	Wide operating range compressor	93

8.3.3	Transonic centrifugal compressor	94
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CHAPTER 9**TURBOCHARGER COMPRESSOR CALCULATIONS**

9.1	Introduction	98
9.1.1	Engine Volumetric Flow Equation	98
9.1.2	Ideal Gas Law/Mass Air Flow	99
9.1.2.1	To get pounds of air	99
9.1.2.2	To get the volume of air	99
9.1.3	Volumetric Efficiency	99
9.1.4	Compressor	100
9.1.5	How Hot is the Air Coming out of the Compressor	100
9.1.6	Equation 1	101
9.1.7	Equation 2	102
9.2	Air Filter Flow Calculations	102
9.2.1	Introduction	102
9.2.2	Formulas	102
9.2.3	CFM Formulas for Filters	103
9.3	Selecting a Turbocharger Compressor	103
9.3.1	Compressor Selection	103
9.3.2	Engine Airflow Requirements	103
9.3.3	Pressure Ratio	104
9.3.4	Temperature Ratio	104
9.3.5	Adiabatic Efficiency	105
9.3.6	Density Ratio	105
9.3.7	Compressor Inlet Airflow	105
9.3.8	Using Your Number	106
9.3.9	CFM to lbs/min	106

CHAPTER 10**SUPER CHARGER OVERVIEW**

10.1	Introduction	107
10.2	Different between Supercharger and Turbocharger	112
10.3	The difference between a turbocharger and a supercharger on a car's engine	113

CHAPTER 11**INTERNAL COMBUSTION ENGINE**

11.1	Introduction	114
11.2	Non-Compression	115
11.3	Compression	116
11.4	Applications	117
11.5	Internal combustion mechanics	117
11.6	Operation	118
11.7	Parts	121
11.8	Classification	122
11.9	Engine cycle	122
11.10	Fuel and oxidizer types	123
11.11	Cylinders	125
11.12	Fuel System	126
11.13	Engine configuration	126
11.14	Engine capacity	127
11.15	Engine pollution	127
11.16	Volumetric efficiency	128
11.17	External-Combustion Engine	129

CHAPTER 12**CONCLUSIONS**

12.1	Summary	130
12.2	Turbo Charger Designed	131

REFERENCES	130
APPENDIX A	131
APPENDIX B	132
APPENDIX C	133
APPENDIX D	134

LIST OF FIGURES

NO	TITLE	PAGE
1	Steam engine	7
2	Model of steam engine	8
3	The first United States patent granted on an electric motor was issued on February 5, 1837	10
4	Turbo Housing	15
5	Wheel	16
6	Compressor Cover	16
7	Compressor Wheel	17
8	Bearing Housing	17
9	Bearing System	18
10	Turbocharger turbine map	20
11	Model of basic system	21
12	Turbocharger with twin-entry turbine	22
13	Turbocharger with water-cooled turbine housing for marine applications	22
14	Turbocharger bearing system (cut-away model)	23
15	Turbocharger for passenger car gasoline applications with water-cooled bearing housing	25
16	Model of Turbo Compressor	26
17	Compressor map of a turbocharger for passenger car applications	27
18	Boost pressure control of a turbocharged petrol engine by proportional control pressure	29

19	Model of Compressor	35
20	Side part of Turbo Charger	36
21	Upper part of Turbo Charger	37
22	Turbo Response	38
23	Schematic of a four stroke piston engine	41
24	Schematic of a mechanically supercharged four-cylinder engine	43
25	Schematic of an exhaust gas turbocharged four-cylinder	44
26	Exhaust pipe	50
27	Fluid Pipe	51
28	Turbo Charger Exhaust	53
29	CAD assembled model of a turbocharger	76
30	During engine operation, the waste gate is exposed to high thermal and mechanical loads.	80
31	A Turbo Charger fixed in V-8 Engine	81
32	Sample of Boost Controller	82
33	Conventional Boost Controller	83
34	Blow off Valve	84
35	Dump Valve	85
36	Internal part of Wastegate	87
37	Model of VTG	90
38	VG turbo for passenger cars	91
39	Dimension of sample engine	93
40	Waste Gate	94
41	Intake manifold	95
42	Intake manifold after smooth	95
43	Stock intake manifold before smoothing.	95
44	Intake manifold after smoothing	96
45	Charger amount.	96
46	Compressor housing	96
47	Stock compressor wheel	97
48	Model of Super Charger	107

49	Compressor with greater flow capacity than the engine.	108
50	Triple-lobe "Roots"-type compressor.	108
51	Reciprocating compressor.	109
52	Vane compressor	110
53	Centrifugal compressor gains effectiveness non linearly as speed rises	110
54	Twin - screw" compressor.	111
55	Type rotary pump was first conceived as a supercharger	111
56	Four-stroke cycle (or Otto cycle)	115
57	Early internal-combustion engines were used to power farm equipment.	115
58	Simple diagram of engine	119
59	Schematic of your ignition system	120
60	An illustration of several key components in a typical four-stroke engine	121
61	One-cylinder gasoline engine (c. 1910).	124

CHAPTER 1

INTRODUCTION

1.1 Overview

A turbo charger is a device that uses exhaust gasses produced by the engine to blow air back into the engine. The additional air is supplemented with fuel by the ECU (engine control unit). This causes the engine to produce much more power since it is being supplied with more air and fuel than it possibly could without it. A naturally aspirated engine (non-turbo, standard engine), or "N/A" engine, has to "suck" air through the intake manifolds, throttle body, air filter, etc. With this setup, the most air pressure that can enter the combustion chamber of the engine is a bit less than the current atmospheric pressure. With the turbo, air is being blown into the chamber with positive pressure so that much more air and fuel can enter. A typical turbo charged engine will generate 7 to 10 psi of maximum positive pressure, or "boost". The turbo charger, or "turbo", is mounted directly to the exhaust manifold, where exhaust gasses pass over a turbine impeller that is attached to a short shaft. On the other side of this shaft is a compressor turbine, which pulls outside air in through the air filter and blows it into the intake manifold. So basically, the energy from the expelled exhaust gasses, which would normally be wasted on a N/A engine, is being used to pump air back into the engine

1.2 Problem Statement

Turbo Charger is widely used in all over the world. Turbo Charger manufacturer in different pattern and weight, but the manufacturer could not find the problem inside the Turbo Charger. If the engine does not operate properly, one should not assume that the turbocharger is the cause of failure. It often happens that fully functioning turbochargers are replaced even though the failure does not lie here, but with the engine.

1.3 Objectives of Project

This project concerned with study and research of turbo charger by investigate and by theoretically. The objectives of the project are as following:

- ❖ To study and understand Turbo Charger.
- ❖ To improved characteristic and efficiency.

1.4 Scopes and limitation of the Project

There are some scopes and limitations of the study. There are consists of:

- ❖ Study the types of Turbo Charger.
- ❖ Study the energy produces by Turbo Charger.
- ❖ Study the fundamental Turbo Charger.
- ❖ Study the different between Turbo Charger and Super Charger.

1.5 Literature Review

A turbo charger is basically a device that uses exhaust gasses produced by the engine to blow air back into the engine. The additional air is supplemented with fuel by the ECU (engine control unit). This causes the engine to produce much more power since it is being supplied with more air and fuel than it possibly could without it. A naturally aspirated engine (non-turbo, standard engine), or "N/A" engine, has to "suck" air through the intake manifolds, throttle body, air filter, etc. With this setup, the most air pressure that can enter the combustion chamber of the engine is a bit less than the current atmospheric pressure. With the turbo, air is being blown into the chamber with positive pressure so that much more air and fuel can enter. A typical turbo charged engine will generate 7 to 10 psi of maximum positive pressure, or "boost". The turbo charger, or "turbo", is mounted directly to the exhaust manifold, where exhaust gasses pass over a turbine impeller that is attached to a short shaft. On the other side of this shaft is a compressor turbine, which pulls outside air in through the air filter and blows it into the intake manifold. So the energy from the expelled exhaust gasses, which would normally be wasted on a engine, is being used to pump air back into the engine.

To better understand the technique of turbo charging, it is useful to be familiar with the internal combustion engine's principles of operation. Today, most passenger car and commercial diesel engines are four-stroke piston engines controlled by intake and exhaust valves. One operating cycle consists of four strokes during two complete revolutions of the crankshaft.

Turbochargers are a type of forced induction system. They compress the air flowing into the engine. The advantage of compressing the air is that it lets the engine squeeze more air into a cylinder, and more air means that more fuel can be added. Therefore, you get more power from each explosion in each cylinder. A turbocharged engine produces more power overall than the same engine without the charging. This can significantly improve the power-to-weight ratio for the engine.

Turbochargers allow an engine to burn more fuel and air by packing more into the existing cylinders. The typical boost provided by a turbocharger is 6 to 8 pounds per square inch (psi). Since normal atmospheric pressure is 14.7 psi at sea level, you can see that you are getting about 50 percent more air into the engine. Therefore, you would expect to get 50 percent more power. It's not perfectly efficient, so you might get a 30- to 40-percent improvement instead.

A turbocharger helps at high altitudes, where the air is less dense. Normal engines will experience reduced power at high altitudes because for each stroke of the piston, the engine will get a smaller mass of air. A turbocharged engine may also have reduced power, but the reduction will be less dramatic because the thinner air is easier for the turbocharger to pump.

If a turbocharger with too much boost is added to a fuel-injected car, the system may not provide enough fuel, so either the software programmed into the controller will not allow it, or the pump and injectors are not capable of supplying it. In this case, other modifications will have to be made to get the maximum benefit from the turbocharger.

1.6 Schedule of Task/ Gantt chart

Activities	Week														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
The PSM Title selection and confirmation of title															
Confirmation of title, scopes and objectives															
Research, data collection and study information															
Literature Review															
First Draft															
Power Point															
Presentation															

Progress of PSM 1

Activities	Week														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Study of Turbo Charger															
Automotive workshop															
First Draft															
Power Point															
Presentation															
Final Theses															

Progress of PSM 2