



**A GRADUATION PROJECT PRESENTED TO
FACULTY OF MECHANICAL ENGINEERING
UNIVERSITY OF TECHNOLOGY MARA**

**In partial fulfillment of the requirements for the
Degree of Bachelor of Mechanical (Hons) Engineering**

**TITLE:
DESIGN AND FABRICATION OF ACTIVATED CARBON BASED OF
NATURAL GAS VEHICLE CONTAINER**

Presented by:

AHMAD ZUBAIDI BIN MUDA 99092649

ABSTRACT

Although the potential for natural gas production in Malaysia is very high, production and distribution facilities are still in the early stages of development. In addition the per capita vehicle ownership is low. But strong moves are being made to develop the natural gas distribution network, and significant increases in vehicle conversions should be seen in the near future. The country at present imports liquid fuels for transport and it seems likely that this will continue, there is a strong case for using locally produced Compress Natural Gas (CNG) as a fuel for both light and heavy duty vehicles for travel in the main cities.

The main purpose of this project is to develop the design and fabricate the low pressure adsorb natural gas container. By understand the main property of natural gas and the characteristic of the compress gas, further detail design of the pressure vessels had been developed to give sufficient driving range as a Compress Natural Gas (CNG) and petrol usage vehicle.

The pressure vessels had been designed accordance with Pressure Vessel ASME Code Section VIII Division 1 and are able to withstand pressure up to 130 bars. The pressure vessels is unfired type and also been fixed with thermocouple, temperature controller, pressure relief valve, heater and filling valve to completed the design requirement.

This project is based on design and collective information. The main activities of this project are including technical aspects and the design requirement. By information gathered from industrial visit and references book, a discussion is made based to the design requirement and technology involve in Absorbed Natural Gas (ANG).

Finally, The aim was to make a case study on the current status of the ANG technology and its future development.

ACKNOWLEDGEMENT

Alhamdulillah, syukur to Allah S.W.T., for giving us opportunity and strength to complete my final project successfully. Grateful acknowledgement is also made to all peoples who helped us directly and indirectly in the preparation of this project.

Firstly, I would like to dedicate this appreciation to my project advisor, Assoc. Prof. Dr. Ku Halim Ku Hamid and my co-project advisor, Mr Hamidun Md. Isa for giving us encouragement, guidance, information and exposure in knowledge for this project, which could produce a good contribution for academic, industry and technology development.

Secondly, deep appreciation to all Tepat Teknik staff especially to Mr. H. K. Lim (Project Engineer), Mr. Monshi Abdullah (Technical Manager), Mr. Mohd Shahir Ismail (Design Executive), Mr. Applasamy (Production Supervisor), and Mr. Nicole (QC Inspector). I would also, like to convey my heartfelt gratitude to all Acheat Automation staff especially to Mr. Ronald Teng (Manager). Also, to all Tractor Malaysia staff for helping us on the complete information about this project and assistance on data preparation.

Last but not least to all lecturers and friends, we are really grateful to all of you for the support, encouragement and co-operation in completing this project. Special grateful to my parents and family for their support, endless love and caring. I love you all and thanks for everything.

May Allah S.W.T bless all of you.

CONTENTS	PAGE
ABSTRACT	i
ACKNOWLEDGEMENT	ii
CONTENTS	iii
LIST OF ABBREVIATIONS	iv
LIST OF TABLES AND FIGURES	v
CHAPTER 1: INTRODUCTION	1
<hr/>	
CHAPTER 2: OBJECTIVE	3
<hr/>	
CHAPTER 3: NATURAL GAS	4
<hr/>	
3.1 NATURAL GAS FUEL OVERVIEW	4
3.1.1.1 COMPRESSED NATURAL GAS (CNG)	4
3.1.1.2 LIQUIFIED NATURAL GAS (LNG)	4
3.2 NATURAL GAS COMPOSITION	5
3.3 NATURAL GAS FOR VEHICLES	5
3.3.1 NATURAL GAS VEHICLES APPLICATIONS	6
3.3.2 WORKING PRINCIPLES OF NATURAL GAS VEHICLES	8
3.4 ADVANTAGES OF NGV	9
CHAPTER 4: ADSORBED NATURAL GAS	10
<hr/>	
4.1 LOW PRESSURE ADSORBED NATURAL GAS	10
4.2 COMPARISON OF ANG AND CNG	13
4.3 THE ANG STORAGE SYSTEM	14
4.3.1 THE ADSORBENT	14
4.3.2 THE STORAGE VESSEL	16
4.3.3 THE GUARD BED	18

CHAPTER 1

INTRODUCTION

Liquid fuels have dominated in the off-road and on-road vehicle markets, but compressed natural gas (CNG) is emerging as a safe, clean alternative to gasoline, diesel and propane. Over 1 million natural gas vehicles in operation across the world have helped build a proven safety record for CNG vehicles for both on-road and off-road vehicle applications. (*Leong Chok Fong, 1997*).

The structural integrity and the natural gas fuel system and the physical qualities of natural gas as a fuel make CNG vehicles as safe as vehicles operating on conventional fuels. CNG fuel tanks are strong and puncture resistant, other components are also well guarded. When the tank is full, fueling stops automatically.

In the event of an accidental leak, CNG will dissipate into the atmosphere. Other fuels are heavier than air and create dangerous pools when a leak occurs. Natural Gas also has a distinct odor allowing for easy detection of leaks if they were to occur. CNG fueling facilities can be located much closer to a building than conventional fuels and in some cases, CNG refueling is so safe that it can be done indoors.

Natural gas is the most abundant source of energy on the planet. It is found on every continent, in nearly every country. Natural gas is virtually ready to use as it comes from the ground. Expensive refineries are not needed to process it. A vast pipeline infrastructure for distributing natural gas throughout the country is already in place and in use.

As worldwide use of automobiles grows, dependence on oil increases daily, vehicle exhaust emissions affect personal health, and "greenhouse gas emissions" continue to contribute to global warming.