INVESTIGATION OF HHO GAS GENERATION FROM WATER AS A RENEWABLE ENERGY SOURCE

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I wish to dedicate this thesis to my dearest country Iraq, my parents, my family and friends who have encouraged, guided and inspired me throughout my journey of education.

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ABSTRACT

Energy demand in the world continues to increase with the increase in development and population growth ,the need for a cleaner, cheaper and friendlier energy source is on the rise . In addition to that, the fossil fuel price is also on the rising trend. Dues to this matter, HHO [H20] Gas Generation from Water as a Renewable Energy Source were invented. However, due to no publicity towards promoting to the smaller scale hydrogen gas plant, the research and study towards it are not being done . The aim of this project is to construct a prototype of HHO Gas Generator from water to be used as a site laboratory in University Teknologi Malaysia . Chapter one will be discussing the introduction, Background of study, objectives and scope of works of the project. Chapter two discuss the previous studies of the HHO Generator system done by previous researcher and students, improvement in the HHO system are main objective of this chapter. The identified area are the site selection, HHO Gas generation system to reduce the fuel consumption in the car, and Hydrogen generation when there is a surplus of electric power generated. Next chapter discuss the methodology in details. In the fourth chapter, the expected results and the equations of the calculations of this system. The last Chapter, the finalization of the design and trial has been done. With the construction of the prototype .it is hope that research towards a proper and better plant design can be achieved.

ABSTRAK

Permintaan tenaga dunia semakin meningkat seiring dengan peningkatan pembangunan dan perkembangan populasi. Keperluan untuk sumber tenaga yang bersih, murah dan mesra juga semakin meningkat. Situasi ini ditambah pula dengan *trend* kenaikan harga minyak mentah. Penghasilan gas HHO dari air sebagai sumber tenaga baru telah dicipta. Walaubagaimanapun, oleh kerana tiada publisiti ke arah mempromosi kepada Kilang Gas Hidrogen berskala kecil, kajian penuh terhadap projek ini tidak dapat direalisasikan. Objektif projek ini adalah untuk membina prototaip *Generator* Gas Hidrogen dari sumber air untuk digunakan di dalam makmal Universiti Teknologi Malaysia. Bab 1 akan membincangkan Pengenalan,Latar Belakang Projek, Objektif dan Skop Kerja di dalam projek. Bab 2 akan membincangkan kajian-kajian terdahulu tentang Sistem Penjana Hidrogen yang telah dijalankan oleh para pengkaji dan pelajar, penambahbaikkan kepada Sistem Penjana Hidrogen adalah objektif utama dalam bab ini. Pemilihan tapak percubaan, Sistem Penjana Gas Hidrogen untuk mengurangkan pengunaan minyak mentah untuk kereta dan menjana gas hidrogen apabila penjanaan kuasa elektrik berlebihan. Bab seterusnya membincangkan kaedah secara terperinci. Dalam bab empat, terdapat keputusan kajian dan pengiraan terhadap system. Pada bab terakhir, rekaan rekabentuk terakhir dan pencubaan telah dilakukan. Dengan penghasilan prototaip , diharap kajian penuh terhadap rekaan kilang penjana hydrogen boleh dilaksanakan.

CHAPTER 1

INTRODUCTION

1.1 Introduction

Hydrocarbon fuels provide the primary source of energy used in the world. These fuels are used for applications such as electrical power generation, heating and transportation. Although hydrocarbon fuels provide energy for our world they have several very serious side effects. These negative side effects include harmful polluting emissions, increased levels of greenhouse gas and catastrophic disasters such as large scale oil spills. High costs and political instability, due to foreign sources, also are negative side effects. Due to the widespread dependence on hydrocarbon fuels and the difficulty of their replacement, it is not economically feasible to completely eliminate their in the near future. Methods are needed to significantly reduce the harmful emissions and consumption of hydrocarbon fuels.

One possible way to reduce consumption and emissions of hydrocarbon fuels is using hydrogen as a fuel supplement. Many studies have shown that adding a small amount of hydrogen gas to the air intake of a combustion process can reduce the emissions and fuel consumption. These studies have shown that hydrogen is able to improve the flame speed, lean burn ability, and flame quenching distance of hydrocarbon combustion in the cylinder leading to reduced fuel consumption and emissions [1,2,3]. The availability and cost of compressed hydrogen have made this process difficult to implement.

Production of Hydrogen rich gas from the electrolysis of water, at the point of use, could solve many of the potential difficulties of using hydrogen as fuel supplement to improve hydrocarbon combustion. This gas, also referred to as Brown's Gas or HHO, has been shown to exhibit properties that make it a much more reactive gas than standard bottled hydrogen. These properties include the ability to melt metals with very high melting temperature but have a relatively cool flame when burned in air [4,5,6]. Several studies have shown that retrofitting a gasoline/diesel generator or automobile engine with an on-board Brown's Gas generating system, powered by the engine's electrical system, can significantly improve engine emissions, performance and fuel efficiency [7,8,9].

1.2 Background of study

Energy is one of the most important factors, technological development , where he became industrialized world looking in earnest for sources, additional energy, and also developing countries, which are looking for useful energy for economic development there. And hydrogen energy is one of the finest environmentally friendly energy and the most readily available and accessible to use in many aspect of life. The hydrogen gas is usually found in the form of a vehicle with other gases notably ethanol Among the most important features and characteristics of hydrogen gas that in normal circumstances and in any place of the globe is available in abundance, which constitute 90 per cent of the total weight of the universe, which is the source of more energy efficient from other sources. The combustion of hydrogen does not cause any contamination or poisoning in the air like other gases such as carbon dioxide or sulfur , but the problems of hydrogen energy that the process of condensation and storage when converted from gas to liquid can be very expensive, as well as the projects of hydrogen is characterized by dangerous high because of the possibility explosions.[10]

Fuel that used in cars and boilers became expensive and combustion products contaminated materials to the environment. Therefore, it is necessary to resort to an

alternative energy, free of this contaminants and one of these energies is to use gas oxyhydrogen. Through the electrically analysis of water and use it in cars and boilers instead or as assistant of conventional fuels as high capacity, low cost and nonpolluting.[10][11]

The analysis of water projects is popular with inventors and hobbyists worldwide. There are thousands of videos posted on YouTube under the search, water fuel. Nearly everyone believes their electrolyzers produce a mixture of hydrogen and oxygen gas known by various names such as HHO, Hydroxy, Oxyhydrogen, and Brown's gas. Brown community has yet to explore or explain this anomaly. Burning hydrogen cannot account for it. Perhaps the most popular application of the water electrolyzers is to boost an automobile's gasoline mileage. An energy anomaly manifests here as well for the boosters typically produce only a few (5-20) liters of uncompressed gas per minute. Yet many claim significant increase in miles per gallon (20–50%). Burning hydrogen cannot account for it.[12]

HHO fuel goes by several other different names including oxyhydrogen and hydroxy. When used in cars, HHO fuel helps an engine to burn more cleanly, reduce emissions and increase gas mileage much to the chagrin of those who don't understand how it works.

In this research study are some of the properties of gas HHO, through the analysis of the water where the gas is produced electrically HHO, which is a mixture of Hydrogen gas and Oxygen gas by the rate 2:1 respectively.[13]

Hydrocarbon fueled engines produce carbon dioxide (CO_2), carbon monoxide (CO) and water vapor (H_2O) as byproducts of the combustion process [13]. The hydrogen-oxygen mix brings the fuel to a temperature that allows more of the injected fuel to vaporize, preparing it for combustion. Oxyhydrogen gas thus allows a more complete combustion of the gasoline in the combustion chamber due to a faster flame propagation and higher combustion temperature. This will results in a cooler and a cleaner burn. As a result there will be an increase in horsepower and gas mileage from the better combustion of the gasoline or diesel. This reduces engine's need for total fuel and also reduces exhaust emissions. Analysis on the study had

shown better increased in thermal efficiencies and overall fuel savings of 15% [14]. Normally, any unburned fuel coming out of an engine is burnt in a catalytic converter.

Oxyhydrogen gas (HHO) improves the burn quality to such a degree that a catalytic converter is no longer needed [2]. As the catalytic converter is not required, any back pressure on the exhaust system which led to less acceleration power can be eliminated. Certain claims been made by people that installed the electrolyzer unit to produce HHO gas to supplement their vehicles observing fuel savings were really unjustified when the electrolyzer unit electrical power is supplied from the vehicle's battery or alternator. Alternator has to recharge the vehicle battery, power the ignition, headlights and supply the power of various accessories that abound in a modern vehicle. As the vehicle alternator is directly coupled to vehicle crankshaft, it is obvious any increasing demand of current will result on decreasing crankshaft speed, and will simultaneously requires more fuel input to keep it running at desired speed.[11]

Thus the use of an alternator to power up the HHO generator actually increases the specific fuel consumption.

Water is analyzed by electrolyzer where pass an electric current in electrolyzer where ability is measuring the input voltage and current, this current given time output analysis is HHO gas was measuring by gas volume meter for the constant volume of HHO gas 100ml and measurement the time needs for this volume after that calculate all data and expense of the efficiency of the system.

1.3 Problem statement

The studies of HHO Gas Generation from analysis of water Properties have not been widely done especially in industries applications field.

The studies of using different concentration from different auxiliary materials and different types of water have not been widely done, especially in industries applications field, and how they effects on the efficiency of the system.

1.4 Research Objective

The main objective of this project is to find milliliter per minute per watt (MMW) of HHO gas by measuring the current, time, and limited volume of HHO Gas generated at different types of water and different concentration of auxiliary materials.

To find the efficiency of the system at difference concentration of auxiliary material and difference voltage with different types of water.

1.5 Research Scope

The scope of this work is described below:

In this work the hydroxy (HHO) or brown's gas generated from analysis of water , by using different voltages starting from (0-22) Volt d.c apply on two electrodes of Capacitive Electrolyzer , 1.5 liter capacity, 21 series stainless steel plates 18.3x3.8cm, 4 stack and 20 water cell, and by using two types of water, tap water and distilled water, with two different auxiliary materials, Hydroxide Sodium (NaOH) and Soda ($NaHCO_3$) . HHO gas will generated with The different time of the same volume 100ml .The quantity of HHO gas depends on the concentrate of auxiliary materials with the water, hence using 5,10,15 and 20 gram per 1.5 liter water concentration.

1.6 Significance of study:

The significant of the study will give contribution in investigation of HHO as a renewable and clean energy.

Hence when using HHO gas the emissions of these gas is water, using this gas due to reduce consumption of fossil fuel and reduce the carbonate emissions in machines due to reduce of pollution rates and reduce of thermal warming, when using this gas in the internal combustion engines due to improvement of efficiency and reduce the temperature degrees of this machines and that means to increase the operational life of her.

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