REVIEW ON DESIGN AND DEVELOPMENT OF HYDROGEN PRODUCTION SYSTEM USING HHO DRY CELL METHOD AND ITS APPLICATON

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ABSTRACT

Electrolytic production of hydrogen from water is gradually gaining its importance among the other conventional process of hydrogen production in the context of renewable energy source utilization and environmentally clean technology. A device called HHO generator, hydrogen and oxygen are produced onboard on it is used as an additive to gasoline in conventional internal combustion engines. Construction of a HHO generator is relatively simply process with small money requirements. All measurements were realized with 10% KOH solution because this electrolyte at this concentration is considered as the best available one. KOH solution excels in chemical stability and efficiency of HHO gas production. For comparison, the 10% NaOH solution was prepared because of low price and good availability of NaOH and all measurements were repeated and results were compared.

Keyword : - *Hydrogen Production , HHO Dry-cell, Gas Production , Electrolysis etc.*

1. INTRODUCTION

Hydrogen is a clean efficient and versatile energy carrier which together with electricity may satisfy that would be permanent and independent of energy source. It has unique characteristics that make it an ideal energy carrier which include the fact that: (a) it can be produced from and converted into electricity at relatively high efficiency. (b) its raw material for production as water- available in abundance. (c) it is a completely renewable fuel.(d) it is environmentally compatible as its production storage, transportation and end-use do not produce any pollutants , green house gas or any harmful effect on the environment[1].

1.1 Principle of HHO Gas Production

In this process two electrode, one is cathode and other anode which act as positive and negative terminal and in between a neutral plate which combine to make a series plate dry cell for electrolysis process to occur. The basic concept for the production of HHO gas is separation of oxygen and hydrogen molecules [2]. Hence the cell will give an output as a mole of hydrogen and oxygen and name is given as oxyhydrogen as generated through electrolysis process.

2. Some of Feature of HHO

2.1 High Working Efficiency Gas

The production HHO gas is on-board setup, whenever we required to produced more gas from higher pressure of flame it is require to drawn more current-voltage, however conventional system is depend on gas cylinder and it extremely dangerous with usage of gas cylinder.

2.2 Environment Protection
The production setup of hydrogen and oxygen and them by product will be water vapor, as in conventional there by product were carbon foot print, soot particle, harmful gas etc.

2.3 Economic
It is less expense in production, storage and flexible system to produce as per requirement.

2.4 High Precision Technology
Oxyhydrogen flame reaches at 3000c temperature and it as high concentration of flame and high spot of point.

2.5 Faster
Energy is given directly to work place, and is also slag low, and edge rollover.

2.6 Application of HHO Gas
Because of cheap production system and high efficiency of cell with low emission under confined area, HHO gas is used in various area of machining process.

1. Soldering & brazing.
2. Metal cutting process.
3. Application on industrial boiler.
4. Heating process.

3. METHODOLOGY

Ramchandra [2]explained various technique to produce hydrogen by electrolysis process. It gives an information of hydrogen production by alkaline electrolyte, proton exchanger electrolyte & solid oxide electrolyte. They studied a life cycle assessment of electrolysis process by renewable way and show that life cycle of electrolysis cell will play an important role for efficient production of hydrogen. One can produce sustainable hydrogen with the help of wind, PV cell, hydropower, solar, thermal etc. A study on the acidic environment and global warming are considered and found that production of hydrogen from PV cell is more efficient.

Marcel [3] has investigated the production of HHO gas with considering the percent of concentration. It will take a 5%, 10%, and 20% of NaOH and changes a volt-ampere characteristic, efficiency among them will considered and comparing graph of all data.This show that NaOH was effectively of low electrochemical stability.
They considered a dimension of cell as 200mm*160mm*0.8mm. He obtained an effective result because 3mm diameter and filling hole of cell for the bubbler was considered as 2mm to equalize an electrochemical level in cell. A bipolar plate having a neutral plate in between is introduced. However, the positive and negative electrode plate is considered as more voltage as compared to neutral plate. It is measured by current-voltage drawn, temperature and production of gas with respect to above parameter as shown in Fig. 3.1.

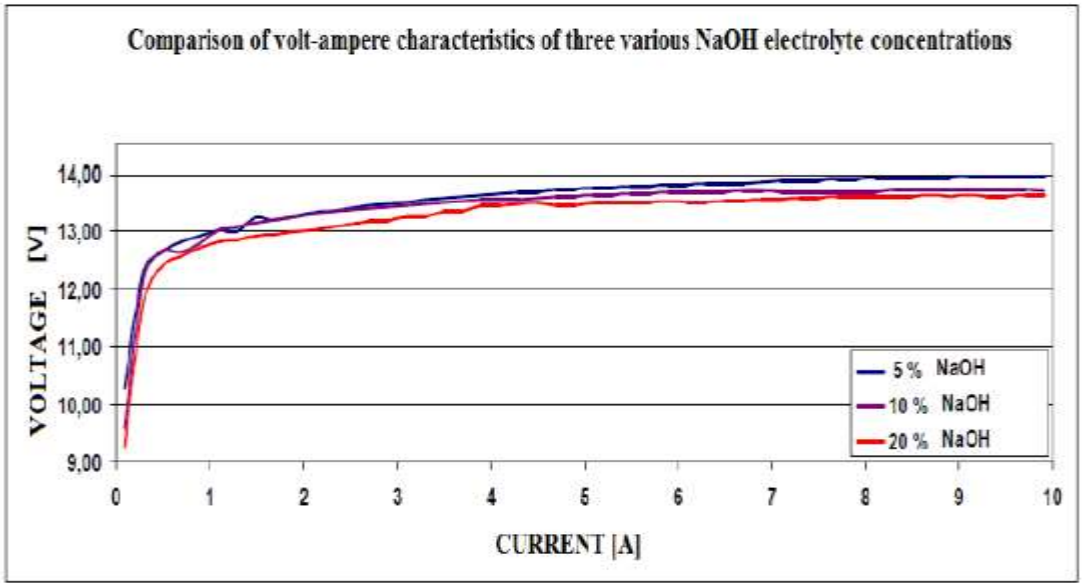

Figure 3.1 Voltage vs Current for different Concentration.[3]

It is concluded that NaOH solution will vary with same amount of difference of varying concentration. It is shown in Fig. 3.2 that cell running at 20% NaOH will be more effective among all other, because it considers lower electricity consumption at 0.5V applied to system respectively.

At last we finally say that at considering electricity to work as cell at 20% NaOH will be more effectively and considering all other parameter we get an effective result at that concentration.

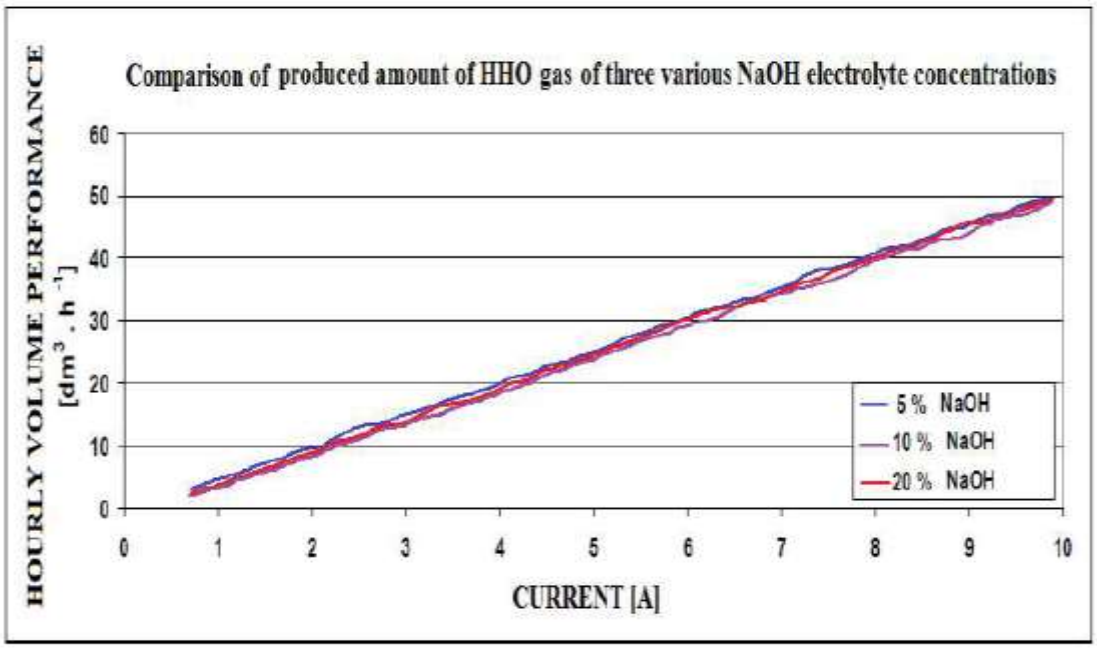

Figure 3.2 Hourly Voltage Performance vs Current.[3]

Lalnunthari [4]]optimized the temperature of cell and concluded that at a certain temperature of cell, maximum production of hydrogen is achieved.The electrolytic solutions are prepared by dissolving KOH in distilled water in the concentration range 0.5 to 2 M. Power supply for electrolysis is obtained from a 144 Ah 12V lead accumulator, which is charged to its full capacity before each experiment. The HHO gas production rate was measured by

displacement of water under atmospheric pressure. The temperature of the solution during electrolysis was measured using alcohol thermometer as shown in Fig. 3.3. The current and voltage were measured with a digital MultiMeter.

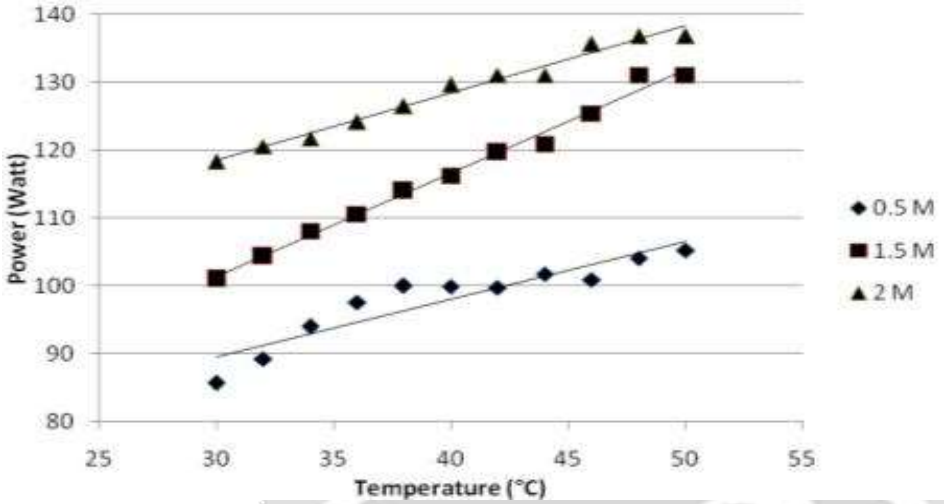

Figure 3.3 Power vs Temperature [4]

4. CONCLUSIONS

The maximum HHO flow rate reach in this study is 1.2 ± %10 LPM at 2M concentration of KOH at 44˚C. The electrical power consumed is 131 Watt. From the information seen in many open sources over the internet, one popular standard used to adjust the amount HHO enrichment level is 1/4 LPM for every 1 Liter of engine size. Production of hydrogen by sustainable energy is an effective method of electrolysis process. KOH is one of hot starting electrolyte and NaOH is one of cold starting electrolyte. For optimization of the cell, it is requiring to consider a parameter like current-voltage, temperature of cell, concentration of electrolyte and cell configuration.

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