

# Sustainable Method of CNG Production Using Carbon Dioxide and Water

**Dr. Vinod V<sup>1</sup>, Mohamed Saheer Marakathel<sup>2</sup>**

Professor, Mechanical Engineering Department, N.S.S College of Engineering, Palakkad, India<sup>1</sup>

Student, Electronics and Communication Engineering Department, N.S.S College of Engineering, Palakkad, India<sup>2</sup>

**Abstract:** The proposed innovation of sustainable method for producing compressed natural gas (CNG) by the inputs carbon dioxide and water is an advanced chain of production. The carbon dioxide extracted from the atmosphere and the water is collected from the residential areas. The hydrogen gas is extracted from the water, which on reaction with carbon dioxide in presence of catalyst produces methane.

**Keywords:** Sustainable, water, pollution, carbon dioxide.

## I. INTRODUCTION

The Non-renewable energy sources like petroleum, diesel, gaseous petrol and other oil-based commodities are in the long run framed from the dead survives from plants and creatures. These dead remains are normally changed over into the petroleum products, in hundreds years of timespan. Non-renewable energy sources are utilized to remove oil and flammable gas which later experience a few cleaning and change procedures to deliver most unadulterated type of fuel. CNG is presently delivered by extraction and refining of raw petroleum which is exceptionally expensive. Embracing the proposed eco-accommodating CNG plant system, would build the proficiency of the creation and furthermore gives better answers for amending the current natural issues; are the commitment to the general public by this task. From the examination, the productivity of CNG creation can be expanded, the expense and endeavors for the sources of info can be decreased by the proposed procedure. The CNG creation plant is really structured as a piece of a chain, comprising of the wellsprings of information sources and yield for a lasting procedure. The sources of info carbon dioxide is removed from the environment, the local waste water is gotten from the local locations. The prepared yield CNG fuel is provided to purchasers, there by proceeding with the chain of creation and utilization.

## II. CURRENT ISSUES AND SOLUTIONS

By taking three global environmental problems for which, no efficient solutions are found; can be rectified by the proposed innovation:

- Global warming: Carbon dioxide concentration in atmosphere
- Water pollution: Waste water increment
- Air pollution: Automobile exhaustion

Carbon dioxide is having a mind blowing focus in the air. Factual reports says that each in 12 years, the centralization of the carbon dioxide expanded twice. As the carbon dioxide sum is expanding in the climate, there is warming impact happening because of the catching of radiations from the sun in then environmental layers of the earth. Which prompts the wonder called an unnatural weather change. For the proposed advancement, carbon dioxide is separated from the environment via air fragmentary refining technique which is a research center investigation process.

The waste water is changed over into hydrogen gas, by most proficient method with no ecological issues. Electrolysis of local waste water, Microbial Electrolysis Cell (MEC) of residential waste water, Microbial Fuel Cell of local waste water are the most refreshed eco-accommodating strategies for creation of hydrogen gas. Consequently the proposed advancement would in the long run make the earth liberated from carbon dioxide increase (an unnatural weather change) and waste (water contamination). [1]

## III. RESEARCH DATA OF THE INNOVATION

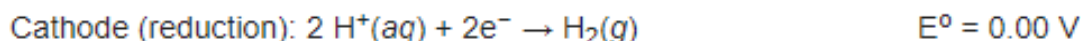
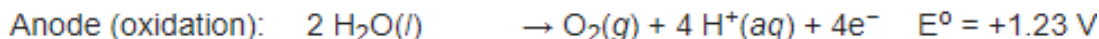
The production of a fuel, compressed natural gas is highly sophisticated due to the extreme conditions and efficiency parameters.

### A. *Electrolysis Chamber*

The electrolysis is the procedure where the water is part into hydrogen and oxygen atoms when power is gone through water. On this response, the yield items oxygen delivered is at the anode terminal and hydrogen is created at the cathode anode. The progression



of electron is through the outer circuit across PEM and there by cathode. On consolidating with the electrons, hydrogen particles are changed over to hydrogen gas at the cathode terminal. [2]

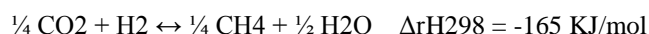


#### B. Air Fractional Distillation Chamber

Air is separated to expel residue, and afterward cooled in stages until it comes to  $-200^\circ\text{C}$ . At this temperature it is a fluid. We state that the air has been condensed. Air is the business hotspot for a significant number of the gases it contains. It is isolated into its parts by partial refining of melted air. Before air is condensed, water fume and carbon dioxide are expelled, in light of the fact that these substances harden when cooled and would stop up the channels of the air liquefaction plant.[3]

#### C. Methanation Chamber

Methanation is a manufactured reaction that changes over carbon monoxide just as carbon dioxide into methane. The carbon dioxide removed from the environment and the hydrogen can delivered is responded within the sight of the impetus to create the methane. Creation of methane over the "Sabatier" reaction is a prominent system for changing over  $\text{CO}_2$  to a supportive thing and was proposed by Paul Sabatier and J.B. Sendersens in 1902. A tremendous extension making of methane dependent on carbon dioxide has never been comprehensively settled and on reason of carbon monoxide just in several plants. This is an aftereffect of the uncommon extraordinary availability and economy of oil gas. With the new improvement of the Power to Gas development for an imperativeness profitable limit plan of boundless force, methanation builds a huge amount of essentialness. [4]



#### D. Liquefaction Chamber

Vaporous petroleum liquefaction chambers. Warmth exchangers used at a consolidated vaporous petroleum plant to cool oil gas into liquid structure with the objective that it will in general be even more adequately moved for use as a fuel. Under normal conditions, methane has a thickness of  $416 \text{ kg/m}^3$  in liquid state and  $0.717 \text{ kg/m}^3$  in vaporous express, its fundamental weight is  $45.8 \cdot 10^2 \text{ kPa}$ , essential temperature is  $-82.1^\circ\text{C}$ , and limit at climatic weight is  $-161^\circ\text{C}$ . [5]

## IV. CONCLUSION

The Production of Compressed Natural Gas (CNG) by using waste water and carbon dioxide, the proposed innovation is not suitable for a household sector, due to the hydrogen gas processing and storage. But a well-known person regarding the transportation of hydrogen and chemical reactions, can have the proposed innovation in their house plot. For the transportation and portability CNG fuel, it is liquefied by the liquification chamber, which is commonly used for LPG conversion. For the same quantity of CNG, the proposed innovation will give a reduction of 45% in cost for the fuel as per the reaction efficiency. Even though CNG vehicles are having 80% efficiency in the vehicle performance, this due to impurities in the fuel. CNG produced by the proposed method is of the purest form of methane, since not extracted from the earth. Thus, the efficiency of CNG vehicles will be increased. Since the CNG is an eco-friendly fuel, this leads to succeed a pollution free better tomorrow.

## REFERENCES

- [1] Bui, M, Adjiman, C. S, Bardow, A, Anthony, E. J, Boston, A, Brown, S, Fennell, P. S, Fuss, S, Galindo, A, Hackett, L. A, Hallett, J. P, Herzog, H. J, Jackson, G, Kemper, J, Krevor, S, Maitland, G. C, Matuszewski, M, Met- callfe, I. S, Petit, C, Puxty, G, Reimer, J, Reiner, D. M, Rubin, E. S, Scott, S. A, Shah, N, Smit, B, Martin Trusler, J. P, Webley, P, Wilcox, J, and Dowell, N. M, 2018, "Carbon Capture and Storage (CCS): The Way Forward," Energy Environ. Sci, 11, pp. 1062–1176.
- [2] AbdullahAlmatouqa, Akintunde O.Babatundeb, MishariKhajaha, GordonWebsterc, Mohammad Alfodaria., "Microbial community structure of anode electrodes in microbial fuel cells and microbial electrolysis cells", Journal of Water Process Engineering Volume 34, April 2020, 101140
- [3] concentration in the reaction mixture" Journal of the Energy Institute, Volume 93, Issue 1, February 2020, Pages 415-424
- [4] TadeuszChwołaa, TomaszSpietza, LucynaWięclaw-Solnya, AdamTataczuka, AleksanderKrótkia, SzymonDobrasa, AndrzejWilka, JanuszTchórz, MarcinSteca, JanuszZdebb., "Pilot plant initial results for the methanation process using  $\text{CO}_2$  from amine scrubbing at the Łaziska power plant in Poland", Fuel, Volume 263, 1 March 2020, 116804
- [5] OlivierBordelannea, MichelineMonteroa, FrédériqueBravina, AnnePrieur-Vernata, Olga, Oliveti-Selmia, HélènePierrea, MarionPapadopouloub, ThomasMuller., "Biomethane CNG hybrid: A reduction by more than 80% of the greenhouse gases emissions compared to gasoline", Journal of Natural Gas Science and Engineering Volume 3, Issue 5, October 2011, Pages 617-624.
- [6] Rohit SinghLatherabL.M.Das., "Performance and emission assessment of a multi-cylinder S.I engine using CNG & HCNG as fuels", International Journal of Hydrogen Energy Volume 44, Issue 38, 9 August 2019, Pages 21181-21192



## BIOGRAPHIES



**Mohamed Saheer Marakathel** graduated from NSS college of engineering, Palakkad in 2020 with a Bachelor's of Technology in Electronics and Communication Engineering. He has a background in electronics, automobile and petro-chemical fields and holds keen interests in the area of IoT and Smart electronics. He had worked on 8+ Innovative projects, 2+ Patents and had received funding more than Rs. 3 Lakhs for his innovations.



**Dr. Vinod V**, is a Professor in Mechanical Engineering at NSS College of Engineering, Kerala. He has 22 Years of teaching experience and 3 years of Industrial experience. His area of interest includes Innovation & Product Development, Industrial Engineering and Advanced Automotive Technology. He has got 4 patents to his credit and has undertaken research projects of State and Central Govt. worth around 60 Lakhs. He has published around 40 publications in International Journals and conferences and is a research guide in the APJ Abdul Kalam Technological University, Kerala.