

BIOGAS SCRUBBING WITH WATER AND CHEMICAL SCRUBBER AND EVALUATE TECHNOLOGICAL PERFORMANCE

Biogas scrubbing technology

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Abstract— The alternative energy sources are the best option to overcome the difficulties of energy crisis and greenhouse gas emission. The bio mass is one of the source of alternative energy and the outcome of which after biological degradation is biogas. Biogas contains three undesirable components – carbon dioxide (CO₂), hydrogen sulphide (H₂S) and water vapour components. The problem with the high amounts of carbon dioxide is dilution of methane. If the biogas is to be stored, a large amount of space would be wasted on storing carbon dioxide. Similarly, if it was to be piped to another location, energy would be wasted in pumping the carbon dioxide. Most importantly, the water reacts with the hydrogen sulphide in the biogas, and creates a very corrosive acid. There is a great need to make biogas transportable. This can be done by compressing the gas in cylinders which is possible only after removing its CO₂, H₂S and water vapor components.

The objective of project work is to purify biogas by removing H₂S and CO₂ content through water and chemical scrubbing technologies.

Index Terms— Biogas production, Biogas purification, Chemical scrubbing, Water scrubbing

I. INTRODUCTION (HEADING 1)

Today the situation of energy in the world, whether in newly created or industrialized countries, is regularly discussed in political, economic and technical terms. The sources of energy like coal, natural gas, crude oil and nuclear energy are becoming meager. Bio-energy is deriving more and more significance in fields of research and development. Burning of fossil fuels creates waste materials, mostly emissions to the environment as combustion fuel gases, dust and some ash. These waste materials have hazardous effects to the nature and some also has global impact. So, now other sources of fuel should be searched out which can be most useful and eco-friendly. Gaseous fuels are the example of such sources of fuel. Gas fuels are more flammable. For good combustion, it forms a homogeneous mixture with air. Thus it will create less pollution.

II. BIOGAS

Biogas is an enchanting source of energy for rural areas. Biogas can be obtained from cow dung, other animal waste and also from plants all of which are renewable and available in the countryside. Also called “Gobar gas”, it is produced by bacteria, which break down organic material under oxygen less conditions. This process is also called “anaerobic digestion”. The content of biogas, based on the feeding material and the method to digest it and mostly lies in the range : 50-70% methane (CH₄), 25-50% carbon dioxide (CO₂), 1-5% hydrogen H₂, 0.3-3% N₂ and other minor impurities, especially hydrogen sulphide (H₂S). A biogas can behave as a promised alternative fuel by changing considerable amount of fossil fuels.

III. WORKING

EXPERIMENTAL SETUP

METHODOLOGY

In the present work, first of all biogas plant will be developed from PVC tank either by using cow dung or kitchen waste. Afterwards, the gas which is generated will be stored in automobile tube and later on scrubbing process will be done to purify biogas.

CHEMICAL SCRUBBING

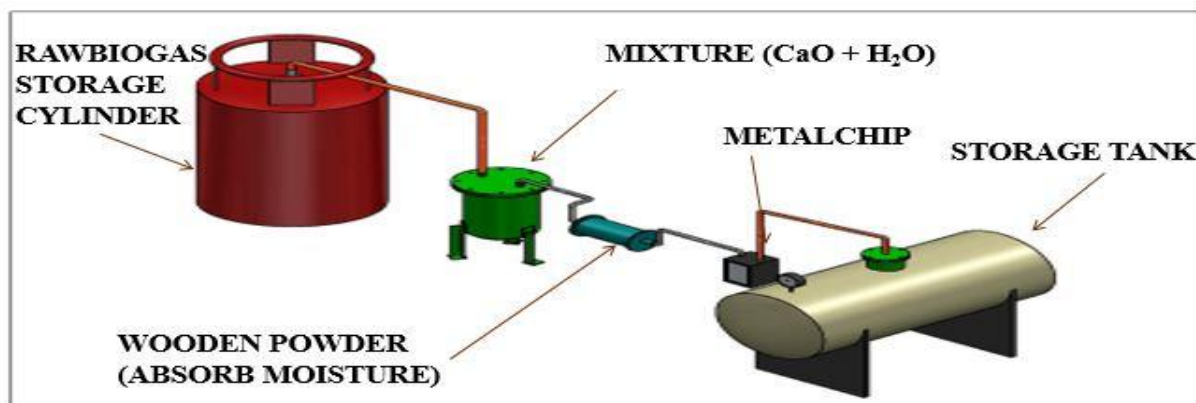
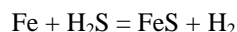
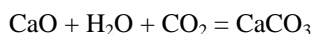


Fig. 3D model of chemical scrubbing technology

In this kind of scrubbing the gas will pass through the tank which is filled with mixture of Calcium Oxide and water ($\text{CaO} + \text{H}_2\text{O}$). So by chemical reaction carbon dioxide will be removed and then the gas will pass through metal chip (Fe) to remove Hydrogen sulfide and finally the gas will pass through wood powder, which absorbs moisture from the biogas.

CHEMICAL REACTIONS



WATERSCRUBBING

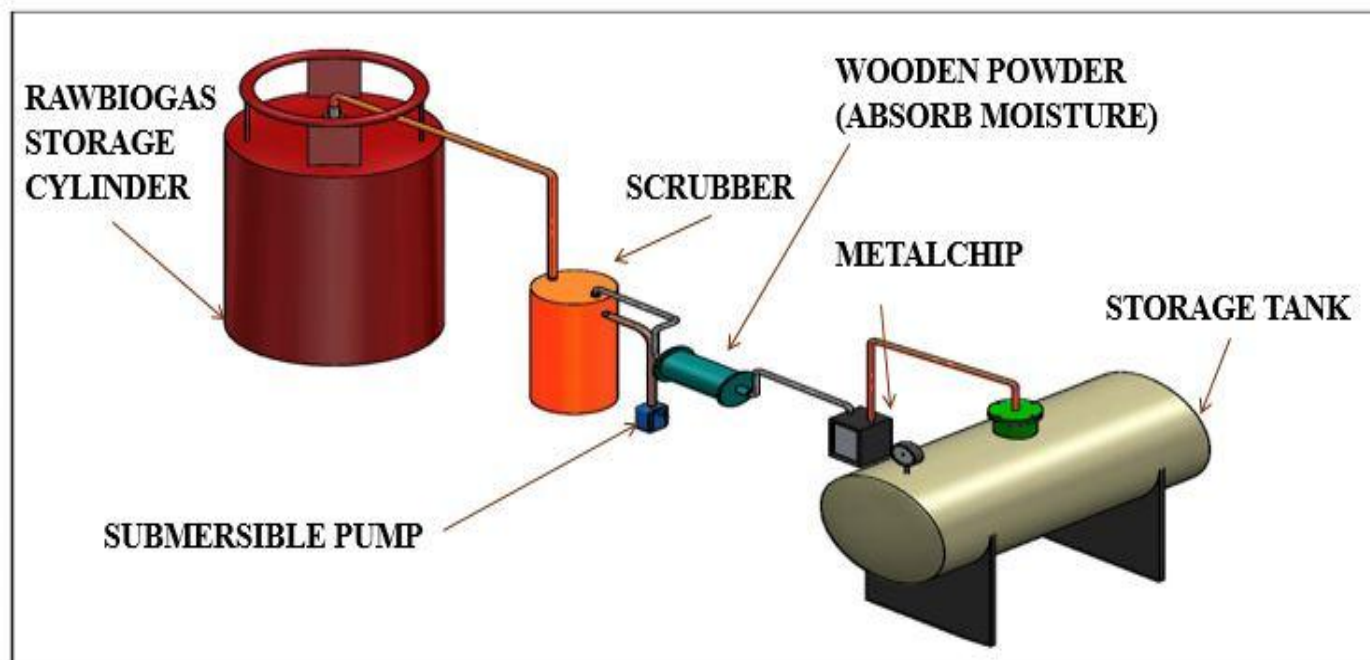


Fig. 3D model of water scrubbing technology

In the water scrubbing, water at high pressure is sprinkled in the pipe where it will mix with biogas and so the water & carbon dioxide (CO_2) will react. So carbon dioxide will be finally removed. The rest of the process to remove H_2S and moisture will be same as chemical scrubbing.

IV. LIST OF COMPONENTS

- 1) PVC tank with 1000 LITRES capacity.
- 2) Calcium Oxide (CaO)
- 3) Metal chips
- 4) Wood powder
- 5) Submersible pump
- 6) Automobile tube
- 7) PVC pipe for Water scrubbing

V. CONCLUSION

By doing chemical and water scrubbing of "RAW BIOGAS", pure methane will be obtained which lies in a range of 85-90 % (CH_4). The Obtained pure methane can be compressed and bottled in a cylinder which can be transported to the places where biogas plant is difficult to Implement (In urban areas) and can be used for different purposes. The scrubbed biogas can also be used as CNG gas by pressurizing the Biogas at around 140 bar.

The usage of scrubbed biogas will reduce the usage of fossil fuels, which further eliminates the emissions of NO_x , CO_x and hydrocarbons. Hence hazardous effect of such pollutant will be reduced and it results in eco-friendly environment.

VI. ACKNOWLEDGMENT

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