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Review Article

A Review on Power Generation and Making Pure Water using Acetylene Gas

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Abstract

In the present study calcium carbide and pure water was used for forming the acetylene. Acetylene was used as main fuel which is stored in a tank, which is supplied to gas turbine then power produced in device. This power is utilized to generate electricity with the help of electricity generator and gear mechanism. This produced electricity is going through following stages: 1] To induction boiler which consist the saline water, which get vaporized due to running of boiler. 2] Then this superheated steam goes upward through electric heat pipe due to low density. 3] This superheated steam was passed some distance by heat pipe. Afterwards co-generation plant is situated, which is working on the superheated steam. 4] this steam is passed again in a cogeneration where it generates electricity again 5] After that this superheated steam is converted into water By condenser.6] this water is used to drought area and required purposes.

Keywords: *Acetylene, Gas-Turbine, Electric Generator, Induction Boiler, Co-Generation Plant, Condenser.*

1. Introduction

Now day's energy consumption increases in day to day life hence we improve and develop technology to complete that need. Also our basic need are as water which is present in lots amount on earth, but its large amount present in form of saline water (sea water) which is not mostly for our use.

Hence to complete the need of water the conversion of saline water into pure water that is necessary. Hence it can be formed by chemically but its formation is minor proportion. Our main aim is to get the pure water and electricity. Both to be complete in our subject that's. A review on power generation and making pure water using acetylene gas

As we know acetylene is one of the most flammable gases that have high intensity of flame we use to drive a power generation plant.

Then this electric power is operated a boiler in this boiler we add saline water from a filter which decrees intensity of salt in the water. Then this water get heated in boiler as it get vaporized then it store at top side of the boiler in the form of vapors then this super-heated steam flow to toward the power generation unit now the electricity is generated by vapor which get from sea water then due to conversion of water into vapor it's become pure and salt free.

Then this steam is flowing from condenser, where it changes its phase and become water this water is store into a reservoir as use of human necessity.

2. About acetylene

Acetylene is the colorless gas with garlic smell produced from the calcium carbide caco2, which is obtained from calcium carbonate caco3. Further the calcium carbonate is heated in lime kiln at about 8250c which forms calcium oxides (lime) liberating. Calcium oxide is then heated in electric furnace with coke to produce calcium carbide finally calcium carbide is hydrolyzed producing acetylene.

As acetylene is colorless gas and is highly combustible with high flame speed and fast energy release, it can be used as alternative fuel in IC engines. It has a very wide flammability range and minimum ignition energy required for ignition. Furthermore comparing with various other fuel properties, acetylene proved good to be used in internal combustion engines.

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COMPARISON WITH OTHER FUELS

Physical and Combustion Properties of fuels	Acetylene	Hydrogen	Diesel
Fuel	C_2H_2	H_2	$C_8 - C_{20}$
Density kg/m^3 (At 1 atm & 20 °C)	1.092	0.08	840
Auto ignition temperature (°C)	305	572	257
Stoichiometric air fuel ratio, (kg/kg)	13.2	34.3	14.5
Flammability Limits (Volume %)	2.5 – 81	4 – 74.5	0.6 – 5.5
Flammability Limits (Equivalent ratio)	0.3 – 9.6	0.1 – 6.9	------
Lower Calorific Value (kJ/kg)	48,225	1,20,000	42,500
Lower Calorific Value (kJ/m^3)	50,636	9600	-------
Max deflagration speed (m/sec)	1.5	3.5	0.3
Ignition energy (MJ)	0.019	0.02	--------
Lower Heating value of Stoichiometric mixture (kJ/kg)	3396	3399	2930

3. About ppa 571

Plascoat PPA 571 ES is a thermoplastic coating powder which has been specifically designed to provide a long lasting, tough coating for exterior applications to mild steel, galvanised steel and aluminium. It is based on an alloy of acid modified polyolefins. Therefore it is halogen free and the combustion fumes are low in smoke and have a low toxicity index. Plascoat PPA 571 ES is resistant to stress cracking, adverse weather conditions, detergents, salt spray and typical airborne pollutants. The coating maintains excellent adhesion to the metal substrate without the need for a separate primer. The material also provides good abrasion and impact resistance. PPA 571 over-sprayed powder is to be recycled then blend a maximum of 25% of this over-sprayed powder with 75% of virgin powder**.** This is use for the internal coating of pipe which used for carrying saline water

4 Construction and working of project

Step 1: The first step involves the production of acetylene gas through the Calcium Carbide reacting with Water in the reaction tank.

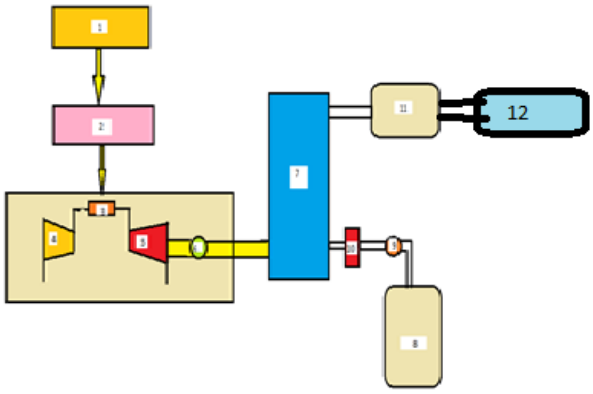
CaC2+2H2O C2H2+Ca (OH) 2

The reaction tank constitutes two chambers:

- In first (upper) chamber the water is kept.
- In second (lower) chamber the calcium carbide is kept.

The water from the first chamber is released in such a way to proceed the reaction spontaneously. The water is passed through the control valve. In the second chamber the calcium carbide is kept in desirable amount to react with water. Through second chamber a valve is connected to the storage tank where the gas produced during reaction is stored

Step 2: In this step the acetylene gas is stored in the storage tank and the pressure is measured by the pressure gauge. In this step the produced gas is stored and is passed through the pipes. Here the gas is stored to avoid moisture and the gas stored in storage tank is provided pressure through pressure gauge so the gas is of high concentration. Sophisticated manner and then pipe is joined with the filter, then it can be get transmit to the gas turbine.



1. Reaction-section2.Reservoir 3.Combustion chamber 4.Compressor 5. Turbine 6. Generator 7Induction boiler 8. Saline water reservoir 9.Feed pump 10. Nanotech filter 11. Cogeneration power plant 12. Drinking water reservoir

Fig.1: Block Diagram of Project

Step 3: in this step generation of power is done first of all atmospheric air is come in compressor section where it get compressed and then its highly compressed air is come in combustion chamber due to high temperature (530c) acetylene get fired and it generate power in the turbine.

Step 4: after then the power devoted in the turbine is transmitted to the alternate which generate electricity.

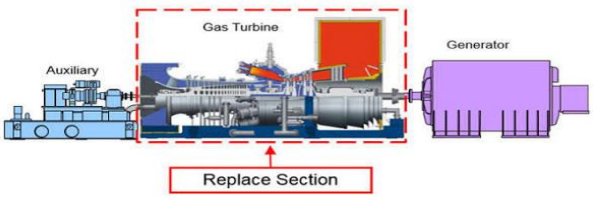


Fig.2: Set up of gas turbine with generator

Step 5: generated electricity is in large amount but our requirements are very few so can donate remaining electric power to local, after that remaining power is passed to induction boiler.

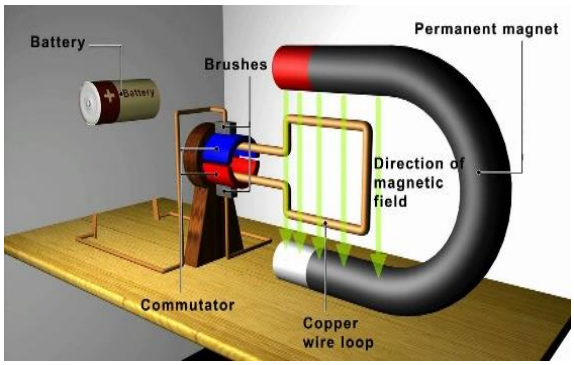


Fig.3: Working of generator

Step 6: In the boiler saline water is passed through Nano-tech filter which filtrate water with partial amount. Water then feed to the boiler where it get super-heated and flow in upward direction.

Fig.4: Nano-tech filter

Step 7: This super-heated steam is again pass over a turbine and generating more electricity than the vapor pass through a conducer and get condensate which is stored in the tank

5. Ozone Layer Depletion (Photochemical Ozone Creation Potential (POCP))

Despite playing a protective role in the stratosphere, at ground-level ozone is classified as a damaging trace gas. Photochemical ozone production in the troposphere, also known as summer smog, is suspected to damage vegetation and material. High concentrations of ozone are toxic to humans. Radiation from the sun and the presence of nitrogen oxides and hydrocarbons incur complex chemical reactions,

Producing aggressive reaction products is one of which is ozone. Nitrogen oxides alone do not cause high ozone concentration levels. Here are some of the comparisons of POPC between several compounds.

The total emissions vary greatly with fuel structure. Two factors have been identified for this large variation: diffusion and reactivity. Diffusion of fuel molecules from boundary layers near the cylinder wall into the hot core gas causing partial oxidation of this fuel may be a significant source of burn-up of HC species exiting crevices during the expansion stroke. Thus, higher molecular weight fuels, which diffuse more slowly, tend to exhibit higher emissions

6. Abundance of calcium carbonate in Nepal

Acetylene is the outcome of Calcium carbide. Similarly, calcium carbide is the outcome of calcium carbonate. According to Krishna Dev. Jha, senior divisional metallurgical engineer at Department of Mines and Geology, Nepal has a billion tons and proven reserves of 210 million tons. This indicates that Nepal has an abundance of calcium carbonate which is the key factor for the production of acetylene. This seems to be one of the fruitful aspects in the development of acetylene gas in our own country, hereby reducing the maximum use of gasoline.

Conclusion

This paper include the fact that acetylene can be a good fuel for the country like Nepal where calcium carbonate are abundant in nature as it is already discussed above. Despite of being, good fuel for IC engine, there are some of the control measures and safety precautions that are involved in gas phase reactions that can cause serious damages.

Acknowledgement

Accomplishment of this project was indeed very challenging and we overcame it with the help of department of Mechanical engineering at Solapur University. We would like to thank our coordinator for helping us succeed this project.

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