

# Invention of water energy

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**Key Word: Energy, Alkaline electrolyser, energy, PEM electrolyser, AEM electrolyser, SOLAR power**

Highlights:

- 1 The purpose of great invention is to provide water energy to world.
- 2 The purpose of great scientific work is to provide pollution free fuel.
- 3 The purpose of great scientific work is to provide fuel with negligible price.
- 4 H<sub>2</sub> storage is the best way of energy storage.

## INTRODUCTION

Energy is extremely important thing required in performance of work, like in transportation we needed fuel, in metallurgy we require fuel; in petrochemical production we require fuel; in cement production we require fuel; in power generation we require fuel.

The entire world is heavily depending on fossil fuel energy like harnessing energy from petrol, Diesel, Kerosene etc.

Author Captain Vartul Dixit has done more than 10 years of researches for finding out the best energy solution.

H<sub>2</sub> Economy

H<sub>2</sub> produced can be stored in underground cavern and it can be used for many purposes:

- 1) For power generation;
- 2) For Industrial fuel;
- 3) For production of petrochemicals;
- 4) For cement industry;
- 5) For brick industry;

- 6) For domestic use;
- 7) For vehicles;
- 8) For ship etc.

H<sub>2</sub>O can generate hydrogen energy. Hydrogen is a source of green energy.

285.83KJoule energy for each mole +H<sub>2</sub>O = H<sub>2</sub>(gas) + 1/2O<sub>2</sub>(gas)

285.83KJoule is the required enthalpy, in which Gibbs energy required to electrolyze 1 mole water molecule will be requiring  $\Delta G = \Delta H - T\Delta S = 237.1\text{KJoule}$ .

This energy therefore can be provided by electrical battery.



Green H<sub>2</sub> can be liquefied at -253<sup>0</sup> C. Cryogenic hydrogen fuel is used in the space craft. Hydrogen in cryogenic condition also can be transported from one place to another place in super refrigerated condition. Hot H<sub>2</sub>O is sighted in my experiment that it ionizes easier than cold liquid. Hydrogen has auto ignition temperature of 560<sup>0</sup> C, therefore suitable for the fuel. Hydrogen auto ignition temperature is close to auto ignition temperature of compressed natural gas. Hydrogen gas require very low minimum ignition energy for burning. The hydrogen gas on other hand has large flammability range from 4 percent to 75% of volume in air.

The perfect air to fuel ration ( $\lambda$ ) required for combustion should be 14.6:1.

H<sub>2</sub>O to H<sub>2</sub> (Gas)

The same H<sub>2</sub> production plant is required on the ship, bus, car, jeep, motorbike, scooter, in steel company, in cement company, in brick production etc.

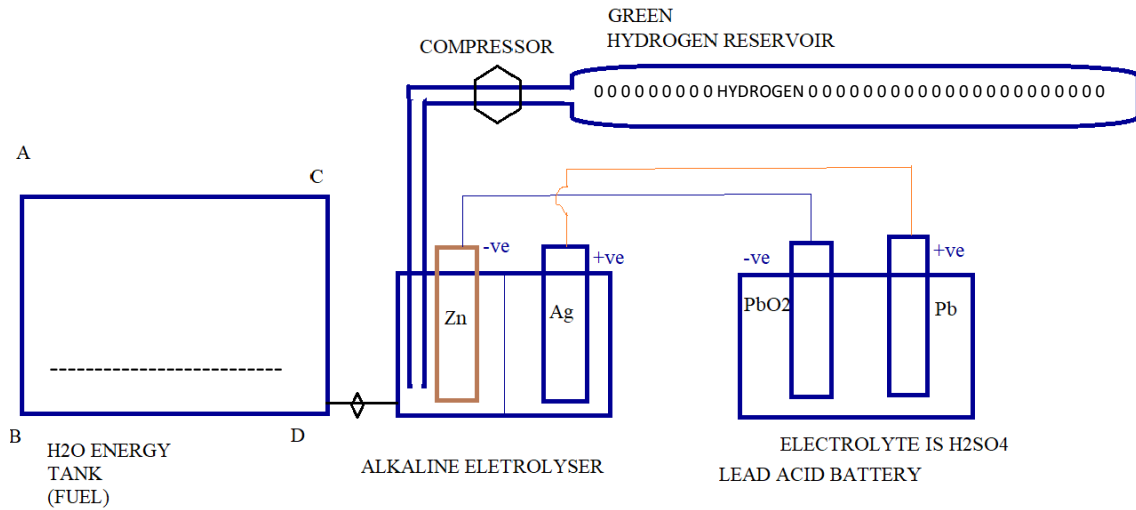


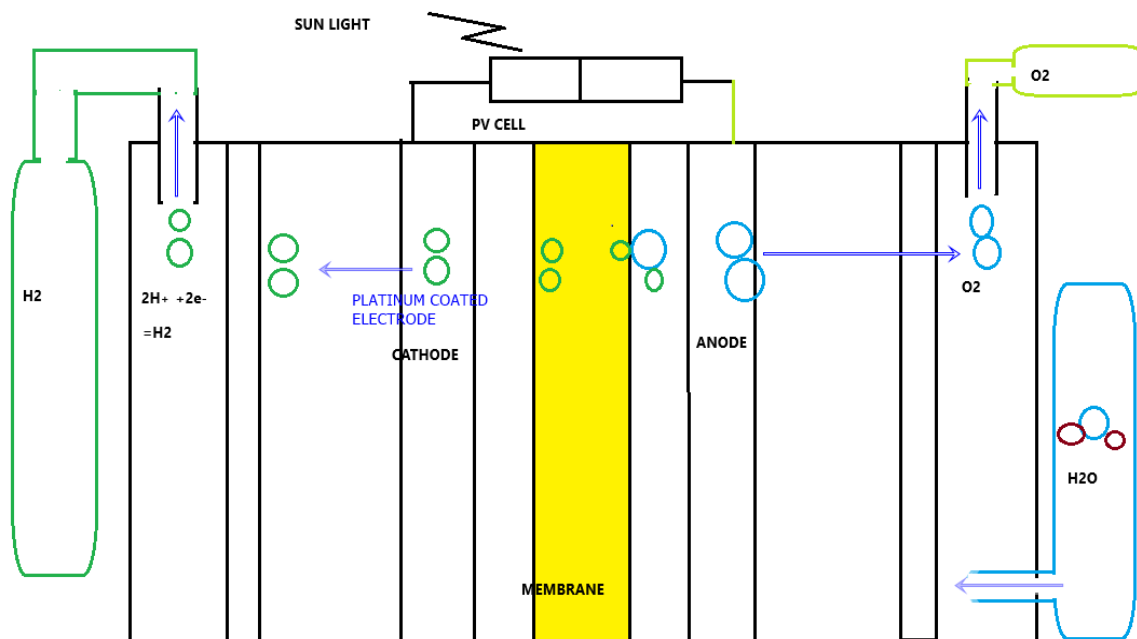
FIGURE 1 H<sub>2</sub>O ENERGY

In the above plant ABCD is the H<sub>2</sub>O energy tank in the ship or in vehicles. It remains the main fuel tank. The main tank ABCD remains connected to alkaline electrolyser. In this electrolyser electrolyte is H<sub>2</sub>O, positive electrode is made of Copper or Silver, another electrode is made of Zinc metal. Lead acid battery is the source of power supply for the alkaline

electrolyser. This figure shows that Hydrogen gas can be collected in reservoir.

Lead acid battery will get charged by the solar panel or if installed in car then by alternator current changed to DC current.

Generation of Hydrogen using water electrolyser and PV solar plate.



Conductivity of KOH ions across the diaphragm or conductivity of ion without diaphragm.

Diaphragm material	Conductivity
Nafion	.149 Ohm /centimeter
Asbestos	.689 Ohm/centimeter
Teflon(Felter)	.003 Ohm/centimeter
Teflon(Woven)	.668 Ohm/centimeter
Polyphenyl Sulphide	.703 Ohm/centimeter

Without diaphragm KOH	.709 Ohm/centimeter
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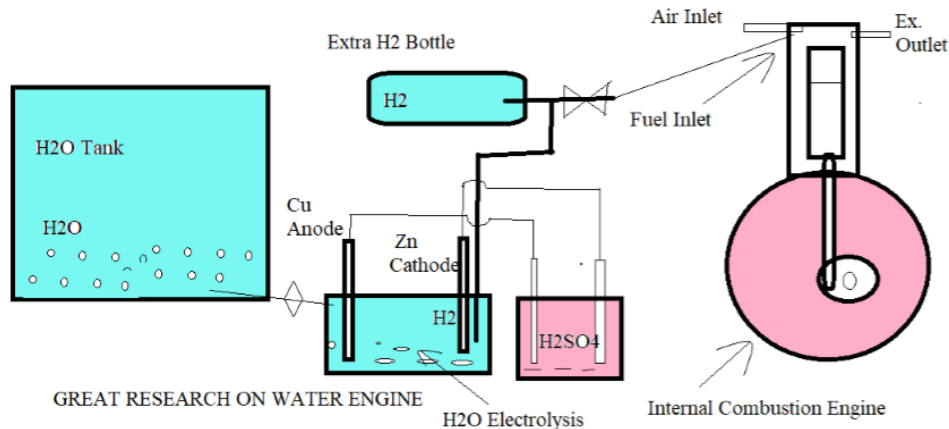


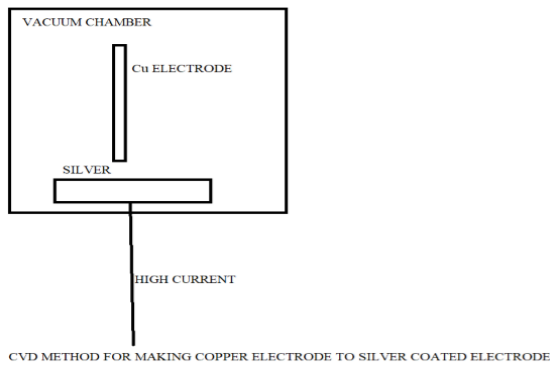
Figure H<sub>2</sub>O FUEL TO H<sub>2</sub> AND FED TO RUN MARINE GAS ENGINE.

The above figure is a block diagram showing how marine gas engine can be operated by alkaline water electrolyser generated H<sub>2</sub> gas.

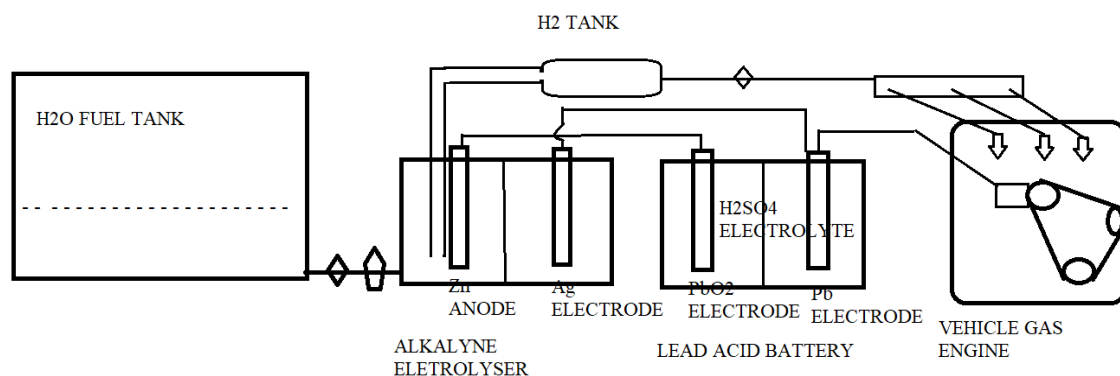
Even PEMWE, AEMWE, oxide type electrolyser can be used in position of AWE.

Silver or Platinum coated electrode can be made by chemical vapour deposition method.

Above diagram shows that to reduce the cost of platinum electrode we can make Platinum doped electrode by the CVD method. In a CVD vacuum chamber we place the electrode and then with silver or platinum metal a very high current is passed to emit the silver ,Platinum layer in the vacuum pot in laboratory.



H<sub>2</sub>O FUEL APPLICATION IN VEHICLES

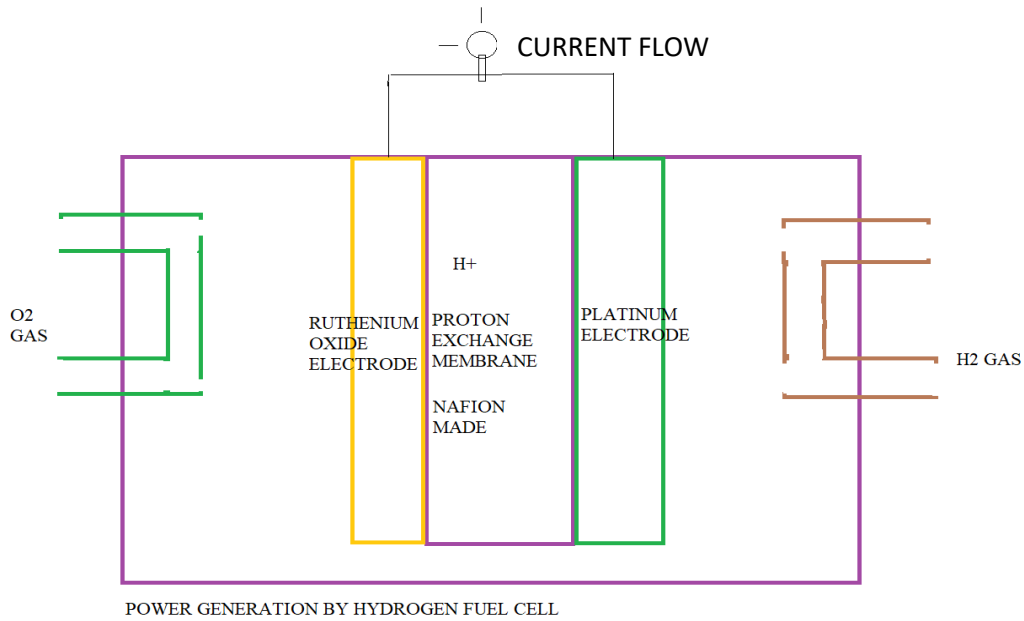


H<sub>2</sub>O FUEL SYSTEM FOR CAR, BUS AND TRAIN VEHICLE (ENGINE IS INTERNAL COMBUSTION GAS ENGINE) FIGURE2

H<sub>2</sub>O fuel directly can be used in vehicle as given in figure-2. Gas-engines are well developed in the world.

Modified engine (type used for CNG) can be deployed for HCNG or for this type beyond doubt.

PEM method



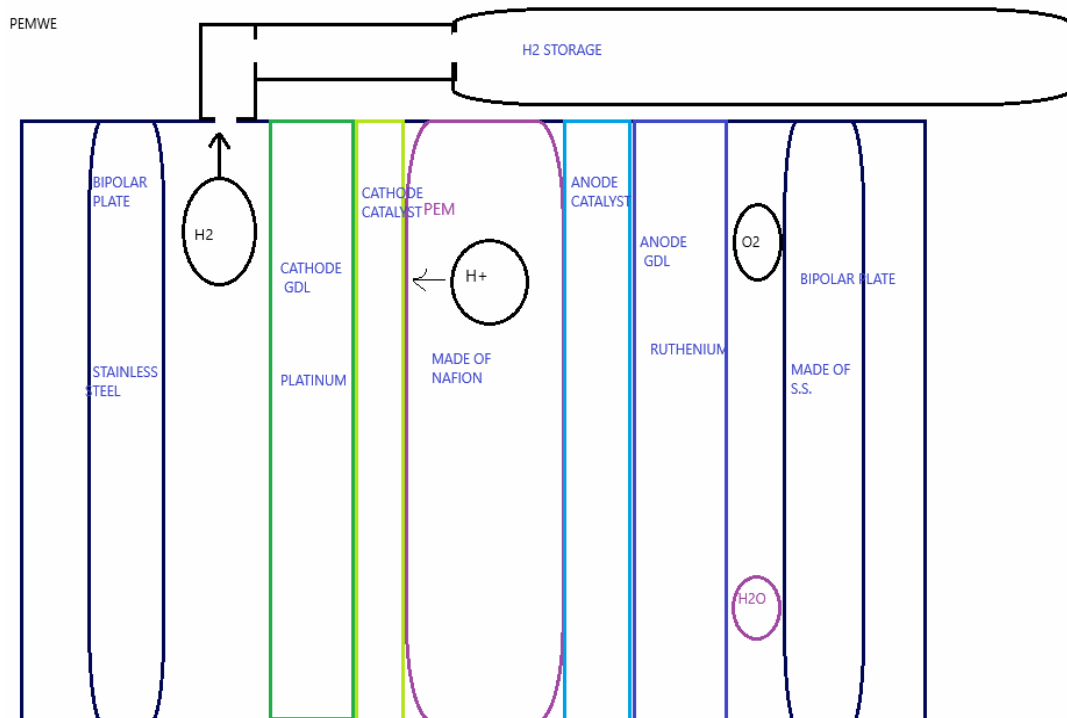
By PEM method, we can be used for harnessing electrical energy. ABCD in figure is a hydrogen-fuel-cell.

In this cell there are two electrodes. One is made of platinum or copper platinum doped and another electrode remains made of ruthenium. When gas is supplied in one electrode side and gas on the other electrode side then current flow takes place. PEM membrane should be made of Nafion material. Nafion

material can pass the hydrogen ion across the membrane.

PEM Water electrolyser

PEMWE can generate the H<sub>2</sub> has more efficiently than the AWE. In this electrolyser we have electrodes made of platinum and Ruthenium. Membrane used is a Proton-exchange-membrane. For platinum electrode we can use the platinum doped electrode to reduce cost of PEMWE.



Electrochemical reactions associated in PEMWE:  $H_2O = 2H^+ + 2e^- + 1/2O_2$  (gas)

In Cathode:

$2H^+ + 2e^- = H_2$  (gas) produced.

In Anode:

AEM method

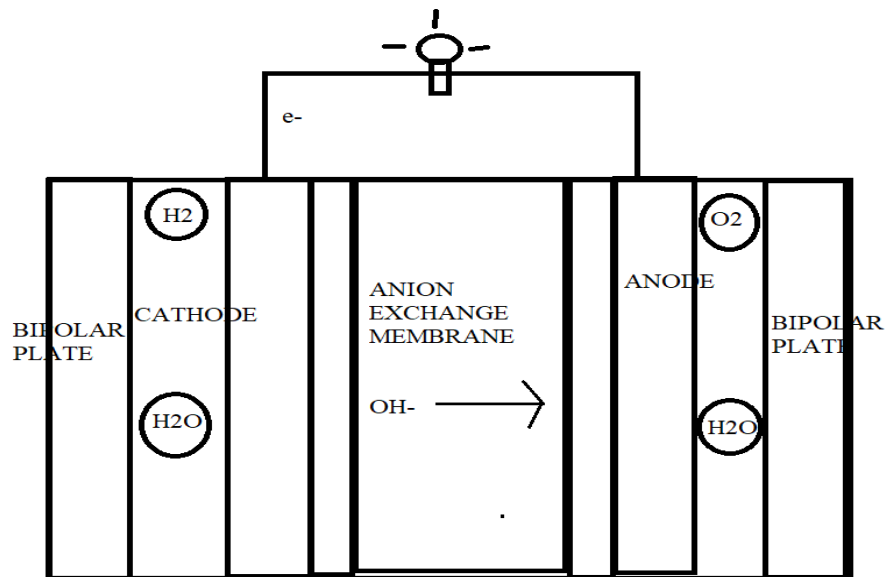
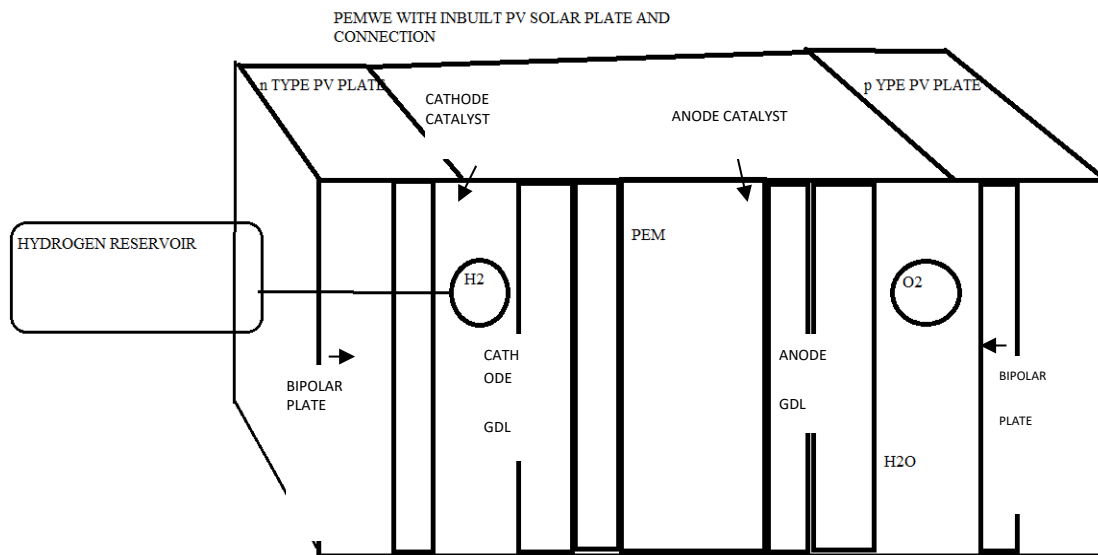


FIGURE FOR ANION EXCHANGE METHOD

In AEM method AEM membrane allows  $OH^-$  ion to pass across the membrane and  $H_2$  gas produces close to cathode. In AEMWE cathode and anodes are used

with anion exchange membrane. Therefore AEMFC can be used in special fuel cell driven vehicles.

PEMWE is built with PV plate



As in the figure above, (Ref3) "PEMWE electrolyser is in built with PV solar plate so no expenditure of electricity. Only the disadvantage of this system is that it can not run in the absence of solar insolation".

I Use of  $H_2O$  fuel converted to  $H_2$  for marine engine

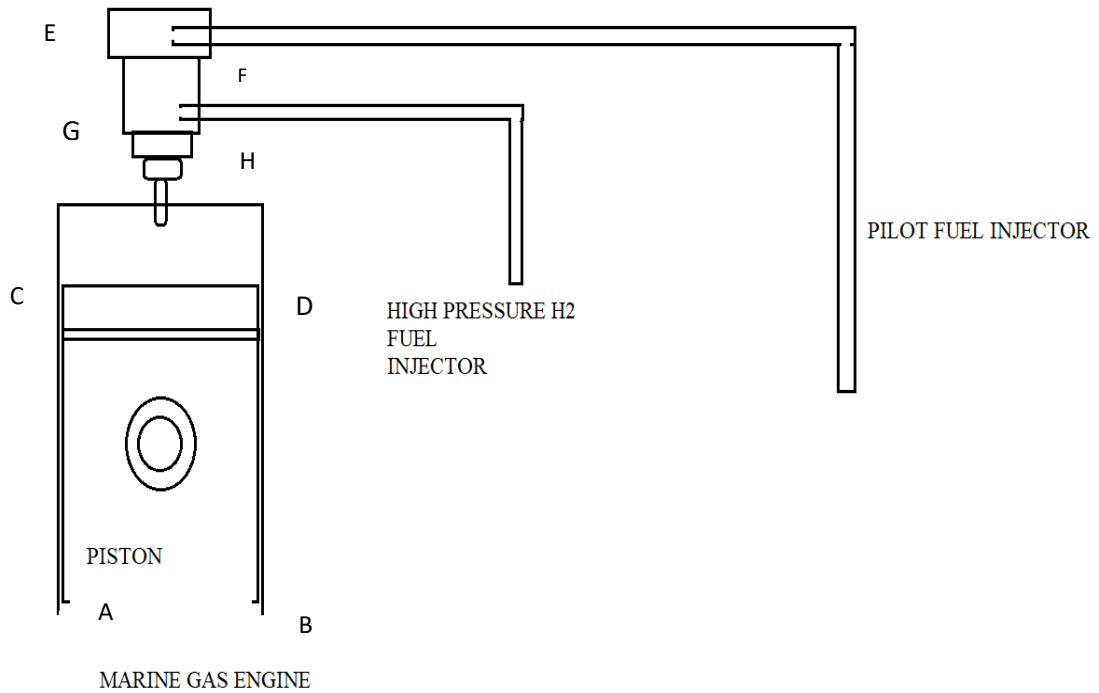


Figure GAS ENGINE FUEL INJECTOR

On ship, hydrogen gas should be generated from the plant as in figure 1. The onboard generated hydrogen gas can run the two-stroke gas engine efficiently. Petrol or other suitable fuel can be used in place of pilot fuel. In this figure 'ABCD' is the piston, 'EFGH' is a special fuel injector. 'For running the gas engine first

pilot fuel injector injects the fuel and once ignition starts then continuously hydrogen fuel injector injects the hydrogen fuel for running the engine. Here only part of engine is given explaining how engine will run by hydrogen gas. (Ref1) Pounder's Book for marine engine gives design of gas engine.

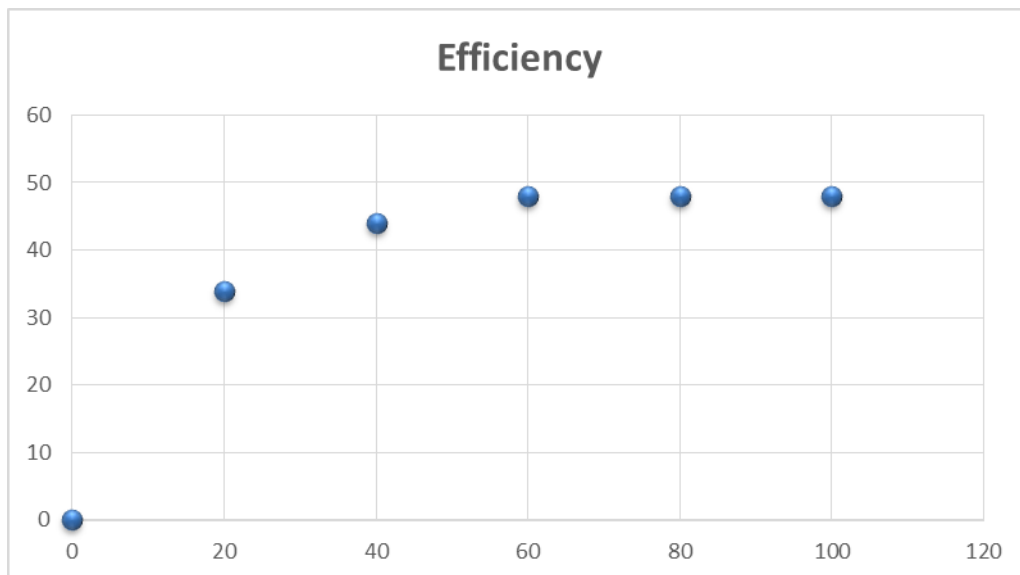


Figure ENGINE LOAD IN X AXIS EFFICIENCY IN Y AXIS

Above chart diagram shows the thermal efficiency of dual type Wartsila marine engine. Use of H<sub>2</sub>O fuel in marine steam engine

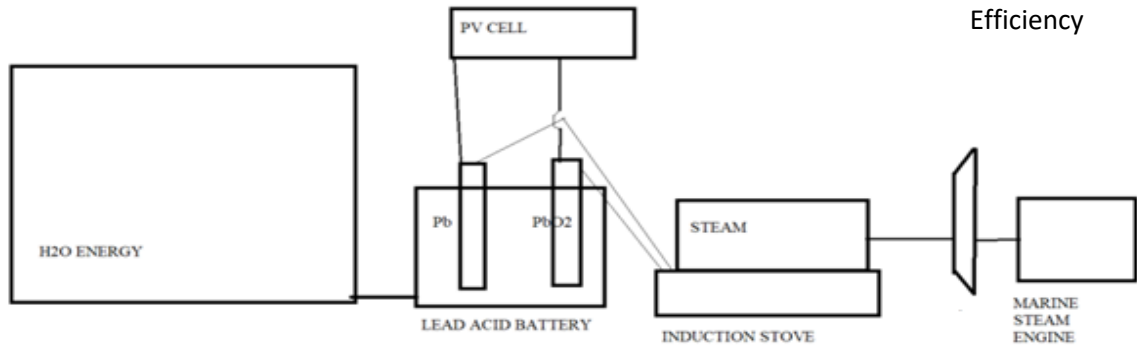
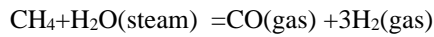


FIGURE H2O STEAM ENERGY

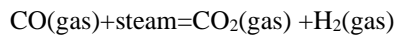
### STEAM TURBINE

As in the figure ABCD is a large fuel tank. 'EFGH' is a lead acid battery, 'A1B1A2B2' is a PV cell, which is connected to this battery for recharging. The battery EFGH is the source of power supply to induction big size plate IJKL'. 'MNOP' is the big steam vessel for steam generation and reservoir. This steam moves the steam turbine and then steam turbine moves to steam engine.

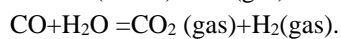
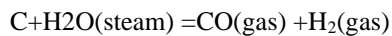
H<sub>2</sub> generation by methane reforming



Further

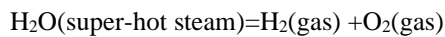


H<sub>2</sub> generation by Carbon oxidation



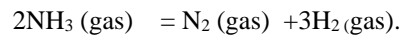
Thermal cracking of H<sub>2</sub>O

It requires higher temperature to break water molecule directly.



Hydrogen formation by Ammonia gas decomposition

H<sub>2</sub> gas can be obtained by thermal decomposition of Ammonia gas at temperature of 400<sup>0</sup> Celsius and above.



It is an endothermic reaction and here ΔH=92K Joule per Mole.

Hydrogen from hydrides

H<sub>2</sub> gas can be obtained from below given hydrides:

LiH= from decomposition of Lithium hydride;

KH=from Potassium hydride;

CaH<sub>2</sub>=from decomposition of calcium hydride;

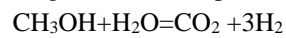
LiBH<sub>4</sub>=from decomposition of Lithium Boron hydride;

NaBH<sub>4</sub>=from decomposition of Sodium Boron hydride;

KBH<sub>4</sub>=from decomposition of Potassium Boron Hydride etc.

Hydrogen from Methanol

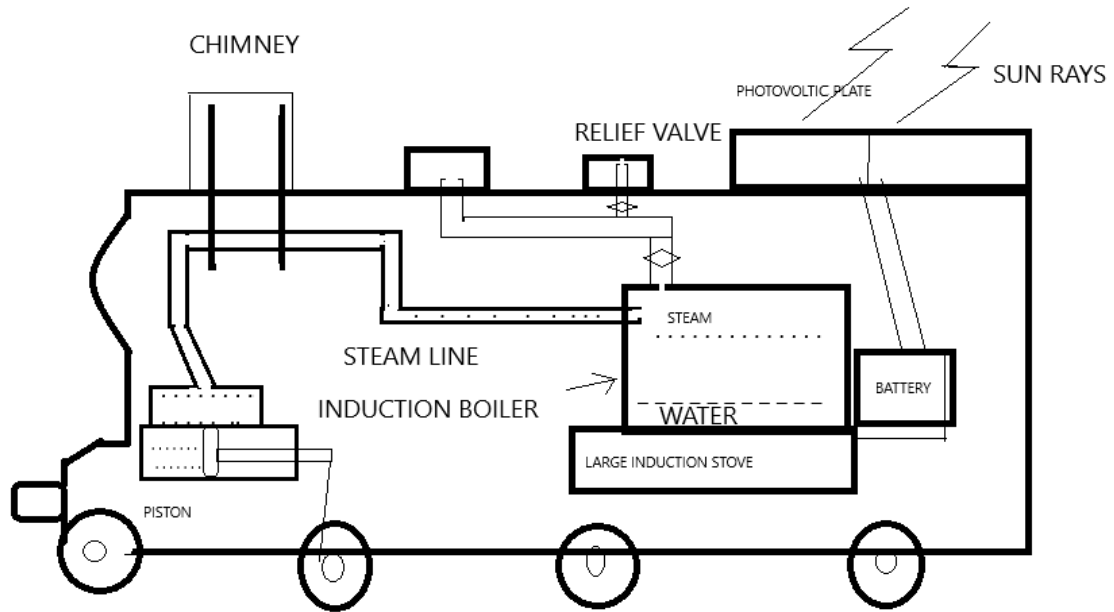
H<sub>2</sub> gas also can be produced from Methanol:



Use of H<sub>2</sub>O generated fuel on car

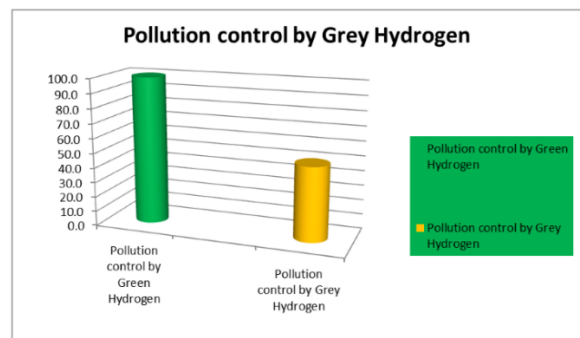
Car gas engine design suits for this fuel system. Car must accommodate in built electrolyzer to produce gas.

New Design of modern Steam engine

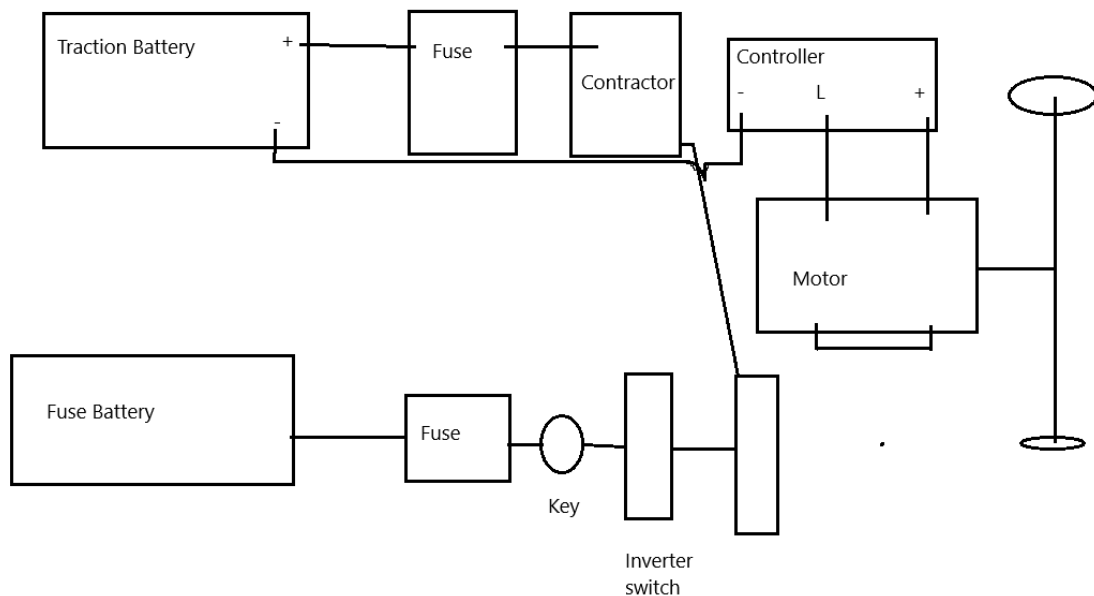


MODERN STEAM ENGINE WITH ZERO POLLUTION

Modern steam engine a discovered by my design and research is a green energy driven steam engine. Here there is no use of coal to generate the steam. Photovoltaic plate will charge a super battery to heat up water and generate to steam. Second way is once engine runs, then induction motor and small electric generator installed will charge the battery.



Pure Electrical Vehicle



(Ref2) Pure electrical vehicle is also a design for green energy using vehicle. Here two batteries are used for running to this vehicle. One battery runs the traction

motor and another battery works for function of starter. Block diagram is given above.



## CONCLUSION

H<sub>2</sub>O is the best source of energy in the world. This great research provides multiple ways of H<sub>2</sub>O fuel use in the industry.

Author has not drawn figures for various plants where same H<sub>2</sub>O fuel can be used in same manner as it is shown for use in vehicle etc.

### Citation

Ref1: Pounder's marine diesel engine book, Doug-Woodyard, page 57, gas marine engine.

Ref2: Research and analysis for Carbon capture, Captain Vartul Dixit, April 2023, IJRAMT.

Ref3: e-Prime-Advances in electrical engineering, electronics and energy, 23 May 2024, Elsevier-Science Direct.

Remark: Research is subject to copy right and patent formation process.