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### MAGNEGAS AS AN ALTERNATIVE FUEL

**Momin Irfan Ali Nasir Husain, Prof. R. D. Shelke, Prof. Samiyoddin Siddiqui**

(Student Of Mechanical Engineering Department)

(Head Of Mechanical Engineering Department)

(Lecturer Of Mechanical Engineering Department)

Everest College Of Engineering & Technology, Aurangabad

#### ABSTRACT

This paper gives the detailed description of magnegas technology which has been developed by Magnegas Corporation to process liquid wastes into a clean burning fuel known as magnegas. Also this paper describes the merits of the magnegas as a fuel, its characteristics, applications, future scope etc. Magnegas technology processes liquid waste such as sewage, used motor oil, used antifreeze & glycerin converting these into a natural gas substitute called "Magnegas". The technology eliminates harmful elements from entering the environment while producing a very clean-burning fuel. It burns more cleanly than Gasoline, bio-diesel, ethanol & natural gas. The technology is said to cost less than fossil fuel. Several patents have been secured & books have been written on the subject & the technology has been installed in a no. of locations. Therefore the credibility factor for its claimed merits appears to be very high.

**Keywords:** Fossil Fuel, Magnegas, Bio-diesel, liquid waste.

#### INTRODUCTION

The MagneGas Technology has been developed to alleviate the serious problem of oxygen depletion, because PlasmaArcFlow Refineries have an efficiency at least ten times that of electrolysis (since the major source of energy is the combustion of carbon by the arc, see the separate data on efficiency). Additionally, the oxygen produced by the separation of liquid waste is trapped in the magnecular clusters composing MagneGas, rather than being separated and sold as currently done for the electrolytic separation of water. Finally, MagneGas contains isolated atoms trapped in said clusters, thus have combustion more efficient than that of fossil fuel, as established by the fact that MagneGas cuts 2" thick metal plates about twice faster than acetylene.

The new technology, called PlasmaArcFlow (international patents pending), is essentially based on flowing liquids through a submerged electric arc with at least one carbon electrode. The arc essentially decomposes the liquid molecules into plasma at 7,000° F composed of mostly ionized H, O and C atoms, plus solid precipitates. The technology then controls the recombination of H, O and C into a combustible gas with a new chemical species, tentatively called magnecules, which is currently under study.

Magnegas has energy content considerably bigger than that predicted by quantum chemistry, since it can store energy in three different levels: magnecules, molecules, and new internal molecular bonds. As a result, the combustion of conventional fuels can be conceived as that of a single stage rocket, while the combustion of magnegas can be referred to the burning of a multi-stage rocket, with intriguing new features.

In addition, the new PlasmaArc Flow Reactors producing magnegas have an independently certified commercial over-unity of at least 6, that is, for each unit of electrical energy calibrated at the panel, the reactors produce up to six units of energy as a combination of the energy contained in magnegas and heat. The additional five units of energy originate from the liquid waste. Therefore, magnegas reactors are capable of tapping energy from molecules in essentially the same way as nuclear reactors tap energy from nuclei.

#### COMPOSITION

These new chemical species i.e. Magnecules are currently under tests and exact composition is yet to be known. Basically the main constitutional elements are H, C and O. the estimated conventional composition of Magnegas produced from antifreeze waste consists of about 40% - 45% Hydrogen, 55% - 60% of Carbon Monoxide, the rest being composed of traces of Oxygen and Carbon dioxide. The percentage of H<sub>2</sub> in Magnegas depends upon the liquid used for production, the highest percentage being expected from crude oil.

#### METHOD OF PRODUCTION



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The information unveiled till now but the researchers show that Magnegas is produced as a by product in the recycling of liquid waste such as automotive antifreeze oil and waste, city and farms sewage etc or from the processing of carbon rich liquids (such as crude oil).

A new kind of reactors called Hadronic Reactor, are used for processing crude oil and liquid wastes into Magnegas and giving heat as byproduct. These reactors are called Hadronic because they are based on concept of Hadronic Chemistry rather than Quantum Chemistry. In these reactors Magnegas is produced by Plasma Arc Flow process in which an electric arc is passed through the liquid at about 7000°F which decomposes molecules into plasma state and the H, C and O recombine to form the clusters of individual atoms of H, C and O plus ordinary molecules H<sub>2</sub>, CO and O<sub>2</sub>. The extensive tests have established that the reactor uses in average 100W of electricity for an average hourly production of 500m<sup>3</sup> of Magnegas plus heat. The reactor has been certified for total recycling of any type of non-radioactive liquid waste, including: antifreeze and engine oil waste, etc. The biggest efficiency is obtained by using crude oil which is converted into a fuel cleaner and less expensive than gasoline when compared to the cost of current refineries.

### PROPERTIES AND TEST RESULTS

Many tests and researches are being done till now which brought to light the following characteristics of Magnegas.

1. Gas Chromatographic Mass Spectrometric (GC-MS) and Infra Red Detectors showed that it consists of large cluster which cannot be all symmetric and having unconventional type of bonding which does not give conventional signature.
2. Magnegas has three different energy storage levels: magneclules, molecules and new internal molecular bonds and thus its combustion may be referred as burning of a multistage rocket.
3. In Magnegas under a sufficient magnetic polarization, hydrogen acquires the necessary energy density to avoid liquefaction as fuel and when tested it gave energy output equivalent to that of gasoline.
4. Combustion of Magnegas has positive balance i.e. the oxygen produced in the exhaust is bigger than that used in combustion.
5. The exhaust emission of an Automobile converted to run on Magnegas had following composition.

Water vapor – 65 – 70%

O<sub>2</sub> – 10%

CO<sub>2</sub> - 6% - 8%

CO - 0.00% - 0.01%

### LITERATURE REVIEW

#### Need of Magnegas

To use Magnegas is necessary due to following reasons:-

#### 1) Indian Carbon Footprint Is Very High And Need To Be Reduce

Carbon footprint is the total amount of greenhouse gas (CO<sub>2</sub>) emissions due to the burning of fossil fuels by certain forms of human activity, usually expressed in equivalent tonnes of carbon dioxide (CO<sub>2</sub>).

The data was collected by United States department of energy's carbon dioxide information analysis center (CDIAC) which gives the 2010 estimate of top CO<sub>2</sub> emitting countries of the world in thousands tonnes of CO<sub>2</sub> per year. According to CDIAC China is on the top in CO<sub>2</sub> emissions, US on second position and India at third position in CO<sub>2</sub> emissions.

Top 3 countries in CO<sub>2</sub> emission (In tones of CO<sub>2</sub> per year)

1) China-82,40,958

2) US - 54,92,170

3) India- 2069738

In India Due to continuous growth in population and their demands the CO<sub>2</sub> emissions are expected to increase in coming years. US have started using Magnegas as an alternate fuel due to which the percentage of Carbon footprint of US is going down. To reduce the Carbon Footprint of our country it is necessary to use an alternate fuel like Magnegas. As the combustion of Magnegas gives very less amount of CO<sub>2</sub> in atmosphere therefore it will be helpful in reducing the carbon footprint of our country.

#### 2) Oxygen Depletion

The notion of oxygen depletion has been introduced by Dr. Santilli in his presentation reproduced below at the 2000 World Hydrogen Conference in Munich, Germany. It is defined as the permanent removal of breathable oxygen from our atmosphere and its conversion into CO<sub>2</sub>, H<sub>2</sub>O and other substances.



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Consequently, the combustion of all fossil fuels causes oxygen depletion because they produce CO<sub>2</sub>. Until the percentage of CO<sub>2</sub> in our atmosphere was small, it was recycled by plants back to breathable oxygen. Today, with the disproportionate increase of its production, the produced CO<sub>2</sub> cannot any longer be recycled by plants, resulting in the ongoing green house effect. It is estimated that nowadays we have in our atmosphere about one billion tons of excess CO<sub>2</sub> of which its O<sub>2</sub> content was originally breathable oxygen but it is no more. Since O<sub>2</sub> is about 72% of CO<sub>2</sub>, the ongoing disproportionate fossil fuel combustion has depleted from our atmosphere about 720,000,000 metric tons of breathable oxygen.

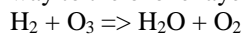
It is evident that hydrogen combustion also causes oxygen depletion because it converts breathable oxygen into water vapor H<sub>2</sub>O. The sole way to avoid oxygen depletion by hydrogen combustion is to:

- A) Produce hydrogen from renewable energy sources that do not cause oxygen depletion;
- B) Use electrolytic separation of water into hydrogen and oxygen, and
- C) Released the produced oxygen into the air so that the hydrogen combustion leaves the oxygen balance unchanged.

### 3) Ozone Depletion

In addition to the serious environmental problem known as oxygen depletion indicated in Section 6, as currently produced and advertised, hydrogen has additional rather serious environmental problems that remain generally un-addressed, such as:

- 1) Embrittlement, consisting of a weakening of the tensile and other characteristics of metals following long exposure to hydrogen, with consequential risks of container explosions due to metal fatigue;
- 2) Seepage, consisting of the passage of the hydrogen molecule through container walls due to its smallest size on Earth, with consequential contamination of the environment;
- 3) Ozone depletion, consisting of the permanent removal of ozone O<sub>3</sub> in the ozone layer of our atmosphere and its conversion into water. Following seepage, since it is the lightest molecule on Earth, H<sub>2</sub> rapidly rises all the way to the ozone layer, where we have one of the fastest known chemical reaction.



### TECHNOLOGY

The Plasma Arc Flow process gasifies a number of liquid wastes into usable byproducts. These byproducts include: a gaseous fuel known as Magnegas, heat, carbon precipitates and sterile effluent liquid that is under development for organic liquid fertilizer or irrigation water. Magnegas is a cost competitive synthetic gas made from many liquid wastes such as sewage, sludge, animal manure, glycerin, used antifreeze, some oil based liquids and waste water. Magnegas is a hydrogen based fuel that has a combination of hydrogen, carbon monoxide and inert trace gases. Magnegas is a clean burning fuel that is essentially interchangeable with Natural Gas or it can be mixed with Natural Gas. It has the lowest Green House gas emissions when compared to fossil fuel. The refinery has no odor or noise pollution as it runs quietly in a completely sealed environment. The fuel can be used for metal cutting, cooking, heating, or powering natural gas bi-fuel automobiles.

The revolutionary technology is based in flowing the liquid waste through a submerged electric arc between coal electrodes. The arc decomposes the liquid molecules into atoms and forms plasma around the tips of the electrodes at about 10,000° F. The Plasma Arc Flow moves the plasma away from the electrodes and controls the formation of Magnegas that bubbles to the surface for collection. In this way the liquid waste is converted into Magnegas, sterile liquid effluent and carbonaceous precipitates collected in a strainer for periodical removal. The machine uses a patented electrical process to decompose the liquid waste molecules into atoms, and the atoms are then recombined into Magnegas.

Magnegas exhaust has been certified by an automotive laboratory accredited with the E.P.A. to surpass all E.P.A. requirements without a catalytic converter, and it produces oxygen when it burns, making it cleaner than gasoline, diesel, and natural gas. Magnegas is composed of hydrogen (55-65%), carbon monoxide (30-35%), carbon dioxide (1-2%), water vapor (2%), and trace gases (0.5-1%).

### COMPARISION WITH OTHER GASES

Element	(MG)	Natural Gas	Gasoline	EPA Standards

Hydro-carbons	0.026 gm/mi	0.380 gm/mi 2460% of MG emission	0.234 gm/mi 900% of MG emission	0.41 gm/mi
Carbon Monoxide	0.262 gm/mi	5.494 gm/mi 2096% of MG emission	1.965 gm/mi 750% of MG emission	3.40 gm/mi
Nitrogen Oxides	0.281 gm/mi	0.732 gm/mi 260% of MG emission	0.247 gm/mi 80% of MG emission	1.00 gm/mi
Carbon Dioxide	235 gm/mi	646.503 gm/mi 275% of MG emission	458.655 gm/mi 195% of MG emission	No EPA standard exists for Carbon Dioxide
Oxygen	9%-12%	0.5%-0.7% 0.04% of MG emission	0.5%-0.7% 0.04% of MG emission	No EPA standard exists for Oxygen

## FUTURE SCOPE

### Civilian Ships

The disposal of liquid waste poses a major challenge to cruise ships, as well as civilian and commercial ships at large, since they generally dump all on board produced liquid waste in the open ocean. Due to the notorious damage to marine life, the International Resolution MECP 159(55) requires that all civilian ships be equipped by 2011 with means for the recycling on board all produced liquid wastes. Due to their completely automatic and remote operation, as well as lack of appreciable noise or odor pollution, PlasmaArcFlow Recyclers of various types can be placed in the hull and recycle all on board produced liquid wastes. In particular, PlasmaArcFlow Sewage Recyclers can process ship sewage into a sterilized and filtered water reusable for toilets, thus decreasing the on board need for potable waters, as well as decreasing docking time for water refilling in the port. Additionally, the produced MagneGas can be used for environmentally acceptable on board incineration as well as for other uses.

### Municipalities

In this case the applications of the MagneGas Technology are multifold. Firstly, sewage treatment plants at times operate beyond the legal limit of biological counts due to population growth occurred since the construction of the plant. In this case, municipalities can flow part of the sewage through a PlasmaArcFlow Station for the specific purpose of reducing the biological count as requested by local laws, and then return the sterilized waters back to the existing treatment facilities. This application does not necessarily require the use of the purification equipment of the PlasmaArcFlow Recyclers, thus allowing a considerable reduction of costs.

### Military Ships

Military ships, such as large aircraft carriers, are known as being some of the biggest polluters of the oceans because dumping at sea all on board produced waste waters, some being very toxic, resulting in a sizable damage to marine life. This occurrence is so serious that various countries prevent military ships from friendly nations to dock at their port so as to prevent large environmental problems. Under sufficient funding, PlasmaArcFlow Recyclers can process all on board produced waste waters, by rendering military ships completely harmless to the environment, while producing on board precious sterilized and filtered waters excellent for toilet and other re-uses, as well as producing on board a clean burning fuel excellent as additive for cleaning fossil fuel combustion. A view of a typical aircraft carrier considered to be one of the biggest pollutants in the ocean due to the dumping at sea of all on board produced waste waters, some of which are notoriously very toxic. By comparison, PlasmaArcFlow Recyclers can be placed in deep inside hulls and controlled remotely from the bridge, by processing all on produced waste waters, thus rendering military ships harmless to the marine life, a condition necessary to dock at most ports in all nations.

## CONCLUSION

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- The use of gasoline is increasing day by day and only way to tackle the problem of pollution is to use alternate fuels.
- The Magnegas fuel is need of the world as the Hydrocarbon based fuels are destroying the environment.
- Magnegas can reduce the use of Gasoline and will help to reduce the global warming as it is an eco-friendly product.
- Magnegas is better fuel than Hydrogen, because it does not cause Oxygen Depletion.
- The cars that are running on the Compressed Natural Gas (C.N.G.) can be made to run on the Compressed Magnegas (C.M.G.).
- The production as well as use of Magnegas is pollution-free.

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