

FUEL FROM MSW AND WATER

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The work is dedicated to design of electric arc reactor for producing fuel, which enriched by hydrogen.

We have developed Electric Arc Reactor (which powered from a fixed current source) for producing of liquid fuel, flammable gas (which is rich in hydrogen and which has higher calorific value as compared to natural gas), and other advanced materials from water and MSW in low temperature.

Advantages:

- 1. Cost effective producing of liquid fuel, flammable gas, which is rich in hydrogen and which has higher calorific value as compared to natural gas and other advanced materials from water and MSW without pretreatment in low temperature;*
- 2. Cost effective MSW treatment;*
- 3. Combined transformation of MSW and water to the liquid fuel, flammable gas (which is rich in hydrogen and which has higher calorific value as compared to natural gas) and other advanced materials;*
- 4. Environmentally friendly technology without releasing hazardous substances.*

The aim of the work is to design Electric Arc Reactor for producing liquid fuel, flammable gas (which is rich in hydrogen and which has higher calorific value as compared to natural gas), carbon black, steel wire and ferrous metal from water and MSW via decomposing them in the long electric arc, which burns in water in low temperature.

The work is dedicated to design of electric arc reactor for producing fuel, which enriched by hydrogen.

Hydrogen is an energy carrier and can be used to store and deliver energy as needed. When used in a fuel cell, the hydrogen atom dissociates into a positively charged hydrogen ion and a negatively charged electron, which diverted to an electric load. A fuel cell can be used to power anything in much the same way that batteries are used. According to the U.S. Department of Energy, "Eventually hydrogen will join electricity as the major energy carrier, supplying every end-use energy need in the economy, including transportation, central and distributed electric power, portable power, and combined heat and power for buildings and industrial processes."

It known that hydrogen is most environmentally clean and renewable fuel and it is mainly accumulated in the water, resources of which are inexhaustible. However, water (H₂O) is the most stable chemical compound. If one takes into account that the energy of water splitting is equal to the energy of water formation and that the splitting of the water accompanied by additional energy loss, then splitting of water to produce hydrogen seems energetically not beneficial. However, if water decomposition by electric arc accompanied by other economically beneficial process (such as producing liquid fuel, flammable gas (which is rich in hydrogen and which has higher calorific value as compared to natural gas), carbon black, steel wire and ferrous metal from water and MSW via decomposing them in the long electric arc, which burns in water in low

temperature), then the decomposition of MSW and water via electric arc for producing hydrogen is cost-effective.

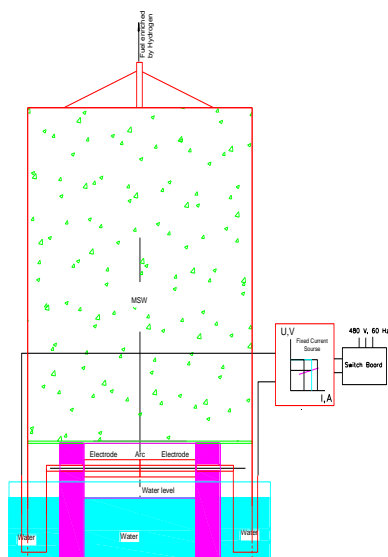
There are various methods of discharges in water (Alexander Fridman, Plasma Chemistry, Drexel University and Cambridge University Press: Chapters 5.9.1, 5.9.2, 5.9.3, 5.9.4, pg. 331-334, 2008). However, these methods are complex, expensive and have a low power (less than 10 kW).

The subject of the work is:

The create an environmentally and energetically high effective Electric Arc Reactor (which powered from a fixed current source) for producing of liquid fuel, flammable gas (which is rich in hydrogen and which has higher calorific value as compared to natural gas), carbon black, steel wire, ferrous metal, non-ferrous metal and biologically pure ash from water and MSW in low temperature.

The principle of generating of plasma with a long electric arc discharge in the water fed from a fixed current source with a rectangular volt-ampere characteristic has been developed. This achieved by using USA patent (# 4,378,522), several patents USSR and Georgia, also by using of new ideas, innovations and Know-How that we have now.

Based on this principle, we have developed Electric Arc Reactor (which powered from a fixed current source) for producing of liquid fuel, flammable gas (which is rich in hydrogen and which has higher calorific value as compared to natural gas), and Other Advanced Materials from water and MSW in low temperature (Please see figure).



Novelty: It is a long electric arc burning in the water of almost unlimited capacity from a few kW to hundreds of megawatts and a lifetime of several thousands of hours. We consider two types of electric arc, short arc and long arc. An electric arc is short if the ratio of the voltage (V) of the arc to the current (A) of the arc is less than two, and an electric arc is long if the ratio of the voltage (V) of the arc to the current of the arc (A) greater than two.

Currently only a short arc is used. Around 25% of world energy consumption falls on short arc (electric welding, electro arc furnaces, plasma furnaces, plasma cutting and plasma spraying etc.)

Currently, long arc not used, though the long arc contains many new technical and technological applications. This is due to the fact that it is impossible to ensure a stable operation of a long arc through the voltage source, which is currently used. The stable operation of the long arc became possible after the establishment of the power source of fixed current having rectangular volt-ampere characteristics and dynamic properties ensuring stable operation of the long arcs.

One can expect that electro physics devices powered by a power source of fixed current takes around 10-15% of world energy consumption.

This means that electro physics devices powered by a power source of fixed current would have virtually unlimited applications

We elaborated namely a power source of fixed current for electric arc reactor for producing of liquid fuel, flammable gas (which is rich in hydrogen and which has higher calorific value as compared to natural gas) and other advanced materials from water and MSW in low temperature.

We create an innovative electric arc reactor with following characteristics:

1. Simple and cheap electric arc reactor with a long arc discharge in any liquid having a low electrical conductivity, working in wide range of industrial applications.
2. Putting of electric power in a proposed installation by less current and higher voltage. By doing these energetic, technological and economic indicators of the electric arc reactor are improved at least by factor of two. Since the mass, size and energy loss of the electric arc reactor is roughly proportional to the square of the current, the figures not less than 10 times better are expected in the proposed device
3. We offer A prototype of the economically effective and technically simple electric arc reactor with a long electric arc (which powered from a fixed current source having rectangular volt-ampere characteristic) and which assigned of producing liquid fuel, flammable gas (which is rich in hydrogen and which has higher calorific value as compared to natural gas) and other advanced materials from water and MSW with power of 50 kW (EARFP 50 - electric arc reactor).

Advantages:

1. Cost effective producing of liquid fuel, flammable gas, which is rich in hydrogen and which has higher calorific value as compared to natural gas and other advanced materials from water and MSW without pretreatment in low temperature;
2. Cost effective MSW treatment;
3. Combined transformation of MSW and water to the liquid fuel, flammable gas (which is rich in hydrogen and which has higher calorific value as compared to natural gas) and other advanced materials;
4. Environmentally friendly technology without releasing hazardous substances.

Possible applications: plasma chemistry; producing of hydrogen, liquid fuel, flammable gas, which is rich in hydrogen and which has higher calorific value as compared to natural gas; hydrogen Fueling Station; Fuel Cell Charging Station.

Level of readiness:

There are a laboratory model of electric arc reactor with a long electric arc (which powered from a fixed current source having rectangular volt-ampere characteristic) and which assigned of producing liquid fuel, flammable gas (which is rich in hydrogen and which has higher calorific value as compared to natural gas) and other advanced materials from water and MSW.

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