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# Electromagnetic Energy of Vacuum and its conversion by Energy efficient Hydroxy Gas Generators

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**Abstract**

Energy efficient Hydroxy Gas Generators Produces Mixture of hydrogen and oxygen Gas in (stoichiometric ratio 2:1) in energy efficient way.Hydroxy Gas can be used in Internal combustion Engine as well as in different Industrial Process and Gas Turbine Also .These gas Generators Uses Voltage simulation Process to Separate water in to its component, for this water is kept in Strong Electric Field between the capacitor Plates, Due to strong electric field between capacitor Plates Water molecule gets elongated and finally dissociates in to its component, in this Process Electric Fields works on water Molecule as the water serves as a dielectric medium between capacitor before dissociation so current in circuit is very Low so Power consumption is very Less[1].For this Hydroxy Gas Generators use Zero Point Energy of Vacuum inside void space of Hydrogen and oxygen atoms of water molecule. In the Present Paper we will discuss what Vacuum Electromagnetic energy is and how it changes in to Energy of an Electric Field to Perform Useful work.

**Keywords:-**Void inside atom, Zero-Point-Fluctuation, Extraction of ZPE and Quantum Electrodynamics, Energetic Photons, Kerr-effect, Energy density of Electric Field, Wave vector

**Introduction:-**The Present analysis is for energy Conversion of vacuum. When electric Field works on certain system such as on water molecule in Hydroxy Gas Generators, Accelerating a charge particle in electric field between capacitor plates etc. In all above Process The energy density of an electric Field is given by $\varepsilon_o|E|2 / 2$.This energy does not come from the source which is producing the Field, Source has to spend it's energy to established the field by moving charge in the circuit, and when this electric field works on certain system energy is extracted from active vacuum. In hydroxy gas generator dissociation of water occurs at electrode surface due to happenings in metal water interface [3] whatever energy is needed extracted from vacuum inside void space of atoms of hydrogen and oxygen atoms and applied electric field becomes a carrier of that energy, Since in hydroxy gas generators input power is very less(Due to Low

 

current) source can' not supply necessary energy for possible dissociation of water[1] so this energy must be supplied by Vacuum. Whatever energy resources we are using does not create energy, it only transforms the energy in one form to another form because total energy of universe is constant and energy cannot be created nor be destroyed. An internal combustion runs on gasoline where chemical energy turns in thermal energy and the chemical energy stored within the gasoline is given by nature at the time of its formation, with same analogy hydroxy gas generator release the energy of water in to useful fuel that gives thermal energy. In present discussion we would not focus how much gas is evolved quantity wise, in place of that we would focused when electric field works on water molecule where from it gets the energy and existence of that free energy. Here it is to be noted that we are not discussing about the ground state energy of water molecule which is called zero point energy of water rather we are interested in the energy inside void space of hydrogen and oxygen atoms from which electric field gets energy to perform dissociation of water molecule[3] . According to Rutherford experiment an atom consists most of void space or vacuum. The "empty space" inside an atom is not actually empty. It is filled with extremely strong electric fields produced by the positive nucleus and the negative electrons. These fields interact with the electromagnetic radiation that corresponds to visible light. Physicists today define the vacuum as whatever is left in a region of space when it has been emptied of everything that can possibly be removed from it by experimental means. The vacuum is the experimentally attainable void. Obviously a first step in creating a region of vacuum is to eliminate all visible matter, such as solids and liquids. Gases must also be removed. When all matter has been excluded, however, space is not empty; it remains filled with electromagnetic radiation. A part of the radiation is thermal, and it can be removed by cooling, but another component of the radiation has a subtler origin. Even if the temperature of a vacuum could be reduced to absolute zero, a pattern of fluctuating electromagnetic waves would persist. We are interested in energetic photons associated with these electromagnetic waves that are present inside atoms.

**Existence of Vacuum Energy:-** Zero-point energy (ZPE) or vacuum energy can be thought of as a limitless source of potential energy that exists throughout the universe; in essence, ZPE describes the ground state of a quantum mechanical system that exhibits a fluctuating finite energy due to Heisenberg's uncertainty principle. Quantum mechanics predicts that all of space must be filled with electromagnetic zero-point fluctuations (also called the zero-point field) creating a universal sea of ZPE. The Heisenberg uncertainty principle states that for a particle like an electron, the more precisely one measures its position; the less exact one can measure its momentum and vice versa. This uncertainty reflects an intrinsic quantum

 

energy fluctuation in the wave nature of quantum systems and leads to ZPE, which essentially is the energy that remains when all other energy is removed from a system, i.e. a vacuum. Since dual properties are observed for photons associated with electromagnetic 'waves''. Electromagnetic waves can be diffracted, but photons individually can cause photo ionization of electrons from a metal surface. In the latter type of observations they seem to have "particulate" properties. So Heisenberg's principle can be applied for photon of electromagnetic waves also. According to Heisenberg Principle momentum p and position x of a particle cannot be simultaneously measured with arbitrary high precision, there is a minimum for product of uncertainties of these two measurements, and this given by

$\Delta p.\Delta x \geq \frac{h}{4\pi}$ . There is likewise a minimum for the product of uncertainties of energy E and time T, as follows $\Delta E.\Delta t \geq \frac{h}{4\pi}$ . If we compare a single photon with quantum harmonic oscillator [4] its energy in terms of momentum and position uncertainties should be at least $E = \frac{(\Delta p)^2}{2m} + \frac{1}{2}m\omega^2(\Delta x)^2$ where ω is angular frequency and m is variable mass of photon depending upon its frequency. Taking the lower limit of uncertainty principle $\Delta p.\Delta x = \frac{h}{4\pi}$ , the energy of a photon becomes $E = \frac{h^2}{8m(\Delta x)^2(2\pi)^2} + \frac{1}{2}m\omega^2(\Delta x)^2$ , for this energy to be minimum

$$\frac{dE}{d(\Delta x)} = 0$$

Which gives, $\Delta x = (\frac{h}{4\pi m\omega})^{\frac{1}{2}}$ so minimum energy at ground state of a photon will be

$E_o = \frac{h\omega}{4\pi}$ Where h is Plank's constant. it is to be mentioned that we have taken the uncertainties at its lower limit because we are discussing about ground state and at ground state no photon in any mode of excitation. The minimum energy $E_o$ is the lowest energy of a photon related to electromagnetic radiation in void space i.e. vacuum. In void space there is infinite number of photons and their frequencies are different also but their lowest energy at ground state for a particular frequency is $\frac{h\omega}{4\pi}$ . The total energy density of void space may be calculated as follows[5] .Let volume V encloses certain void or vacuum then energy per unit volume will be given by summing the energies of all photons (Note that there are infinite number of photons inside a void space related to electromagnetic radiation) . So energy density $\rho = \frac{1}{V}\sum_{k=1}^{\infty}\frac{1}{4\pi}h\omega_k$- (1).Where $\omega_k$ is angular frequency of kth photon. In terms of wave vector $\vec{K}$ of electromagnetic field, energy density of vacuum can be expressed as follows[5]

 

$\rho = \frac{1}{(2\pi)^3}\int \frac{1}{4\pi}\hbar\omega d^3K$-(2) where K stands for zero point oscillation .where wave vector $|\vec{K}| = \sqrt{K_x^2 + K_y^2 + K_z^2}$ and $\omega = c|\vec{K}|$ where c is speed of light, and $d^3K = dK_x.dK_y.dK_z$ .So (2) reduces to[2] $\frac{hc}{(4\pi)}\int \frac{|\vec{K}|d^3K}{(2\pi)^3}$ -(3)

**Vacuum energy Extraction:-**Vacuum energy can be extracted by lowering down the frequency of photons associated with vacuum i.e ground state energy reduction [6].This process is analogous to a atom which is in excited state comes back to its ground state release the energy. Although in vacuum energy extraction Process excited state is free space ground state and final state is new lower energy ground state, the difference of energies between these two states is extracted Energy. Experimental example of Vacuum energy extraction by ground state energy reduction is Casimir effect[8] . In which two parallel Perfectly conduction Plates Placed close two each other experiences attraction force due suppression of vacuum fluctuations between the Plates. Another Practical example of vacuum energy extraction by Bernard Haisch experimantal setup[8] .In which gas molecule passes through Casimir micro cavities and due to ground state energy reduction of quantum vacuum, energy is released which is captured by this device for other uses. The above phenomena can be formulated as follows according to (2)

$\rho_{released} = \frac{1}{(2\pi)^3}\int \frac{\hbar\omega d^3K}{4\pi} - \frac{1}{(2\pi)^3}\int \frac{\hbar\omega_N d^3K}{4\pi}$ -(4) where $\omega_N$ is angular frequency of photons in new Lower energy ground state and $\rho_{released}$is released energy per unit volume. So our objective is to reduce the angular frequency of photons and consequently the speed of electromagnetic waves, as speed of electromagnetic waves is equal to speed of light, So in our vacuum energy extraction process speed of light is going to reduced but the wave length $\lambda$ is constant and as a result the wave vector modulus ( $|\vec{K}| = \frac{2\pi}{\lambda}$ ) remains constant. It is very clear that this is not the case where speed of electromagnetic waves is reduced due to refractive index of the material where weave length is decreased. In further discussion we will establish relationship between energy extracted and reduction of speed of electromagnetic waves.

**Speed reduction of Electromagnetic waves and Vacuum Energy Extraction:-** According to Keer-effect[9] when a varying electric field is applied across a sample, The sample becomes Birefringent, with different indices of refraction for light polarized parallel to or perpendicular to the applied field. Birefringence is a kind of optical phenomenon that when the light go through an anisotropic crystals, there are two emergent refracted lights as the different refractive index along directions, So when electric field is applied across isotropic medium the medium becomes anisotropic and it shows different

 

refractive indices in different direction. Likewise vacuum is isotropic medium and when electric field applied, it becomes anisotropic [2] and it shows the birefringence effect. This is called birefringence of vacuum. According to John Keer, difference of refractive Index of Material in Presence of electric field is given by $\Delta n = \lambda K\left|\vec{E}\right|^2$ where λ is wave length of light(which is constant for certain material) and K is keer constant. The difference of refractive Index can be approximated in terms of speed reduction of electromagnetic waves in vacuum ( in given range of electric field; $\left|\vec{E}\right| < 10^8 V/m$ in the case of Hydroxy gas generators[1] ) as follows[2]

$\Delta n_{Keer} \approx \left(1 - \frac{v}{c}\right) \approx 4.2X10^{-41} \frac{m^2}{volt^2}\left|\vec{E}\right|^2$ -(5) where v is reduced speed of electromagnetic waves inside void space of atoms of water molecule after application of external electric field. From equation (5) it is clear that due to electric field velocity of propagation of electromagnetic waves can be reduced, So with the help of electric field vacuum energy can be extracted. The reduced frequency of electromagnetic waves $\omega_N$ after application of electric field can be expressed as follows

$\omega_N = \frac{v}{c}\omega$ –(6) where ω is frequency of electromagnetic waves before application of Electric field.

In the case of Hydroxy gas generator total energy per unit volume inside void space of atoms of water molecule will be $\rho_T = \frac{1}{(2\pi)^3}\int \frac{h\omega_N d^3K}{4\pi} + \frac{\varepsilon_o\left|\vec{E}\right|^2}{2}$ -(7), As inside hydroxy gas generator water acts as a dielectric and energy stored in the capacitor in form of electric field only, and ground state energy reduction is only due to electric field so according to equation (5) and, by Law of energy conservation we can say that $\rho_T = \rho$ which further gives from (4)

$\rho_{released} = \varepsilon_o \frac{\left|\vec{E}\right|^2}{2}$ –(8) .

Equation (8) shows that energy stored in the electric field is the released energy due to ground state energy reduction of electromagnetic waves.

**Vacuum energy density:-** Vacuum energy density can be calculated with help of equation (4),(5),and (6) as follows.With the help of (4) and (6) we get $\rho_{released} = \left(1 - \frac{v}{c}\right)\frac{1}{(2\pi)^3}\int \frac{1}{4\pi} h\omega d^3K$-(9),putting the values from (5) we get $\rho_{released} \approx 4.2X10^{-41}\left|\vec{E}\right|^2 \frac{1}{(2\pi)^3}\int \frac{1}{4\pi} h\omega d^3K$, with the help of (8) we

 

get $\frac{1}{(2\pi)^3}\int\frac{1}{4\pi}\hbar\omega d^3K \approx \frac{\varepsilon_o}{2X4.2X10^{-41}} \approx 1X10^{29}\frac{J}{m^3}$ –(10), which is a constant value. Let us examine the energy content in form of vacuum energy inside a water molecule, we know that a water molecule consists of two hydrogen atom and one oxygen atom and atomic radius of an hydrogen atom is approximately 1.1x10-10 m, so volume of void space inside a hydrogen atom of water molecule that contain vacuum electromagnetic energy is approximately equal to 4.56x10-30 m3 (taking 99% void space inside atom) , so vacuum energy content inside an hydrogen atom is approximately equal to 4.56x10-30 x 1x 1029 ≈ 0.4 J. And dissociation energy of water molecule is 512x103 Joule/mole, which means 85.17x10-20 J/molecule, On basis of above calculation we can say that energy content inside void space of atoms is more than sufficient for the dissociation of water molecule.

**Utilization of Vacuum Energy in Hydroxy gas generator:-** It is very clear form previous discussion that energy stored in the electric field is due to ground state energy reduction of electronic waves and not supplied by the source, In Hydroxy gas generator water molecule are pulls by electric field and potential energy is given to water molecule by vacuum, As we know that water molecule is polar so we can compare water molecule with a dipole where positive and negative charges at two ends, when electric field is applied each dipole (water molecule) align itself in the direction of electric field and distance between charges continuously increases (as electric field is increases with time[1]) and finally leads to dissociation of water molecule. To understand how the potential energy is transferred from vacuum to water molecule Consider a charge +Q (corresponding to polar water molecule) in the electric field $\overrightarrow{E(x)}$ of cylindrical capacitor according to **Fig-1,** Let due to increase in bond length the charge +Q moves a distance L in the direction of electric field from point A to B.

The resultant electric field at any Point P will be the resultant of $\overrightarrow{E(x)}$ and $\overrightarrow{E(r_1)}$ , where $\overrightarrow{E(r_1)}$ is field due to point charge +Q. So resultant electric field at point P (fig.1) will be given by

$\left|\overrightarrow{E_P}\right|^2 = \left|\overrightarrow{E(x)}\right|^2 + \left|\overrightarrow{E(r_1)}\right|^2 + 2\overrightarrow{E(x)}.\overrightarrow{E(r_1)}$ - (11) where $\overrightarrow{E(r_1)} = \frac{Q}{4\pi\varepsilon_0}\left(\frac{\vec{r_1}}{{r_1}^3}\right)$ ,And $\overrightarrow{E(x)}$ is the electric field due to cylindrical capacitor which is radialy outward from cylindrical surface. Now consider a sphere of radius R=L with centre at point B, The total electrostatic energy within this spherical volume will be given by

 

$$\frac{\varepsilon_0}{2}\int\left|\overrightarrow{E_P}\right|^2 dV = \frac{\varepsilon_0}{2}\int\left|\overrightarrow{E(x)}\right|^2 dV + \frac{\varepsilon_0}{2}\int\left|\overrightarrow{E(r_1)}\right|^2 dV + \varepsilon_0\int \overrightarrow{E(x)}.\overrightarrow{E(r_1)}\, dV \text{ –(12)}$$

And the last term of (12) will be given as follows, $\varepsilon_0\int \overrightarrow{E(x)}.\overrightarrow{E(r_1)}\, dV = \frac{Q}{4\pi}\int\frac{\overrightarrow{E(x)}.\overrightarrow{r_1}}{{r_1}^3} dV$ and $dV = 4\pi {r_1}^2 dr_1$, so $\varepsilon_0\int \overrightarrow{E(x)}.\overrightarrow{E(r_1)}\, dV = Q\int_{r_1=0}^{r_1=R}\overrightarrow{E(x)}.\widehat{r_1}\, dr_1 = -Q\Delta V_{AB}$, where $\widehat{r_1}$ is unit vector in direction of electric field $\overrightarrow{E(r_1)}$ and $\Delta V_{AB}$ is potential difference between point A and B. so equation (12) can be written as follows

$\frac{\varepsilon_0}{2}\int\left|\overrightarrow{E_P}\right|^2 dV = \frac{\varepsilon_0}{2}\int\left|\overrightarrow{E(x)}\right|^2 dV + \frac{\varepsilon_0}{2}\int\left|\overrightarrow{E(r_1)}\right|^2 dV \;\; -Q\Delta V_{AB}$ -(13). In this way we can say that total electrostatic energy stored in the volume is partially given to the charge particle (water molecule) as potential energy [10]. As we know that energy stored in electric field is the released energy of electromagnetic waves due to ground state energy reduction, so with the help of equation (8) equation (13) can be rewrite as follows,

$\frac{\varepsilon_0}{2}\int\left|\overrightarrow{E_P}\right|^2 dV = \int \rho_{(released)1} dV + \int \rho_{(released)2} dV - Q\Delta V_{AB}$ -(14) where $\rho_{(released)1}$ is released energy of electromagnetic waves due to field $\overrightarrow{E(x)}$ and $\rho_{(released)2}$ is due to field $\overrightarrow{E(r_1)}$ . So total energy stored in resultant field $\overrightarrow{E_P}$ is less than total energy released by both the fields' separately by a amount $Q\Delta V_{AB}$ and same energy is given to charge particle as its potential energy.

In hydroxy gas generator water molecules stretches due to applied electric field and its potential energy increases continuously until dissociation, If we draw potential energy of water molecule with respect to its bond length, we will find as the bond length increases or decreases potential increases and finally leads to dissociation of molecule.**Fig-2**

**From the figure-2** it is clear as bond length increases or decreases from its equilibrium position energy of molecule increases which finally leads to dissociation of water molecule.

**Conclusions:-** On the basis of above discussion we can conclude that hydroxy gas generators uses electromagnetic energy of vacuum to dissociate the water molecules in to useful fuel gas mixture, here we are not arguing that this is a free energy device rather it is a energy efficient device. In hydroxy gas generator energy has to given to set up the desired electric field. If we calculate the energy requirement for

 

establishing the electric field, it is equal to 1/2C.V2 where C is the capacitance of cylindrical capacitor [1] and V is the maximum voltage across the capacitor. Let assume maximum attainable voltage across water capacitor is 10000V(although for dissociation of water around 5000V is require[3] with electrode spacing 2 to 3mm) and capacitor having 10mm inside radius and 13mm outside radius with dielectric constant of water equal to 78,then 1/2C.V2 =1.65 joule maximum, which is require energy to establish the field inside water capacitor, and this energy is not a big deal because output energy in form of useful fuel gas mixture is very high. This Process also not defy any law of energy conservation as it uses the electromagnetic energy of vacuum which exist everywhere. This process is very much similar to burning of gasoline in which stored chemical energy turns in to thermal energy although this chemical energy is given by nature in form of electromagnetic energy of vacuum at the time of formation of gasoline.

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**Fig-1**

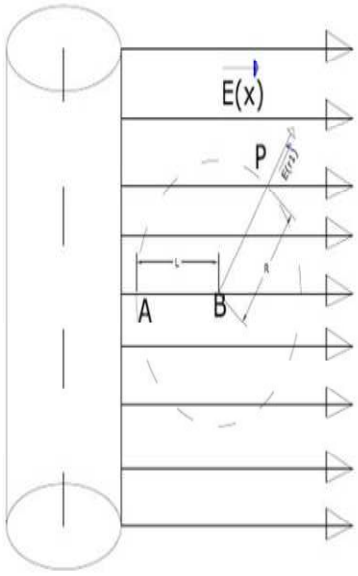
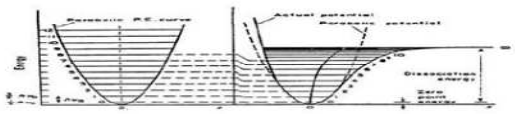



**Fig-2**



**Bond length**