

Technical theory for Valance wave

By Cosmotor Corp. Korea

Summary

- The energy loss in electric motors, electric heaters, and lighting operated by electric energy, and in the conductor resistance of electric wire, are generated due to irregular movement of electrons caused by heat and vibration.

Valance wave rays mitigate the vibration of electrons, one of the reasons causing energy loss, by relieving the friction of electrons. Therefore, they stabilize electric systems and reduce power consumption by maximizing of the efficiency of electric energy. To change the property of electron movement, an energy source which can be a particular wave is needed. The particular wave is made by integrated circuit composed of pure **silicon** dioxide (SiO₂) at 200mesh-350mesh powder after compounding and refining ingredients (SiO₂, copper) which are high-degree of purity and passing special process. When the wave, stored in a semiconductor, flower into electric wire, it can reduce Joule heat by mitigating collision of spinning electrons. Therefore, the decrease in specific resistance of the conductor improves conductivity, and electric resistance caused by mobile electrons is reduced so it significantly affects electric energy by Joule heat. The basic experiment resulted in a 7 to 15% electric energy reduction by using a developed flow system of valance wave to generate these particular wave, and semiconductor or supplying equipment to store the valance wave. This research and development has been carried out by experiments based on this theory and verified in the industrial filed. However, the correlation between the change of electron movement and energy efficiency, valance wave and capacity of power consumption will be continuously researched.

I. Introduction

There are factors of energy loss such as heat and vibration in electromotor, electric heater or lightings, which uses electric energy for operation, as well as the conductor resistance in energy cable path due to the irregular movement of the electron. For the vibration of the electron that becomes the factor of energy loss. Emitting synthetic wave-length that is the valance wave of specific range over the semiconductor and making the wavelength flow over the electric cable to relieve the crash of the electron that makes spinning movement (changing the moving direction and characteristics) and to decrease the energy loss; relieve the generation of frictional heat and heat vibration of the atom due to the crash among atomic nucleus, bound electron and internal existed in the conductor so as to decrease the heat; make the flow of electrons in the electric goods smooth to decrease the noise of magnetic field, in which the electron generate, frictional noise and vibration and to change the track of electrons flowing on the conductor as well decreasing the fallen electrons and radio wave; relieve the frictional power of the electron by using the circuit device that heightens the efficiency of electric energy to stabilize the electric system and maximize the electric energy efficiency decreasing the electric power consumption.

II. Subject

1. A theory, Material and Principle For electrical efficiency.

1) Theory

It is the plane figure of the charge distribution inside the metal. + means the positive charge and electron strongly bound to atomic nucleus, and means the valence electron on the outmost track of the atom which is not bound to array specific atom but moves freely. The electrons in the mental, according to the electronic gas theory, crashes with heavy ion in almost stationary state making successive move in every direction, and the average distance between crashes is called mean free path.

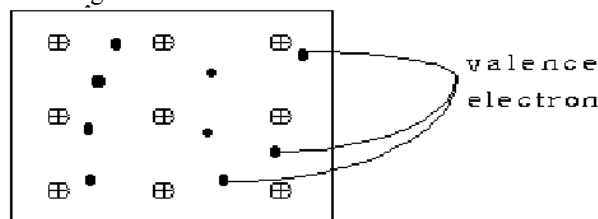


Figure 1.1 electron gas of metal

It is the place figure of the charge distribution inside the metal. +means the positive charge and electron strongly bound to atomic nucleus, and -means the valence electron on the out most track of the atom which is not bound to array specific atom but electronic gas theory, crashes with heavy ion in the

almost stationary state making successive move in energy direction, and the average distance between crashes is called mean free path. The electron has the mean speed in normal state which is called drift speed.

If the size of electric field is E, then acceleration $a = \frac{e}{m} E$, so the electron's speed V becomes $V_d = at$

So the mean speed of the electron V becomes $V_d = at = \frac{e}{m} tE$, $u = \frac{e}{m} tE = \frac{V_d}{E} [\frac{m^2}{V_s}]$

then u is electron's mobility.

If a conductor of length L(m) has free electrons N, and the time is T, the current passes in the unit time becomes I, $I = \frac{N_e}{T} = \frac{N_{ev}}{L} v = \frac{L}{T}$ and the current density becomes J,

$$J = \frac{I}{A} = \frac{N_{ev}}{L_A} = nev = \rho v, n = \frac{A}{L_A}$$

then $\rho [\frac{C}{m^3}]$ is sensity of charge.

$J = nev = ne \mu E = \sigma E, \sigma = ne \mu$, then σ is conductivity.

$$I = JA = \sigma EA = \sigma \frac{V}{L} A = \frac{V}{R}, R = \frac{L}{\sigma A}$$

So, Ohm's law is materialized.

In this way, the energy that electron gets from the electric field is delivered to the ion every time it crashes with the electron, and thereby the power is consumed when the electron passes within the metal. The flow of current is the move of electron, and numerous electrons crash one by one, and the energy of electrons becomes extinct and is emitted in heat. If the wavelength of specific area is lighted on the electron, it becomes in excited state decreasing the crash. There are two factors of energy loss; irregular movement of the electron and unbalance, but by removing the factors of electronic vibration, we can stabilize the electric system and maximize the electric energy efficiency decreasing the electric power consumption.

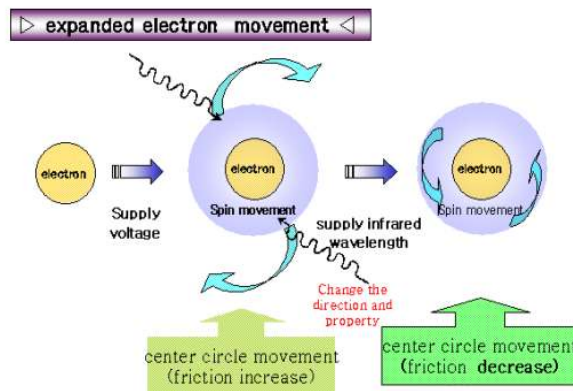
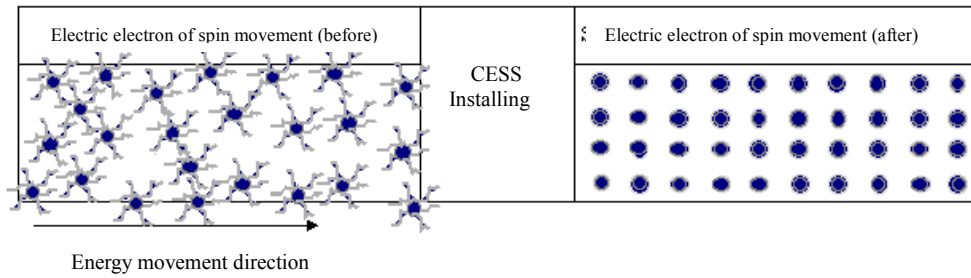


figure2.2 expanded electron movement

2) Function of CESS (Cosmotor Electric Saving Device)

a) Device activating Energy wave

This apparatus helps to improve the wavelength of natural resources emitted by SiO₂ to be an ideal wave by its resonance and sympathy. The reinforced wavelength of natural resources affects power energy itself and the outside circumstance of wire. Thus, it devotes to reduce the residence value (ohm) on transmission wire, to suppress a leakage of current and to maximize the activity of power energy itself. Accordingly, it takes a role to recover the power property, which was distorted by rude wavelength and electrical hazardous factors like serge, harmonics, electromagnetic wave, power loss on transmission wire and overload, etc.), to be close to the original quality just generated at power plant that the activity of power is maximized.



b) Apparatus emitting Permanent wave s

Most of existing objects which emit wavelength couldn't keep emitting on same quanta of it as original. However, COSMOTOR Corp. developed the specifically constructed object which is emitting high efficient light wavelength and was refined by the very special production process after properly mixing up powders of a high purity of copper (99.9%) and SiO₂ grinded finely (200~350mesh).

It makes possible to radiate semi-permanently wavelength of natural resources onto power energy and transmission cable. So, the wavelength of natural resources being emitted steady from the object takes part a function to complement the critical weak points that Energy wave vitalizing apparatus emit it momentary.

(a) Experimental result

i) Test in Laboratory

Table 2.1 testing for active power in Lab

	Measured Value		Variation	Result(%)
	Before install	After install		
Voltage(V)	381.3	381.7	+0.4	+0.1%
Current(A)	7.2	2.6	-4.6	-63.9%
Power Factor(PF)	0.336	0.862	+0.526	+156.5%
Active Power(Kw)	1.6	1.5	-0.1	-6.25%
Reactive Power(KVar)	4.5	0.6	-3.9	-86.6%
Apparent Power(KVA)	4.7	1.7	-3.0	-63.8%
Accumulated consuming power(kWh)	0.8	0.7	-0.1	-12.5%

ii) Field Test

Table2.2 Kumho OO(Load: Motor, 430V,3P)

	Measured Value		Variation	Result(%)
	Before install	After install		
Voltage(V)	431.0	432.9	1.9	+0.4%
Current(A)	73.9	63.9	-10.1	-13.6%
Power Factor(PF)	0.91	0.96	+0.06	+5%
Active Power(Kw)	50.7	46.2	-4.5	-8.8%
Apparent Power(KVA)	55.2	47.9	-7.3	-13.3%
Accumulated consuming power(kWh)	17.0	15.4	-1.6	-9.4%



If there's time change in magnetic flux density, it produces turbulences in electric field. If there's a change in electric field, it causes turbulences in magnetic field. When there's alternating current in the wire, it changes magnetic field around wire so electromagnetic wave is produces. Therefore, power consumption is reduced by decreased amount of electrons, by inducing orbit change of electron with Valance wave.

Also it alleviates friction of electron in conductor so it can reduce power consumption with increased efficiency of load device and productivity.

According to $P=VI\cos\eta$, power consumption can be decreased by increasing efficiency(η). Mixed-infrared ray also reduces friction between moving electrons, so noise and vibration caused by electron friction are decreased. For instance, noise or vibration generated by super-pressure wire, transformer, or motor can be reduced, so it directly links to lowering power consumption. Therefore, power consumption can be reduced due to decreased Joule heat, increased efficiency(η), lowered noise and vibration, and reduced electromagnetic wave.

(b) Application of wavelength of natural resources in daily life.

Lots of medical therapy and equipments have been used of wavelength such as infrared ray therapy, MRI, low-frequency therapy, microwave oven, mobile phone etc.

2. Principle technology of CESS (Cosmotor Electric Saving Device)

a) Mechanism of CESS

If the valence wave is emitted by CESS flow on the electric current, this wave can eliminate loss factors of electricity (reactive electric power, leaking electric current, oxidizing effect, heat generation) and can improve power factor, electrical transmission efficiency, and conversion efficiency. As those results, you can get fundamental saving effect because electrical appliances will be performed well consuming electricity effectively.



▶ 1. Electric Power Factor :

In electric power energy, the value of practically using energy without loss. (Max.=1)

▶ 2. Electrical Transmission Efficiency :

In Electrical Transmission system, the transmit ratio on electric power line without loss power.

▶ 3. Conversion Efficiency:

In electrical machinery, the converted ratio for light, heat, kinetic energy from electric energy without loss.

b) The Principle function of Efficiency Improvement of CESS

(a) Physical function of CESS

- i) Improvement of electricity environment.
- ii) Improvement of wave shape

(b) Electrical function

- i) Transient Voltage Surge Suppressing(TVSS)
- ii) Power Factor Compensatory Function

3. Principle effectiveness of electric saving device

Every material consists of its own (unique) molecule. The molecule is the combination of atom and atom, or group of atoms. And the material is maintaining its own vibration. This is the power which acts on between molecule and atom, in other words, the vibration of electrostatic force. And the material which has absolute temperature more than zero has vibrating state suitable for the temperature, and is giving vibration to the medium of electricity and magnetism that spreads fully in the space.

This vibration has various and complex forms of vibrations such as vibration on the straight line and rotating vibration. The number of vibration is dependent on the material, and it becomes more intense by absorbing the energy of valence wave vibrating with the same number of vibrations. This is the resonance. The vibration gets bigger by atom among the molecule or the group of atoms grows in intensity after all. If the vibration continues like that, it becomes large to infinity. If so, it is expected that molecule would be destroyed because atom or the group of the atom is scattered, but actually it is not destroyed but causes structural change keeping the whole balance. As the application of this principle, CESS, developed by COSMOTOR is the electric power saving system which influences on the whole electric environment as the valence wave is running on the current, a form of wavelength.

By using any wave, electricity cannot be saved. To use the characteristic of wave electrically, it had better not to use any wavelength, but to be applied to just the wave able to cause resonance with its own vibration of molecule, which forms the substance. Therefore the optimum saving effect is expectable when the characteristic of wave fitting into the quality of the material by using the material which emits wave together with other materials.

The valence wave emitted from the CESS through the reconstructed emissions by several years of research, influences on the whole electrical environment while running on the current. In other words, it removes the loss factor of electricity at each point and maximizes the energy efficiency by influencing on the electricity energy, copper wiring and every instrument which consumes electricity.

Energy efficiency means the proportion of the amount of performed work and required energy. Good efficiency can be understood that a lot of work can be done with the small amount of energy. With the valence wave emitted by CESS, you can see the improved effect to the problems such as decline of power factor due to the phase difference between voltage and current, decline of transmission efficiency related to electricity transmission and decline of energy conversion efficiency of the electrical appliances.

a) The Principle function of Efficiency Improvement of CESS

(a) Physical function of CESS

CESS has functions as below to generate valence wave.

The function of activating wavelength ball mills SiO₂ (SiO₂=Fe is removed up to 95%) into 20~300Mesh and Copper 350Mesh, installs it onto PCB after chemical treatment to the substance that high-tech is added to, and composed of functions to give emission more than natural emission through optimum frequency producer.

And maintaining permanent wavelength function is added another function that maintains wavelength emission of SiO₂ semi-permanently without half-life using the force of electric field, after molding several electric resistances with epoxy along with electric circuit plate connected in serial to induce magnetic wavelength.

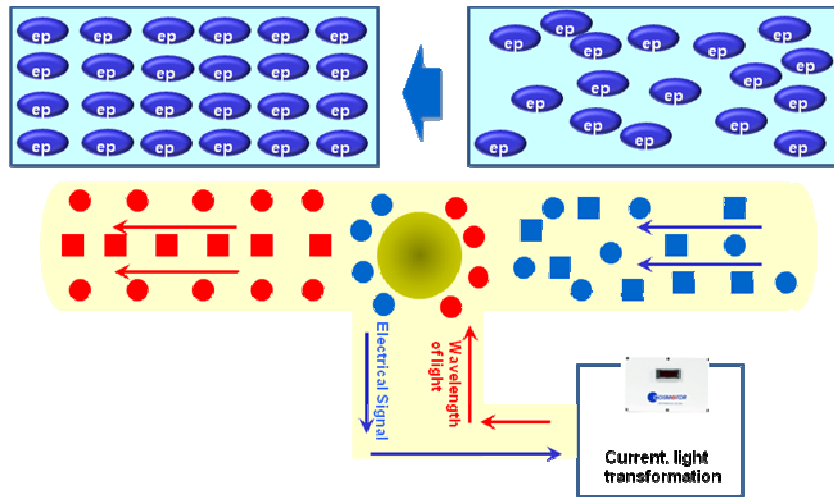
Two functions of the bellow are core technologies for electric power saving of CESS, and provide effect like improving energy efficiency to the whole electric system.

When valence wave is emitted from CESS by these functions, you can get expected effects as follows.

i) Improvement of electricity environment.

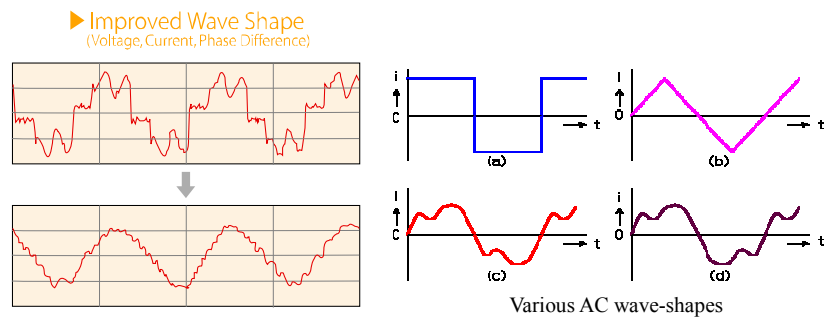
As you operate electric appliances and facilities, impedance in the whole electric environment increases and the amount of loss is getting bigger owing to various

factors. Then electrical transmission improvement is getting worse, falling-off in quality of electric power succeeds after that, and this makes a vicious circle of increasing impedance again. However, change occurs on the molecular structure of copper wire by the influence of valence wave, and it is arranged more regularly and stably than the existing structure, so resistance decrease and electrical conductivity improves. And while converting energy, efficiency of electrical appliances improves by maximizing conversion efficiency improvement.



iii) Improvement of wave shape

It contributes to minimize impedance by basically eliminating abnormal condition of electricity itself like it removes phase difference between voltage and current, redresses imbalance of waveform by offsetting distorted wave which is transformed into electric disturbance factors(surge, harmonics, electromagnetic wave) etc.



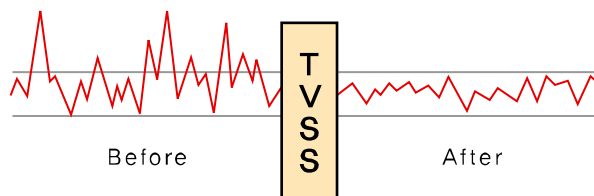
(b) Electrical function

i) Transient Voltage Surge Suppressing(TVSS)

To absorb an impulse voltage, CESS induced safe power supply to electric power system by easing the surge which causes disorder in electrical transmission with connecting several ZN, IN, Barrister in parallel on the circuit board.

Also, another function is added to CESS to supplement various kinds of electric system troubles such as harmonics, which are getting serious due to the introduction of numerous computer systems by information industrialization recently.

Through the organic interaction with the physical function of saving electric power valence wave is added to, the functions which control each electric power show saving effect of electricity.



ii) Power Factor Improvement

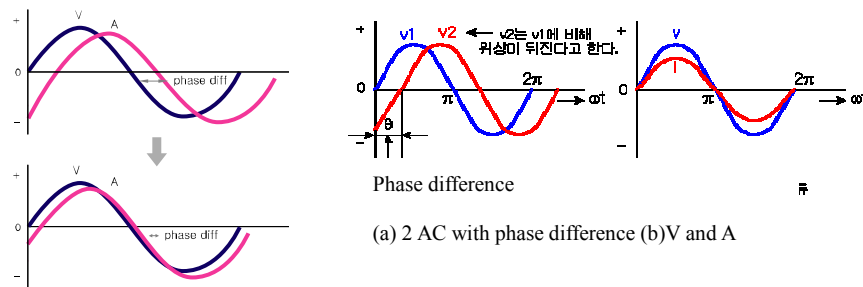
Power factor is the barometer value how to be efficiently run power. It is as same as cosign value of the degree between effective power and apparent one.

(Mathematical y expressed as KW/KVA).

It takes a rule to be produced a reactive power, which marks low value of power factor, by means of the reductive power load, and that the power load containing low power factor remains up to 2/3 at its whole. That state leads to causes to increase the power loss on transmission wire and transformer load, to get voltage value down and the size of power control facilities bigger.

Moreover, a power supplier would separately charge the penalty to consumer as she keep managing power factor value less than 90% on running her facilities. So, if consumer installs an appropriate standard and regularity of capacitors bank on his power facilities, she can gain the effect to be decreased Kvar, KW and KVA along with power factor improving.

► Improved Power Factor



b) Organic(integrated) combination with other electric power regulator

To absorb an impulse voltage, CESS induced safe power supply to electric power system by easing the surge which causes disorder in electrical transmission with connecting several ZN, IN, Barrister in parallel on the circuit board.

Also, another function is added to CESS to supplement various kinds of electric system troubles such as harmonics, which are getting serious due to the introduction of numerous computer systems by information industrialization recently.

Through the articulated interaction with the physical function of saving electric power valence wave is added to, the functions which control each electric power show saving effect of electricity.

$$P=V \text{ (voltage)} \times I \text{ (ampere)} \times \sqrt{3} \times \text{Cos}\theta$$

On the assumption that voltage is fixed, the amount of current should decrease to save power consumption. As the potential energy value, voltage(V) means the force of electricity, and as the kinetic, current(A) means the amount of electricity including reactive power.

In most industrial spots, however, only the passive effort to maintain or improve power factor is made, there's no special effect in saving electric charges actually.

CESS, however, decreases load current significantly which is unnecessary in electric power system by improving electric power efficiency considering characteristic of the load and power distribution facilities.

As a result of current decrease like this, electricity loss can be largely reduced in power distribution facilities, with the decrease in the range of fluctuation; CESS is great system reducing heat generation and factors of electricity loss over the whole electric power system.

As a result of this, electric power facilities are operated in pleasant condition and troubles are substantially improved by mutual interferences between the loads. According to that, effects such as reduction in electric accidents, life expansion of the load and great saving in electric power are expected.

To keep a safe and ideal electrical environment, CESS should be applied after collecting information in advance and analyzing all circumstances exactly causable electrical troubles like

the generation of harmonics or surge trouble.

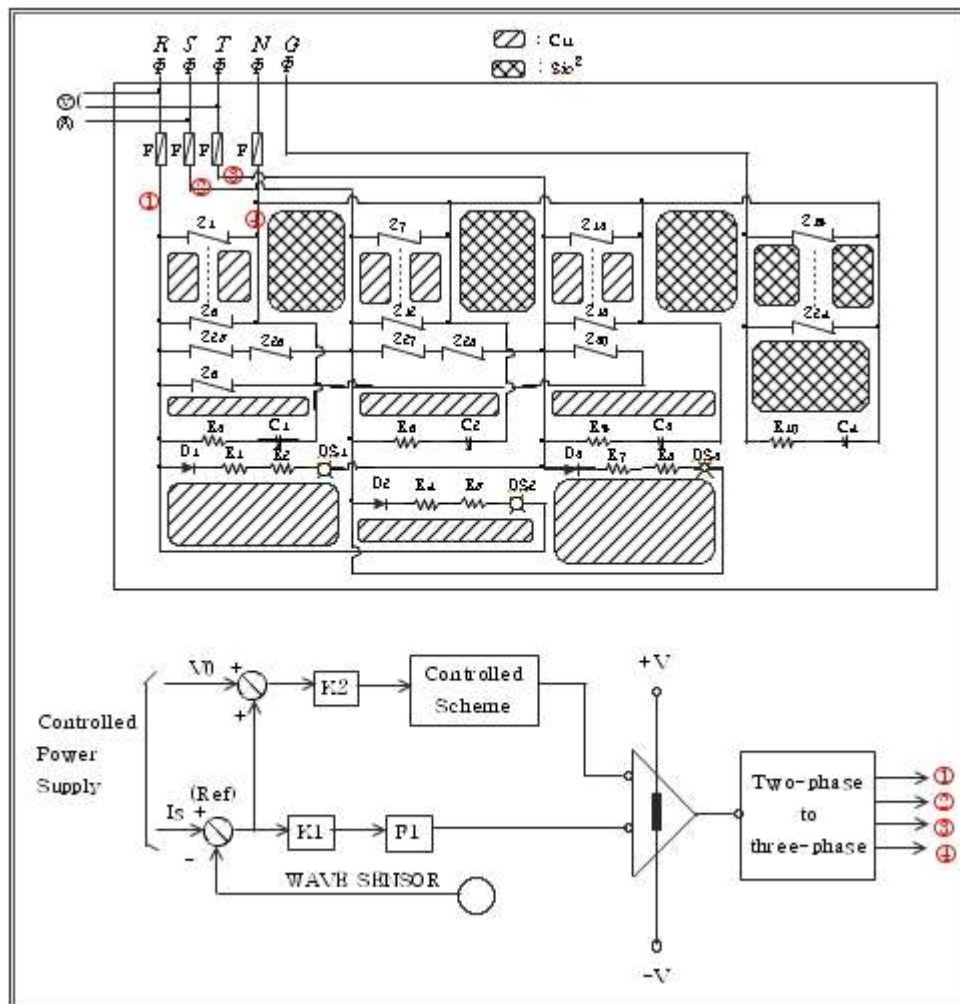
CESS (Cosmotor Electricity Saving System) is the only alternative that can improve almost all troubles occurred in these electric power systems, in the true sense, it can be said it is the best electricity saving system.

c) The efficiency improved by CESS at running load

- (a) The loss rate of power supplying on transmission wire is reduced
High voltage transmission loss rate is managed to be less than 4% although the variation between maximum and minimum value comes out around 30% of difference each other by means of each load value in 3 phases.
- (b) Energy saving by TVSS (Transient Voltage Surge Suppressor)
3~4% of energy saving would be possible in general by TVSS, even though it depends on variation of WL/R value.
- (c) Energy saving by Power Factor rising
It would be possible to save 1~2% energy by reducing a phase difference between voltage and current at alternative current (A.C.).
- (d) Energy saving by Valance Wave and Others
 - Slight rising of Voltage (over 0.1%)
 - Current consumption reduction (Max. 50%)
 - Harmonics reducing (1~2%)

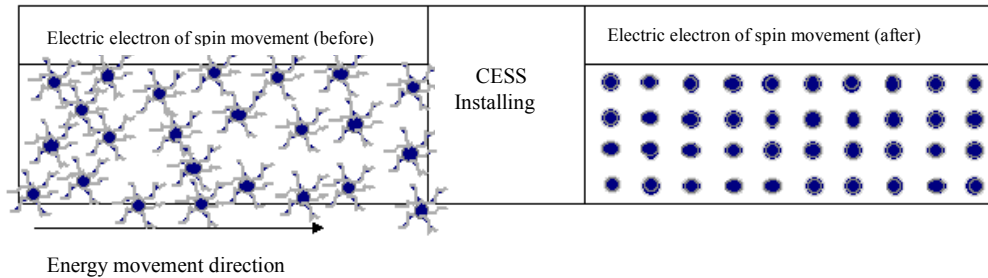
4. Formula and function of CESS circuit board

a) Circuit Diagram inside



i) Apparatus activating Energy wave

This apparatus helps to improve the light wavelength emitted by SiO₂ to be an ideal wave by its resonance and sympathy. The reinforced light wavelength affects power energy itself and the outside circumstance of wire. Thus, it devotes to reduce the residence value (ohm) on transmission wire, to suppress a leakage of current and to maximize the activity of power energy itself. Accordingly, it takes a role to recover the power property, which was distorted by rude wavelength and electrical hazardous factors like surge, harmonics, electromagnetic wave, power loss on transmission wire and overload, etc.), to be close to the original quality just generated at power plant that the activity of power is maximized.



ii) Apparatus emitting Permanent wave

Most of existing objects which emit light wavelength couldn't keep emitting on same quanta of it as original. However, COSMOTOR Corp. developed the specifically constructed object which is emitting high efficient light wavelength and was refined by the very special production process after properly mixing up powders of a high purity of copper (99.9%) and SiO₂ grinded finely (200~350mesh).

It makes possible to radiate semi-permanently light wavelength onto power energy and transmission cable. So, the light wavelength being emitted steady from the object takes part a function to complement the critical weak points that Energy wave vitalizing apparatus emit it momentary.

iii) Function of improving Power Factor

Power factor is the barometer value how to be efficiently run power. It is as same as cosign value of the degree between effective power and apparent one. (mathematical expression as KW/KVA)

It takes a rule to be produced a reactive power, which marks low value of power factor, by means of the reductive power load, and that the power load containing low power factor remains up to 2/3 at its whole. That state leads to causes to increase the power loss on transmission wire and transformer load, to get voltage value down and the size of power control facilities bigger.

Moreover, a power supplier would separately charge the penalty to consumer as she keep managing power factor value less than 90% on running her facilities. So, if consumer install an appropriate standard and regularity of capacitors bank on his power facilities, she can gain the effect to be decreased KVar, KW and KVA along with power factor rising.

Diode rectifier is the most used circuit in applied field (computer, air-conditioner, etc) whose way of input is AC, input current of rectifier is capable of being sine wave that has the same phase with the input voltage, so PF is almost 1.

Since input current of chopper is controlled to follow rectified waveform of sine input voltage, controlled by *PWM*, *m*th pulse begins at $wt = \alpha_m$, formula of average output voltage at δ_m by pulse *p* is,

$$V_{dc} = \sum_{m=1}^p \left[\frac{2}{2\pi} \int_{\alpha_m}^{\alpha_m + \delta_m} V_m \sin \omega t d(\omega t) \right]$$

$$= \frac{V_m}{\pi} \sum_{m=1}^p [\cos \alpha_m - \cos(\alpha_m + \delta_m)]$$

When current load that has average value of I_a , which is consecutive, input current at the moment is,

$$i_s(t) = I_{ds} + \sum_{n=1,3,5,\dots}^{\infty} (a_n \cos n\omega t + b_n \sin n\omega t)$$

$$= \sum_{n=1,3,5,\dots}^{\infty} \sqrt{2} I_n \sin(n\omega t + \phi_n)$$

(But, $\phi_n = \tan^{-1}(a_n/b_n) = 0, I_n = (a_n^2 + b_n^2)^{\frac{1}{2}}/\sqrt{2} = b_n/\sqrt{2}$)

In AC circuit only the resistance ingredient of the total impedance, put together inner impedance and loaded impedance, is left by offsetting capacitive and inductive reactance of each impedance, and the current and voltage become equal, so PF of the circuit becomes 1, therefore the largest power is provided to the load.

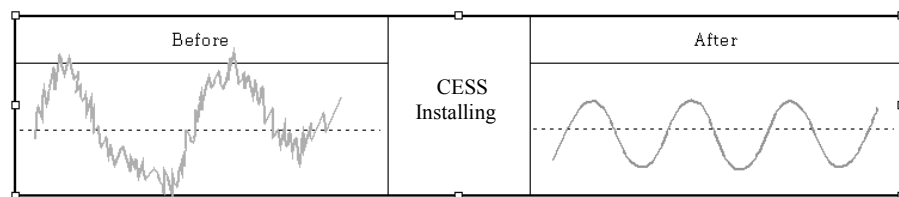
iv) **TVSS(Transient Voltage Surge Suppressor)**

Surge is an excessive wave of voltage and current which is generated by thunderbolt falling, power switches on/off etc. and transmitted through to wire and circuit to power device, and contains the character being fast increased and slowly decreased itself. Voltage surge emit lots of thermal energy as much as burning out parts and it possibly is a cause to destroy, to shorten life cycle and to get a functional property of electronic parts low in the device equipped semi-conductor parts because those parts are very poor off for the incoming voltage surge into it.

In addition, the transient voltage surge leads with possibility to device disorder by destroying the insulating function.

TVSS that is very popular technology at present is a capable of ensuring the security of power device based on the theory by transmitting it through to an earth wire once incoming into power wire and, on the contrary, by keeping voltage value steady by voltage suppressing on power wire once incoming into an earth wire.

★ **TVSS (Transient Voltage Surge Suppressor) Function Diagram**



► **Characteristics of RL series circuit**

In case the condition of power source changes momentarily, energy of voltage current of each part can not reach the normal condition, and therefore various changes of wave length are come up.

In the characteristics of RL series circuit, the current against normal condition is

$$i' = \frac{\sqrt{2}V}{\sqrt{R^2 + (\omega L)^2}} \sin(\omega t + \psi - \theta)$$

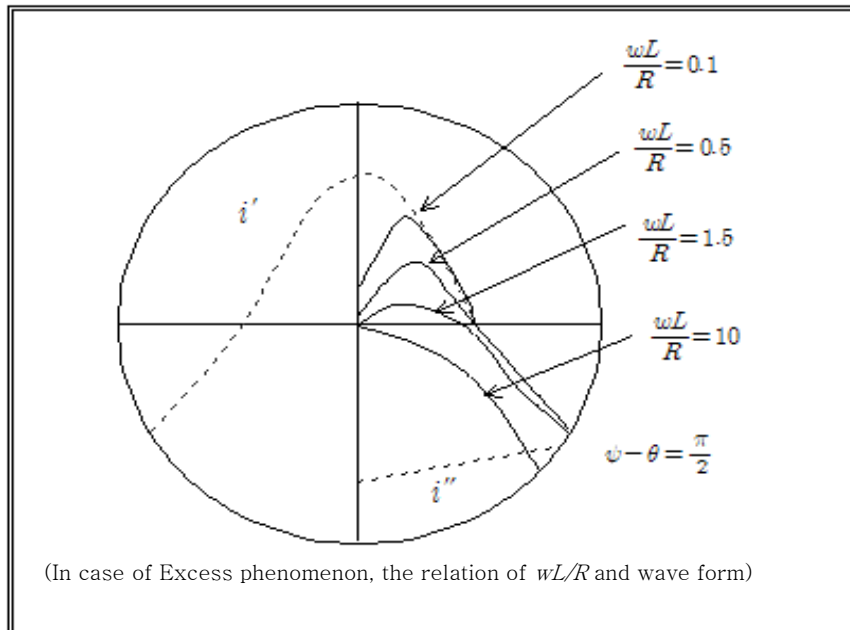
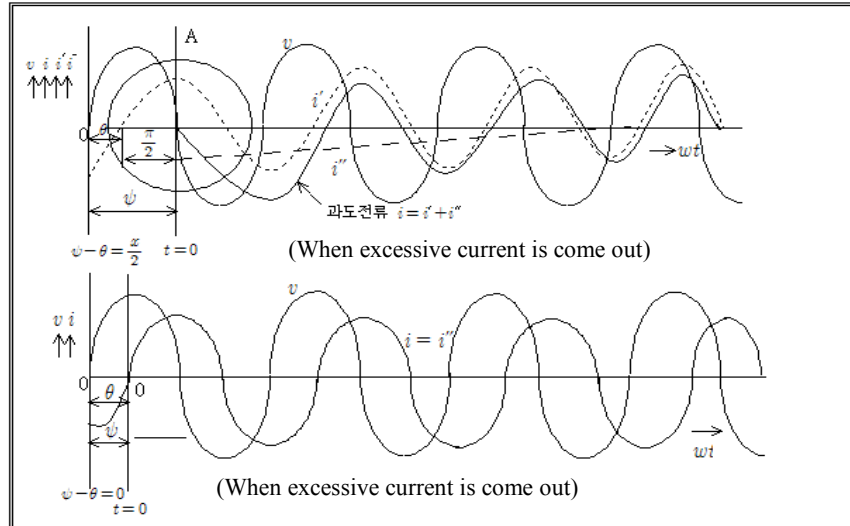
When switch is turned on, the excessive current flowing at the moment is,

$$i'' = \frac{\sqrt{2}V}{\sqrt{R^2 + (\omega L)^2}} Kq e^{-\frac{R}{L}t} \sin(\omega t - \theta)$$

the current flowing on circuit is normal current +excessive current

$$i = i' + i''$$

$$= \frac{\sqrt{2}V}{\sqrt{R^2 + (\omega L)^2}} \sin(\omega t + \psi - \theta) + Kq e^{-\frac{R}{L}t}$$



► Characteristics of LCR series circuit

In excess phenomenon on AC circuit, when the switch is turned on in $t=0$, LCR series resonance circuit, the circuit equation for current $i(t)$; is

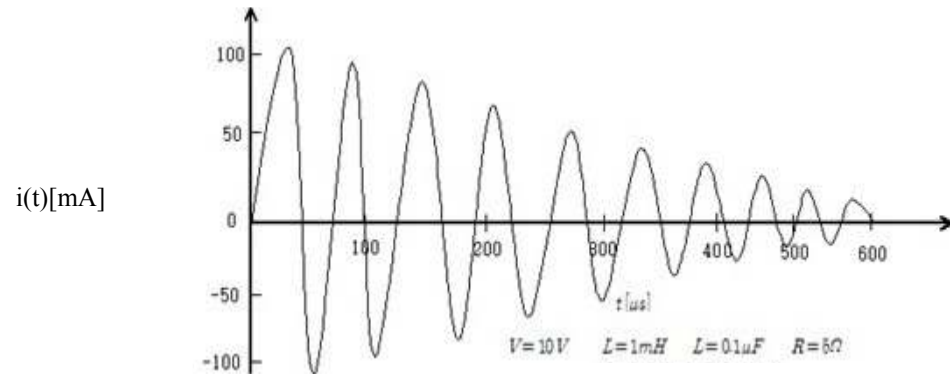
$$L \frac{di}{dt} + Ri + \frac{1}{C} \int_0^t i dt = V \quad \text{and differentiate this by } t \text{ is,}$$

$$\frac{d^2i}{dt^2} + \frac{R}{L} \frac{di}{dt} + \frac{i}{LC} = 0$$

$$R^2 < 4L/C$$

$$A = \frac{2V}{\sqrt{4L/C - R^2}} \quad \theta = 0 \quad i(t) = A e^{\alpha - t} \sin(\omega t + \theta) \quad (\text{E: } \alpha = \frac{R}{2L}, \omega = \sqrt{\frac{1}{LC} - \frac{R^2}{4L^2}})$$

$$F = \frac{1}{2\pi} \sqrt{\frac{1}{LC} - \frac{R^2}{4L^2}}$$



(When excessive current is come out)

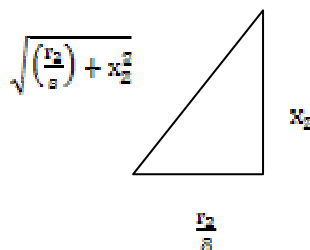
(Energy wave activating apparatus + permanent wave emitting apparatus) as above is a physical energy saving principle possessed know-how the only by COSMOTOR. In addition, CESS (Cosmotor Electricity Saving System) saves power energy and ensures security on power facilities by the effect that, as the popular technology, (power factor rising apparatus + TVSS) rise power factor and suppress transient surge by electrical (mechanical) principle.

CESS attains around 10% or more of energy saving result by the running quanta reduction of current, reactive power and harmonics and by rising power factor because CESS itself is organically combined and functioned by a physical and electrical energy saving devices. It also dedicates to save facilities maintenance expenses because its own function ensures the security of power facilities and extends life cycle of power device.

b) Power output formula by CESS

► 2nd Output formula

Power factor comes from impedance (Z); $Z = \frac{E_2}{I_2} + jX_2$



$$\text{Power factor(P.F)} \theta = \frac{\frac{E_2}{I_2}}{\sqrt{(\frac{E_2}{I_2})^2 + X_2^2}}$$

(the 2nd input of totator)

2nd input(P_2) = 2nd oupput(P_0) + wire loss(P_{02}) + otherloss(P_1)

$$P_2 = E_2 I_2 \cos \theta$$

$$P_2 = E_2 \times \frac{E_2}{\sqrt{(\frac{E_2}{I_2})^2 + X_2^2}} \times \frac{I_2}{\sqrt{(\frac{E_2}{I_2})^2 + X_2^2}} = I_2^2 \frac{E_2}{E} [W]$$

► 2nd Efficiency formula

2nd wire loss; P_{c2} (which is loss by being consumed at r_2)

2nd efficiency;

$$P_{c2} = I_2^2 r_2 \times \frac{E}{E_2} = I_2^2 \frac{r_2}{s} = s P_2$$

$$\eta = \frac{\text{output}}{\text{input}} = \frac{P_0}{P_2} = 1 - s = \frac{N}{N_s}$$

$$2^{\text{nd}} \text{ output}(P_0) = P_2 - P_{c2} = I_2^2 \frac{r_2}{s} - I_2^2 r_2$$

$$P_0 = (1 - s) P_2$$

$$= I_2^2 \left(\frac{r_2}{s} - r_2 \right) = I_2^2 \left(\frac{1-s}{s} \right) r_2$$

$$\eta = 1 - s = \frac{N}{N_s}$$

$$P_0 = P_2 - s P_2 = (1 - s) P_2$$

► The relation between torque and supplied voltage

Torque is proportional to Voltage

$$P_2 = E_2 I_2 \cos \theta$$

(the relation of torque and slip)

$$P_0 = \omega \tau = \frac{2\pi N_s v_{rpm}}{60} \tau [W]$$

$$P_2 = E_2 \times \frac{E_2}{\sqrt{\left(\frac{E_2}{s}\right)^2 + X_2^2}} \times \frac{\frac{E_2}{s}}{\sqrt{\left(\frac{E_2}{s}\right)^2 + X_2^2}} = \frac{E_2^2}{\sqrt{\left(\frac{E_2}{s}\right)^2 + X_2^2}} \times \frac{r_2}{s}$$

$$\tau = \frac{60}{2\pi N_s v_{rpm}} P_0 = 9.55 \frac{P_0}{N_s}$$

If impedance, reactance is a constant,

2nd input (P_2) is proportional to voltage (E_2^2),
also becomes torque;

$$P_2 \propto \tau \propto E_2^2$$

$$= 9.55 \frac{(1-s) P_2}{(1-s) N_s} = 9.55 \frac{P_2}{N_s} [N.m]$$

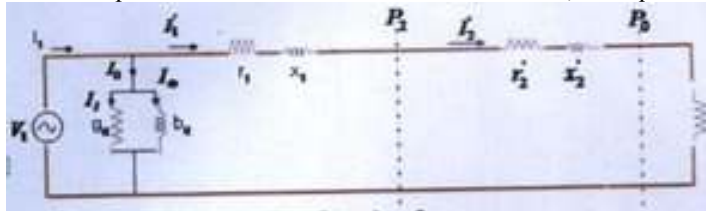
Substituting [Kg.m] for torque

$$\tau = \frac{9.55 P_2}{9.8 N_s} = 0.975 \frac{P_2}{N_s} [Kg, m]$$

Then, torque will be expressed
by 2nd input and synchronous speed.

► The relation between torque and slip (1)

If 2nd of equivalent circuit of inductive motor into 1st, the equivalent circuit becomes;



$$\frac{1-s}{s} r_2' = R'$$

$$a = \text{turn ratio, } r_2' = a^2 r_2, X_2' = a^2 X_2, R' = a^2 R$$

$$1^{\text{st}} \text{ current of load } I_1' = \frac{1}{\sqrt{(r_1 + \frac{r_2'}{s})^2 + (X_1 + X_2')^2}}$$

► The relation between torque and slip (2)

$$2^{\text{nd}} \text{ input}(P_2) = P_0 + P_{c2} = I_1'^2 R + I_1'^2 r_2' = I_1'^2 (R + r_2') = I_1'^2 \frac{r_2'}{s}$$

$$= \frac{V_1^2 \frac{r_2'}{s}}{(r_1 + \frac{r_2'}{s})^2 + (X_1 + X_2')^2}$$

$$\tau = \frac{P_2}{\omega} = \frac{60}{2\pi N_s} P_2 = \frac{60}{2\pi N_s} \times \frac{V_1^2 \frac{r_2'}{s}}{(r_1 + \frac{r_2'}{s})^2 + (X_1 + X_2')^2}$$

$$N_s = \frac{120f}{P}$$

then,

$$\tau = \frac{60}{2\pi N_s} \times \frac{V_1^2 r_1^2}{(r_1 + r_1^2/s)^2 + (x_1 + x_2^2)^2} = \frac{60}{2\pi} \times \frac{P}{120f} \times \frac{V_1^2 r_1^2}{(r_1 + r_1^2/s)^2 + (x_1 + x_2^2)^2}$$

$$\tau = \frac{P}{4\pi f} \times \frac{V_1^2 r_1^2}{(r_1 + r_1^2/s)^2 + (x_1 + x_2^2)^2} \propto \frac{V_1^2}{f}$$

Torque is inverse ratio to hertz, is proportional to voltage.

Based on the above equation, it shows us that the output is proportioned to the supplied voltage value.

c) **The difference of power saving rate in the industrial field by CESS**

(a) **Theory about compensation for loss of line**

Function of valance wave to the Electricity transmission (Second quantization)

① **Classical Hamiltonian of Physical**

If we express electricity and magnetic field (\vec{E} \vec{B}) by means of vector potential (\vec{A} (\vec{x} $\frac{t}{c}$)) with considering Coulomb gauge;

$$\vec{E} = -\frac{1}{c} \frac{\partial \vec{A}}{\partial t}, \vec{B} = \nabla \times \vec{A}$$

$$\nabla \times \vec{E} = -\frac{1}{c} \frac{\partial \vec{E}}{\partial t}$$

$$\nabla^2 \vec{A} - \frac{1}{c^2} \frac{\partial^2 \vec{A}}{\partial t^2} = 0 \quad \nabla \cdot \vec{A} = 0$$

② **Process of absorbing and emitting atom by electromagnetic wave**

If we consider the sum of atom and electricmagnetic wave which has reciprocal action between atom and electricmagnetic wave, Hamiltonnian becomes

$$H = H_{atom} + H_{rad} + H_{int}$$

$$H_{atom} = \sum_i \frac{1}{2m_i} p_i^2 + V(\vec{x}_i, \dots, \dots)$$

$$H_{atom} = \frac{1}{8\pi} \int d^3x (\vec{E}^2 + \vec{B}^2) = \sum_i \sum_\sigma \hbar \omega_i (a_{i\sigma} + a_{i\sigma}^\dagger + \frac{1}{2})$$

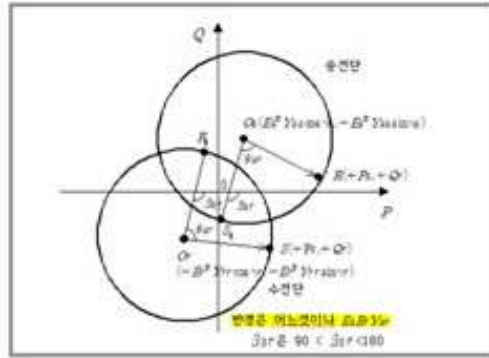
$$H_{atom} = \sum_i \left\{ -\frac{e}{m_i c} \vec{p}_i \cdot \vec{A}(\vec{x}_i, t) + \frac{e^2}{2m_i c^2} A^2(\vec{x}_i, t) \right\}$$

The variation rate between Peak and Minimum is about 30% according to the Load of each Phase.

(b) **Equation of supply power transmission**

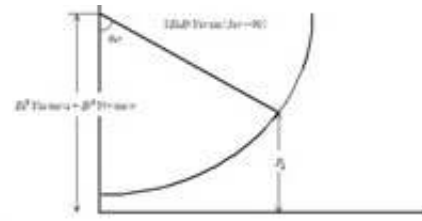
If active power is P_s and reactive power is Q_s , then the equation of power transmission becomes

$$(P_s - E_s Y_{ss, \dots, \dots})^2 + (Q_s + E_s Y_{ss, \dots, \dots})^2 = (E_s Y_{sr})^2$$



The loss of active power = P_L becomes

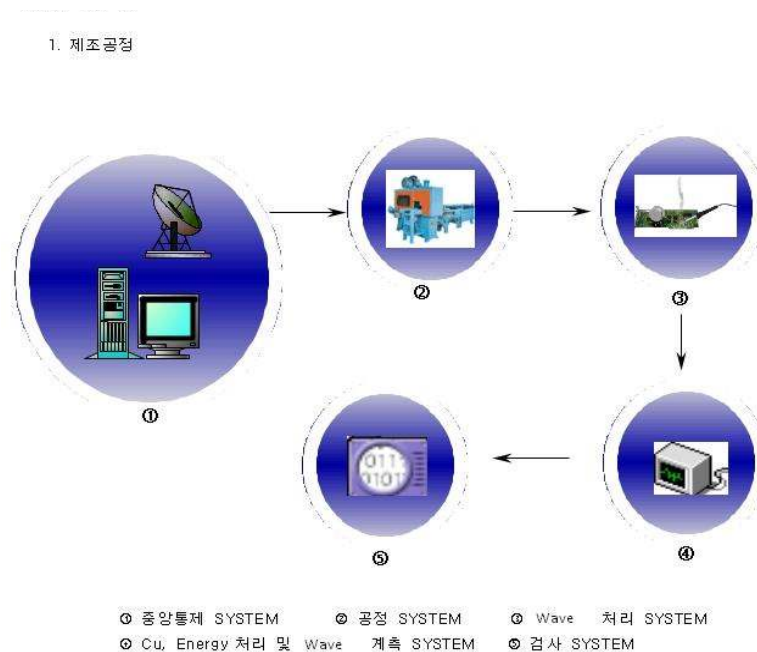
$$P_L = P_1 + P_2 = E_1^2 Y_{11} \dots + E_2^2 Y_{22} \dots + 2E_1 E_2 Y_{12} \dots$$



- (c) **The reason breaking out the difference of energy saving rate at a site by CESS**
As the above equation, at the power receiving position, the arrival power property is possibly different from one another at each different site by means of the difference of place, time spot and environmental factors etc. In addition, the power property difference of the supplied power is also turned out at same kind of power device due to the various change of power wave created under transmitting on wire from a sudden variation of power property itself by other factors like transient surges and irregularly changed property of voltage and current, even though it had made as same capacity and by same manufacturer, at same date. In consequence, the energy saving rate will be differently come out by same CESS device as per the installed site accordingly because the typical function of CESS is to alter the supplying power property to the best qualified one.

5. A simple manufacturing process

a) Manufacturing sequence



b) The process of energy(valance wave) exciting

c) The flow system of Valance wave process

- d) **The device activating the period of half-life of valance wave**
- e) **Flow system of Valance-wave process**
- f) **The basic structure of wave model**

III. Conclusion

After emitting wavelength made in specific area on the active area of circuit board (semiconductor), make the conductor shed specific wavelength to affect the electron movement. The natural resources material such as pure silicon dioxide (SiO₂) can form a specific wavelength by exciting energy, and the specific wave is provided to the conductor making the wavelength of the electron longer on the conductor due to the Compton Effect. In case of the broadcasting wave, for example, the short wave with short wavelength, as the displacement current (radio wave) i is

$$i = \frac{\partial D}{\partial t}$$

according to the Maxwell's equation, can transmit the displacement current better as the wave length is getting shorter, but it couldn't be transmitted well if there is obstacles such as long distance or mountain. However, if the wave length is getting longer just like the infrared ray, it is not affected by the long distance and obstacles (mountain, wall, etc.)

Therefore, by making the wavelength of the electron on the conductor long, and as the speed of electron moving inside the conductor is

$$\Delta\lambda = \frac{h}{mc} (1 - \cos\theta)$$

the Joule's heat generated upon the crash of electron can be decreased. In this way, the resistivity if the conductor gets smaller increasing the conductive rate and the decreased electric resistance upon the move of electrons is judge to be helpful in saving the electric energy by the Joule's heat.

THE END