

Harnessing new clean energy induced by electromagnetic resonance

Osamu Ide

Owner

Clean Energy Research Laboratory

Funabashi, Japan

daphne@myad.jp

0000-0003-1176-6178

Abstract— We have no reliable new clean energy source for our future. The author has been researching new clean energy since 1973. Recently, the one author found was the method of electromagnetic resonance getting more energy than the input energy. While making an experiment of electromagnetic resonance between two coils, the author found an interesting phenomenon. The author supposed much electrical energy was induced more than the input energy by the resonance coils. The total energy of the coils was amplified more than the input electrical energy. The author started to compose an inverter of applying electromagnetic resonance. As the result, the output power from the transformer system with a resonance coil is larger than the input power. It means the inverter applying electromagnetic resonance will become a generator of no input energy by feedback of the part of the output power to the input terminal. It will be a generator of no natural energy resources.

Keywords—*electromagnetic resonance, inverter, air gap, beyond 100%*

I. INTRODUCTION

The first result of the research was achieved in 1980, while the author had been testing a prototype of the motor driven by discharging of the capacitor. The current source of the motor was oscillating current by the capacitor and a motor coil. The author found “a positive EMF” which could not explained by common electromagnetic theory in the prototype motor. The positive EMF accelerates the current flowing into the motor coil. Then the motor gets unexpected efficiency [1].

In 1995, the author presented the report of the research on Journal of Applied Physics (JAP) [2].

The author continued to research more precise experimental and theoretical analysis of the positive EMF. Then the author found the positive EMF has clear mathematical rule. The result was presented by oral at the conference of Fifth International Symposium on Magnetic Suspension Technology by NASA Langley Research Center, in Santa Barbara California, on December 1-3, 1999 [3].

Since 2000, the author has been researching to apply the positive EMF to inverter. In January 2010, the author succeeded to compose an inverter applying the positive EMF. The efficiency was 130~250%. The result was presented at SPESIF in 2011 and published on Physics Procedia [4].

The experiment above was replicated by Japanese electrical engineer and German scientists independently at

almost same day in January 2015. Japanese engineer is Mr. Y. Inui. The German scientists are Dr. H. Eckardt and the members of his group. Dr. Eckardt presented several papers related to the author's experiment [5] [6] [7] [8][12].

In 2015, the author succeeded to make an experiment of self-charging inverter by feedback of the output to battery for input.

The inverter is applying the positive EMF. The battery is the power source of the inverter. Then the charge of the battery was increasing a little while the inverter with load was driving. The results was presented by a poster at MANA-RSC symposium in Tsukuba on 15, 16 October, 2015.

Around the age of 2000, the author made many types of Tesla coils, small to large. Tesla coil was invented by Nicola Tesla in 1902 [9].

Tesla coil is combined resonance circuit of low voltage primary coil and high voltage output coil. The input power was AC power source of the power transformer. And the output power was the power of the primary coil with the high voltage spark air gap. Because so high voltage output of the secondly coil is too difficult to measure. When the author measured the input power of AC power transformer and the power of the high voltage primary coil for resonance. Then the author found the efficiency was about 130%. Tesla coil has unusual phenomenon on energy.

In September 2017, the author started to research inducing excess energy by the peripheral coils distributed around a main coil for input power. But the author could not find the excess energy by the method above. As on the common sense, it is quite natural.

In November 2017, the author got a technical suggestion from an alumnus at alumni association of university. The alumnus said that electrical energy transmission applying by electromagnetic resonance had so high efficiency.

At once the author thought of applying the electromagnetic resonance to the inverter system by adding capacitor for electromagnetic resonance to the system above.

Then the author achieved to get the efficiency beyond 100% by the method. The report was presented by a poster at MC14 by RSC, on July 2019, Aston University in Birmingham, UK.

The author found the phenomenon of increasing energy only occurred in a transient moment. However, was not found in continuous driving.

In March, 2020, the author had made the experiment of the electromagnetic resonance among the two or three cores located with some distance. Then the author got the result that the phenomenon of increasing electromagnetic energy reached 50~100 times of the input AC power.

The author succeeded to induce energy beyond the input energy to the transformer driven by sine wave. Since then, the author made many types of the transformer applying electromagnetic resonance. They all had different specs and features of excess energy. This report is for one type of them.

The experimental system is composed of main and side electromagnetic cores. They are distributed with some small distance. One of them has electromagnetic resonance circuit by coil and capacitor.

The main and side magnetic cores are connected loosely with large air gap. So it doesn't look a common transformer with closed magnetic circuit. The input and output coils are wound around the main magnetic core. The side core has a resonance circuit composed of coil and capacitor.

If the driving power of sine wave is input to coil of the main core, the coil of the side core gets oscillation. If the driving frequency is matched to the resonance frequency, the oscillation of the side core coil increases the amplitude.

And the result shows the total output power of the both two output coils exceeded the input power.

In 24th March, 2022, the author also presented another type of the resonance transformer with different feature by oral (virtual) at ACS spring in San Diego, CA [10].

In 20-22nd July, 2022, the author has presented the report of the early experiment of the resonance transformer by oral (virtual) at IEEE (ICECET), Prague, in Czech Republic. The report shows fundamental feature of the resonance transformer [11].

Described above is some of a series of the experimental results the author made for these 40 years. They contain typical evidences of existing of the new clean energy.

The following experiment is one of the recent result, and the replication of the different type of the resonance transformer presented at the ICECET, Prague [11]. The result has much measured power data of wide range.

The latest news, Prof. Y. Yoshida and his students in Hiroshima Institute of Technology (HIT) have been trying to replicate the author's experiment on JAP [2].

Recently, Prof. Yoshida succeeded to get some positive results of existing the 3rd positive EMF. He observed that the current flowing into the electromagnetic system from the charged capacitor was accelerated by the 3rd positive EMF.

The current and the recycled voltage to the capacitor were both larger than the value by simulation based on the present electromagnetic theory.

The result shows the strong evidence of inducing excess energy by electromagnetic resonance in the experimental system.

II. EXPERIMENTAL CIRCUIT AND METHOD

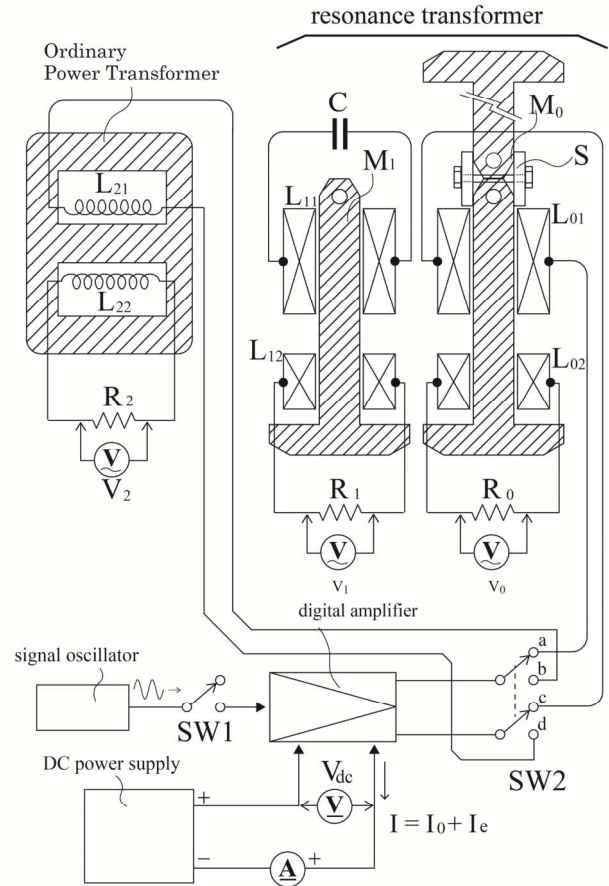


Fig. 1. Experimental Circuit

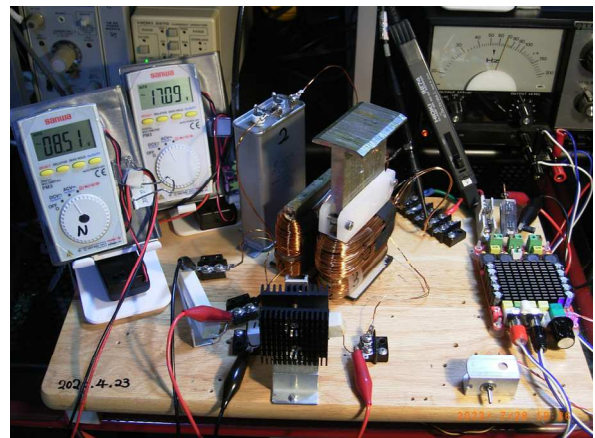


Fig. 2. Photo of the experimental system

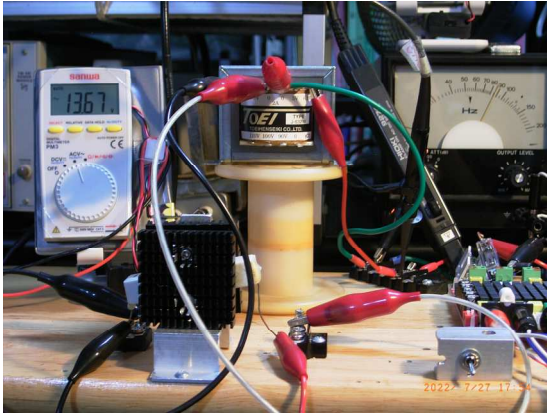


Fig. 3. Photo of the experimental system of the ordinary power transformer

Figure 1 is the experimental circuit.

Figure 2 is the picture of the experimental device of the resonance transformer.

Figure 3 is the picture of the experimental device of the ordinary power transformer driven by the same condition as the resonance transformer.

The resonance transformer has two electromagnetic cores. The main core M_0 is electromagnetic core with input coil L_{01} . Two magnetic cores of same size are connected by the coupling device S to make a large core M_0 .

The input coil L_{01} and the output coil L_{02} are wound around the main core M_0 . The resistance load $R_0 = 100.1\Omega$ is connected with the output coil L_{02} .

The main core M_0 and the side core M_1 are not connected, but separated with some air cap. The side core M_1 has also two coils L_{11} and L_{12} .

The coil L_{11} is connected with a capacitor $C = 4.09\mu F$ to make a resonance circuit.

The resistance load $R_1 = 99.5\Omega$ is connected to the output coil L_{12} . So the resonance transformer has two output terminals.

The input coil L_{01} of the main core M_0 is driven by a digital amplifier. The sine wave power from the digital amplifier is input to the input coil L_{01} of main core M_0 . When the signal oscillator outputs driving signal to the digital amplifier, DC power supply supplies DC power to the digital amplifier. The voltage of the DC power supply is constant, $V_{dc} = 22.00V$.

If switch $SW1$ is turned off, the amplifier does not drive the transformer. However, the current I_0 from DC power supply is flowing into the digital amplifier. The input current I_0 does not contribute to induce output power of the transformer. As the input current I_0 is consumed by the inner circuit of the digital amplifier.

If switch $SW1$ is turned on, the driving signal inputs to the digital amplifier. And switch $SW2$ is connected to the

terminals of a and c. Then the input current I becomes $I_0 + I_e$ and the digital amplifier outputs power to the resonance transformer. So the only input current I_e is available to induce output power to drive transformer.

Also the side core M_1 starts to oscillate by driving frequency of $F = 671Hz$. Both output coils L_{02} and L_{12} output power to the load R_0 and R_1 .

For comparison of the data, the author prepared another ordinary transformer on Figure 3. If switch $SW2$ is connected to the terminals of b and d, the ordinary transformer is driven by same voltage and same frequency condition as the resonance transformer.

The primary coil L_{21} and the secondly coil L_{22} of the ordinary transformer have nearly same inductance of the resonance transformer. The two coils, L_{21} and L_{22} of the ordinary transformer are separated output terminals of low voltage.

The input power P_0 was calculated by $P_0 = V_{dc} \times I_e$ (W).

Where, the voltage of the DC power supply is $V_{dc} = 22.00V$.

The input current I_e was measured by the digital DC current meter which cancels no available current I_0 .

The digital AC volt meters V_0 , V_1 and V_2 measured the output voltage of each three loads. The measured value of the AC volt meters are effective value. To cancel the error of measuring by the digital AC voltmeters, the measured value were calibrated to the measured value of digital oscilloscope.

The output power of the resonance transformer was calculated by

$$P = V_0^2 / R_0 + V_1^2 / R_1 \text{ (W)}.$$

The output power of the ordinary transformer was calculated by $P = V_2^2 / R_2$ (W).

Then the power efficiency was calculated by $P / P_0 \times 100$ (%).

III. RESULTS AND DISCUSSION

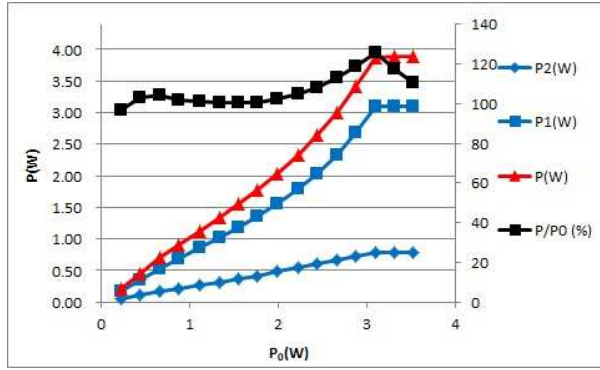


Fig. 4. Result of the resonance transformer

Figure 4 shows the result of the resonance transformer.

Figure 5 shows the result of the ordinary transformer.

On Figure 4 and Figure 5, the horizontal axis is the input power P_0 (W). The vertical axis are the output power P (W) and the power efficiency $P/P_0 \times 100$ (%).

On Figure 4, the red curb shows the total output power P (W) of the coil L_{02} and L_{12} . The blue curbs show the output power P_1 (W) of the load R_0 , and the output power P_2 (W) of the load R_1 . The black curb shows the efficiency of the resonance transformer.

TABLE I.

The numeral results of Fig. 4.

x P_0 (W)	y P_2 (W)	P_1 (W)	P (W)	P/P_0 (%)
0.22	0.050	0.163	0.2134	97.0
0.44	0.107	0.347	0.454	103.2
0.667	0.164	0.532	0.696	104.2
0.88	0.210	0.584	0.894	101.6
1.111	0.265	0.559	1.124	101.2
1.34	0.317	1.029	1.346	100.4
1.547	0.367	1.188	1.555	100.5
1.767	0.417	1.355	1.772	100.3
1.987	0.481	1.558	2.039	102.6
2.222	0.545	1.79	2.335	105.1
2.433	0.603	2.032	2.635	108.2
2.650	0.663	2.306	3.005	113.1
2.871	0.723	2.582	3.411	118.8
3.091	0.775	3.099	3.875	125.4
3.311	0.780	3.102	3.882	117.2
3.52	0.780	3.106	3.886	110.4

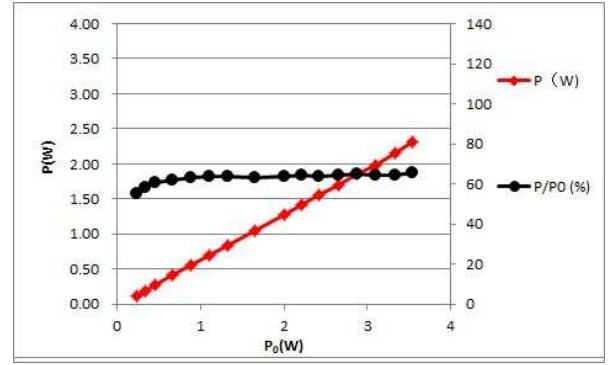


Fig. 5. Result of the ordinary power transformer

On Figure 5, the red curb shows the output power P (W) of the load R_2 . The black curb shows the result of the power efficiency (%).

On Figure 4, the red and blue curb show that the output power is nonlinear to the input power. The approximation of the relation between the input power P_0 and the total output power P (W) is shown by function (1), except the saturated domain of the right side two points.

Table I is the original data of Figure 4.

Table II is the original data of Figure 5.

TABLE II.

The numeral results of Fig. 5.

x P_0 (W)	y P (W)	P/P_0 (%)
0.231	0.27	54.98
0.332	0.93	58.13
0.451	0.274	60.75
0.664	0.413	62.20
0.889	0.561	63.10
1.104	0.701	63.50
1.327	0.846	63.75
1.657	1.046	63.13
2	1.281	64.05
2.218	1.425	64.25
2.424	1.553	64.07
2.649	1.703	64.29
2.873	1.863	64.85
3.091	1.988	64.32
3.331	2.151	64.58
3.542	2.314	65.33

$$P = 0.1305 P_0^2 + 0.8038 P_0 \text{ (W)} \quad (1)$$

Where, $R = 0.9951$

The function (1) implies the efficiency exceeds 100%, if the input power P_0 is larger than $P_0 = 1.503$ (W).

While on Figure 5, the red curb of the output power P (W) is clearly linear to the input power (P_0). The approximation between P and P_0 is shown by function (2).

$$P = 0.6543 P_0 - 0.0247 \text{ (W)} \quad (2)$$

Where, $R = 0.9999$

The function (2) shows the output power P never exceeds the input power P_0 . It is quite reasonable on the common sense.

The results of Figure 4 and Figure 5 clearly show the difference of the output power and also the efficiency of the two transformers driven by same driving condition as the DC input power and the frequency.

On Table 1, the efficiency of the resonance transformer are distributed within the range of 100 ~ 125%. Whereas, on Table 2, the efficiency of the ordinary power transformer are distributed within the range of 60 ~ 65%.

The efficiency value on Table 2 looks reasonable for the ordinary power transformer of 25Watt power output.

The results of two Figures and two Tables show clear advantage of the resonance transformer.

The reason of the result is estimated the effect of the resonance circuit of the left side core M_1 . Electromagnetic resonance could amplify the electromagnetic energy.

On the present electromagnetism, we have no theory that electromagnetic resonance makes increasing the oscillating energy. However, the results on Figure 4 and Figure 5 look to verify the increasing of energy.

For simulation of the resonance transformer, the author will introduce an early stage experiment he has done in the past. It is necessary to decide the value of mutual inductance between input coil and output coil. The experiment is simple, however it verifies the basic phenomena the author found.

The author prepared two electromagnetic cores shown on Figure 1. These cores have coil of L_1 and L_2 , as same size as the left core on Figure 1. The inductance of each coil is 6.72 mH. The cores are separated with the gap of 1 cm between the bottoms of two cores.

The author made a transformer experiment by these two electromagnetic cores. The coil L_1 is for the input and the coil L_2 is for the output. If sine wave power of voltage V_1 is input to the coil L_1 , the coil L_2 output AC voltage of V_2 . Then voltage V_2 never exceed voltage V_1 , because the mutual inductance M must be smaller than L_1 ($= L_2$), as the air gap between L_1 and L_2 is so large.

The result shows that the input voltage $V_1 = 10.45 \text{ V}$, the output voltage $V_2 = 2.06 \text{ V}$. Then the mutual inductance M should be $M = V_2 / V_1 \times L_1 = 0.197 \times L_1 \text{ mH}$. The result is quite natural. For the transformer has so large air gap and the flux interlinkage between L_1 and L_2 is small. Probably, we don't call it transformer as the efficiency is very low.

On the other hand, a capacitor of $C = 5.08 \mu \text{ F}$ is connected to the output coil L_2 to make a resonance circuit and applied identical value sign wave to the input coil L_1 as above. The sign wave signal has the resonance frequency of the coil L_2 and the capacitor C . Then the input voltage V_1 is 10.39 V, however the output voltage of the capacitor C and the coil L_2 becomes 42.3 V. The output voltage V_2 is much larger than the input voltage, although the mutual inductance M is $0.197 \times L_1 \text{ mH}$.

The result shows it is impossible to fix the value of the mutual inductance M for simulation.

The result above shows $V_2^2 / V_1^2 = 42.3^2 / 10.39^2 = 16.6$ times magnetic flux energy of the input core is induced in the resonance circuit of the output core. Because inductance of L_1 and L_2 are almost equal. The current in the coils are linear to the voltage of each coils.

The theory of mutual inductance is based on the idea that magnetic flux of the transformer never exceed the flux made by input coil. But it is wrong when the resonance circuit is existing in the transformer system.

So the simulation is impossible by the present electromagnetic theory.

By the way, the load of the output coil gets heat by the output power of $P = 3.10 \text{ W}$.

That is why the black radiator is connected with the resistance load $R = 100.1 \Omega$ on Figure 2 and Figure 3. The author checked temperature of the black radiator more than 20 minutes past after the driving started. It became 42.2 °C when the ambient temperature was 21 °C, measured by emission thermometer.

On Figure 4, the blue curb and the red curb showing the output power of P_1 and P_2 look to saturate at the right side two points. The reason of the saturation is not clear.

The resonance transformer is my original idea. So there is no references from current international conferences.

The author will try to produce a new clean generator of utilizing the electromagnetic resonance. The generator wastes nothing. Then the quality of magnetic material of the transformer should become very important factor. The quality of battery and the quality of switching element of the driving circuit should be also important factor to advance the research.

IV. CONCLUSIONS

The author named the transformer utilizing the electromagnetic resonance "Resonance Transformer". The transformer with two separated magnetic cores and single resonance circuit has tested and discussed. And compared with an ordinary transformer with closed single magnetic core by same driving condition.

The results show the efficiency of the resonance transformer is nearly twice of the ordinary power transformer.

The deviation between input and output power of the resonance transformer is excess energy for new clean energy.

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