Euler's Coil Technology Experiment 4

Aim: To investigate the effect of phase difference between inputs on the induction process.

Hypothesis A:
Transformer is a device that transferring electrical energy from Primary Coil to Secondary Coil. For an ideal transformer:

From Faraday's Law

For ideal transformer

The voltage ratio is equal to the turns ratio, and power in equals power out.

$$\frac{V_S}{V_P} = \frac{N_S}{N_P}$$

From conservation of energy

$$P_P = V_P I_P = V_S I_S = P_S$$

Specifically, in a Source-Source-Response coil system, the electrical energy of the first Source will NOT able to pass into the Response coil. And the phase difference between two Source coils would not in anyway affecting the output of the Response coil,

Hypothesis B:

In normal transformer,
First Round Induction from Primary coil to Secondary coil:
$V(Primary\,coil)=\sin(t)$
$V(Induced\,Secondary\,coil)=-V'(Primary\,coil)=-(\sin(t))'=-\cos(t)$
Notice that $\sin(t-Pi/2)=-\cos(t)$

Hypothetical Induction from Secondary coil to Primary coil:
$V(Induced\,Primary\,coil)=-V'(Induced\,Secondary\,coil)=-(-\cos(t))'=-\sin(t)$
Notice that $\sin(t-Pi)=-\sin(t)$

The description of the energy transferring process should be
$E(Original\,Primary\,coil)\rightarrow E(Induced\,Secondary\,coil)$
$E(Induced\,Secondary\,coil)\rightarrow E(Induced\,Primary\,coil)$
$E(Induced\,Primary\,coil)=-E(Original\,Primary\,coil)$
$E(Final\,Primary\,coil)=E(Induced\,Primary\,coil)+E(Primary\,coil)$
$E(Final\,Primary\,coil)=E(Primary\,coil)+(-P(Primary\,coil))$
$E(Final\,Primary\,coil)=E(Primary\,coil)-E(Primary\,coil)$
$E(Final\,Primary\,coil)=0$

Thus:
$V(Primary\,coil)=V(Primary\,coil)+V(Induced\,Primary\,coil)$
$V(Primary\,coil)=\sin(t)+(-\sin(t))$
$V(Primary\,coil)=\sin(t)-\sin(t)$
$V(Primary\,coil)=0$
$V(Induced\,Secondary\,coil)=-\cos(t)$

Generically speaking:
Given initially when V(Primary coil)=A(t) and V(Secondary coil)=B(t),
What we have at its steady state,

$$V(Primary\,coil) = A(t) - \frac{n}{1}B(t) + \frac{n}{2}A'(t) - \frac{n}{3}B''(t) + \frac{n}{4}A'''(t) - \frac{n}{5}B''''(t) .....$$

$$V(Seconady\,Coil) = B(t) - \frac{n}{1}A(t) + \frac{n}{2}B'(t) - \frac{n}{3}A''(t) + \frac{n}{4}B'''(t) - \frac{n}{5}A''''(t) .....$$

Notice that when we are substituting different pairing of A(t)= sin(t) and B(t)=sin t, B(t)=sin(t+90)=cos(t), B(t)=sin(t+180)=-sin t and B(t)=sin(t+270)=-cos t

We obtained:
For A(t)= sin(t) and B(t)=sin t;
V(Final Primary Coil)={2^n*sin t, }
V(Final Secondary Coil)={}

Original Energy content of each coil:
$$E(Primary\,Coil) = \int A(t)\,dt$$
$$E(Secondary\,Coil) = \int B(t)\,dt$$

Final Energy content of each coil(if undisrupted):
$$E(Primary\,Coil) = \int (A(t) - \frac{n}{1}B(t) + \frac{n}{2}A'(t) - \frac{n}{3}B''(t) + \frac{n}{4}A'''(t) .....)\,dt$$
$$E(Secondary\,Coil) = \int (B(t) - \frac{n}{1}A(t) + \frac{n}{2}B'(t) - \frac{n}{3}A''(t) + \frac{n}{4}B'''(t) .....)\,dt$$

Setup:
This experiment is divide into two group in terms of A.C power supply: transitory (T) and persistent (P), the former will have only transitory and periodic A.C power supply while later have A.C power supplied uninterrupted.
The control (No-Delay) is an A.C source connected to a 'normal' Tansformer with 1:1 Primary to Secondary ratio. Another Response coil is placed next to the Secondary coil for recording the outputting voltage variation.
The comparison circuit 1 is an A.C source connected to both Primary coil and Secondary coil of a 1:1 Transformer, however the later is delayed by 90 degree from former. Another Response coil is placed next to the Secondary coil for recording the outputting voltage variation.
The comparison circuit 2 is an A.C source connected to both Primary coil and Secondary coil of a 1:1 Transformer, however the later is delayed by 180 degree from former. Another Response coil is placed next to the Secondary coil for recording the outputting voltage variation.
The comparison circuit 3 is an A.C source connected to both Primary coil and

Secondary coil of a 1:1 Transformer, however the later is delayed by 270 degree from former. Another Response coil is placed next to the Secondary coil for recording the outputting voltage variation.

Expected Result:

If Hypothesis A is right, then we would expect the voltage variation would only happen when its energy is supplied by an A.C source, therefore we should only observe periodic voltage variation in group T when A.C power is on. The period is controlled by the supply frequency f. We should expect that the output of ND, 1, 2 and 3 to be identical since phase difference between two coils would not affect how the electrical energy being transferred from Secondary coil to the other Response coil. The Primary coil is prevented from transferring any electrical energy to the Response coil since its Magnetic field is blocked by the Secondary coil.

If Hypothesis B is right, then we would expect little difference between the output of group P and T since the later give spaces for the infinite recursive interaction to generate enough electrical energy to sustain the system. We should also expect that the output of ND,1,2 and 3 to be different from each other in either group.

Result:

Discussion:

Setup P and T is use to verify the experimental hypothesis that the infinite recursive interaction do happen therefore we could replace persistent voltage supply with transitory voltage supply without affecting the function of the system(implying 'extra' energy induce in the process). The purpose of having Response coil in different arrangement in 1, 2 and 3 is to demonstrate that the infinite recursive interaction does occur, and difference of the phase difference would affect the outputting amplitude. If the phase difference is of the right amount, we would see an increase of energy as a result; otherwise we would see a decrease of energy despite the fact that we are inputting the identical amount of energy. We can also see why Hypothesis A appear to be right in daily life.