Refuting Over-Unity Claim of the Multiple Moving Magnets Experiment

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A report of an experimental apparatus was recently presented by Jeffrey Cook, which consisted of an electrically driven inductor and five reversible DC motors, functioning as DC electrical generators, which were linked to ring magnets suspended above the inductor and positioned on axles at 90 orientation from a radial of the inductor. Transfer of power form an input signal to the output generators was examined at a combination of input signal frequencies and duty cycles. The report included a coefficient of performance calculation and reported that with certain input signal parameters, the experimental device produced significantly greater output power than was input, thereby claiming over unity performance. An analysis of the method of measurement of input power to the drive coil, which affects the calculation of the coefficient of performance, is found to have failed to include all sources of input energy, thereby refuting the claim of over unity performance.

1. Introduction

At the 19th Annual Conference of the Natural Philosophical Alliance, held in Albuquerque, New Mexico in July of 2012, a demonstration and presentation was delivered by Jeffrey Cook concerning an experiment he had recently conducted, titled "**Experiment on the Linear Increase in Efficiency with Multiple Moving Magnets over Pulsed Inductors**." A report of the experiment was included in the Proceedings of the 19th Annual Conference of the Natural Philosophy Alliance. [1]

An overview of the experiment, taken directly from the conference paper by Jeffery Cook states:

"*I have prepared an experimental apparatus consisting of an inductor and five reversible DC motors, used as DC electrical generators, hooked to ring magnets suspended above the inductor whose radii are ninety degrees from the radius of the inductor and hooked from belts to the motors. I then DC pulse the inductor causing the magnets to experience three motions, but confine all energy with the belt to the rotational motion alone, which turns the motors. I include many iterations of varied waveforms and different numbers of generators in order to measure the power IN to the inductor and OUT from the reversible DC motors, used as electrical generators (not hooked to the same electrical circuit with the inductor in any way). I have measured over many iterations and varied resistive loads (though only a 10 ohm load is described in this paper for sake of straight forward simplicity) that the COP (the coefficient of power OUT divided by power IN) is greater than unity of significant magnitude when the amplified signal frequency input to the inductor is above a certain threshold, while the power IN is reduced below another threshold.*" [1]

2. Input Waveform Structure

A cyclically varying voltage can be described in several ways. One way is a voltage-time depiction, called the waveform, which shows the voltage variation through one or more repetitive cycles. Another way is a voltage-frequency depiction, called the waveform spectrum, that shows the voltage or power at each frequency component of the waveform. For a cyclic signal, these components include the direct current, or DC, component at zero frequency and one or more alternating current, or AC, frequency components at the fundamental frequency, and possibly also at multiples of the fundamental frequency, called harmonics.

If the AC signal is generally symmetrical with respect to a horizontal time axis, the average signal voltage measured over one cycle will be zero, and the signal will be said to have zero DC component, or exhibit zero DC offset. If, however, the signal is not symmetric about the time axis, then the signal will be found to have a DC component, or exhibit DC offset.

The input waveform for the experiment is shown in the following picture, identified as Fig. 18 in the cited paper. This waveform appears to be a modified sine wave, and would be typically called a triangle wave. Such a waveform will definitely have many AC frequency components, but may or may not have a DC component.

The oscilloscope image of the signal in Fig. 18 does not indicate the zero voltage reference line, so the presence or absence of DC offset cannot be determined from this image.

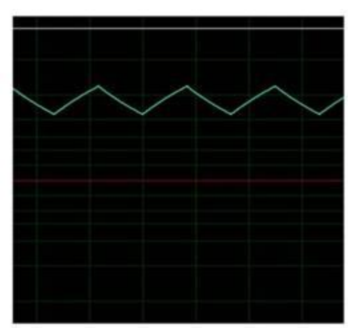

Fig. 18. Final Waveform

3. Role of AC and DC Waveform Components in Energy Transfer in the Experiment

In the cited experiment, the waveform of Fig. 18 is applied to a wound coil of insulated copper wire surrounding an iron core.

This results in an oscillating current flow in the coil, which produces an oscillating magnetic field of alternating North and South magnetic orientation in the vicinity of the coil. Ring magnets are positioned above the coil and restrained there, but each is permitted to rotate about an axis which is oriented at 90 degrees to the radial direction of the coil.

The alternating North and South orientation of the magnetic field above the coil causes the magnets to rotate as the North and South magnetically oriented parts of each magnet are alternately attracted and repelled by the coil. Small reversible DC motors, functioning as generators, are positioned above each of the magnets, and drive belts connect the ring magnets to the generators, causing the generators to spin as the magnets rotate.

By this arrangement, the AC components of the input signal will produce electrical output from the generators if the input signal power is strong enough to overcome all of the friction losses caused by the axle bearings of the magnets and the motors, plus the drag effect of any load applied to the generators. The frequency of rotation of the ring magnets will most likely be found to be related to the input waveform fundamental frequency by an integer multiple and the rotation frequency, that will be generally independent of the power input level of the input waveform.

The DC component of the input waveform will also produce a magnetic field about the coil, but that field will be static. If at any location above the coil, the DC magnetic field is stronger than the peak AC magnetic field, then the total magnetic field at that point will pulsate, but will not reverse. Since the magnetic field must periodically reverse to optimally start and maintain rotation of the magnets, the power level of the DC component must be maintained below that of the AC fundamental frequency component to enable the experiment to dynamically function.

DC offset in the input signal would be unproductive, and would be expected to be minimized, but minor DC offset would still be acceptable. Any DC component will basically dissipate as resistive thermal losses in the input coil and will not contribute to energy transfer to the magnetic ring connected generators.

4. Measurement of Input Power

The following images, from the cited paper, show the measurements of the input waveform to the coil, as "actual volts in measured" and "actual amps in measured".

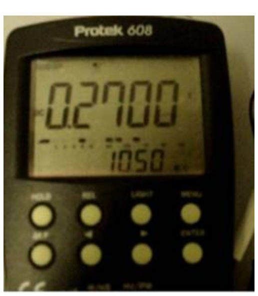

Fig. 36. Actual Volts IN Measured

Fig. 37. Actual Amps IN Measured

The input power measurement shows .27 V DC x .012 A DC = .003 W DC coil input power. The specifications of the measuring instrument, a Protek 608 multimeter, indicate it is capable of measuring AC, DC and True RMS (AC+DC). But in the recorded images of the measuring instrument as shown, only the "DC" flag is displayed on the meter (to the left of the top numeric display), which shows it is only measuring the DC component.

5. Calculation of the Coefficient of Performance

The paper calculates a coefficient of performance (COP) for the energy transfer between the input and the output for 2 loaded generators, at the most highly responsive input frequency, as shown in the following excerpt from the cited paper:

Voltage OUT	Amps OUT	Watts OUT	Volts IN	Amps IN	Watts IN	COP
1.180	0.11	0.13	0.27	0.01	0.003	43.333

Fig. 35. Actual COP for just 2 Generators, but with 5 Moving Magnets

The output power is reported to be .13 watts, and the input power is reported to be .003 watts, resulting in a claim of over unity performance in excess of 43:1.

But, note that the measured input power was only the DC component, which must be minimized to enable the ring magnets to rotate and allow the dynamics of the experiment to occur.

The critical magneto-dynamic performance component, AC input power to the coil, which is the primary energy transfer mechanism in the experiment, does not appear to have been measured, and was not included in the calculation of COP.

Correct calculation of the COP of the energy transfer in the experiment should have used total coil input power (AC+DC) as the denominator of the COP calculation. Failure to include the AC input signal power in the denominator of the COP calculation produced an error in the COP calculation.

6. Conclusion

The method of calculation of the coefficient of performance in the paper "**Experiment on the Linear Increase in Efficiency with Multiple Moving Magnets over Pulsed Inductors**" by Jeffrey N. Cook [1], failed to include all sources of input power in the coefficient of performance calculation, leading to an erroneous conclusion that the experiment had exhibited over unity performance.

References

[1] Jeffrey N. Cook, **Experiment on the Linear Increase in Efficiency with Multiple Moving Magnets over Pulsed Inductors**, Proceedings of the Natural Philosophy Alliance, 9: 82-96, July 2012.