Applications for the RLE (Reduced Lenz Effect)

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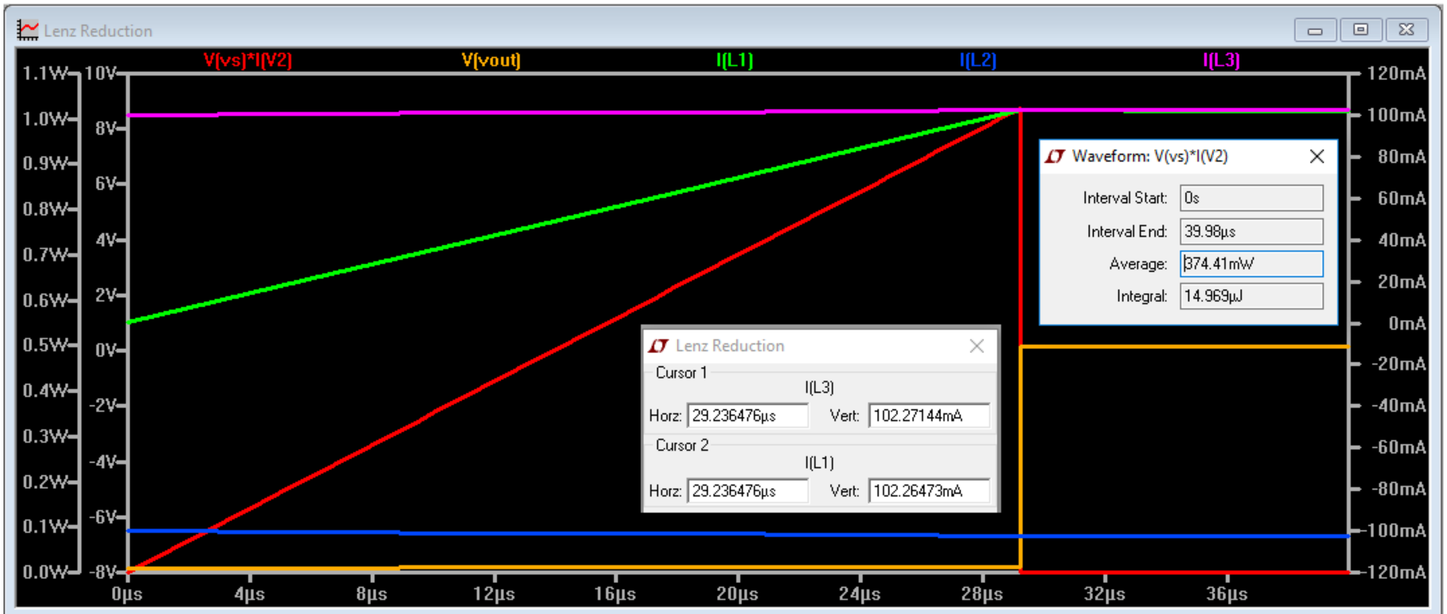
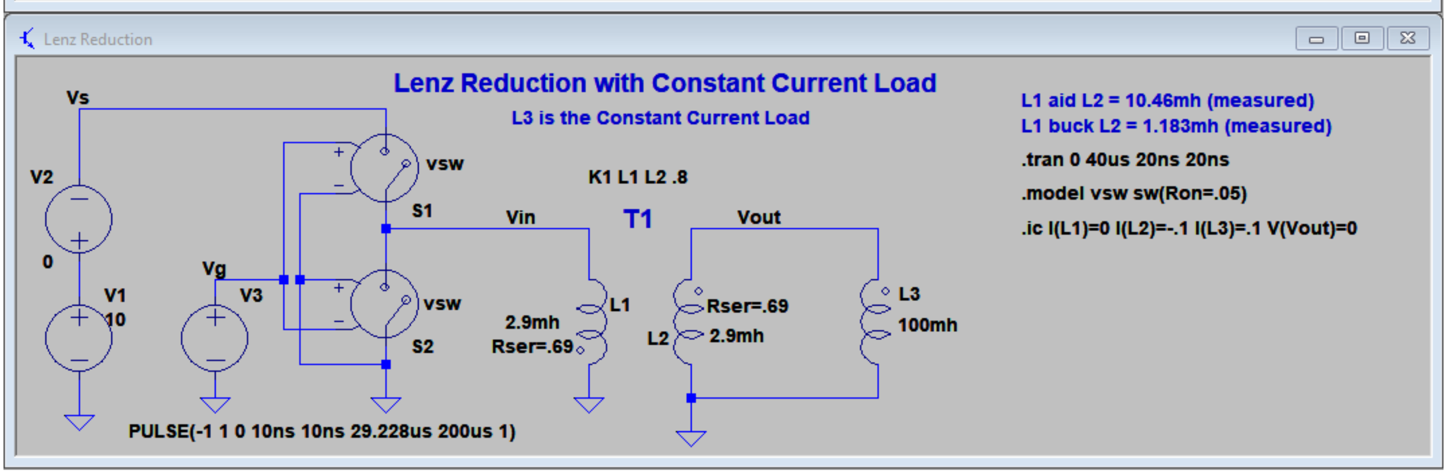
In accordance with my previous paper "Reducing the Lenz Effect in a Transformer", this paper will cover some of the finer details and will look into applying the concept to a rotary PM generator.

Referring to the simulation below that has the polarities on the secondary L2, and constant current inductor L3, such that the energy in L3 increases with the primary induction in L1.





In the schematic, conventional current flow is towards the dots on L1,L2, and L3. Therefore, prior to the start of the simulation, L3 is biased at 100ma and L2 at -100ma with zero current in L1.

At the start of the sim, the current in L1 begins to ramp in a positive direction and the voltage across L2 is forced to ~ -8vdc. The pulse generator Vg is on for 29.228us which allows the current in L1 to reach an equal but opposite value to L2. During this time period, the average voltage at V(Vout) is -7.8197v which is placed across L3 and will force a change in the current in L3 and L2. Using the equation $\Delta I = E \cdot \Delta t / L$, we can see that the change in current is 7.8179 * 29.228e-6/.1 = 2.285ma. Due to the polarity of this voltage, we see an increase in the original L3 current of 100ma to 102.271ma so the increase is close to the calculation.

If the polarity of L2 is reversed whereas the voltage across L3 would be a positive value of the same magnitude, we would see a drop in current in L3 of ~ 2.285ma.

There is enough info on the sim to calculate the Uin and Uout values and the result will be conservative. IOW, the COP<1 although the efficiency will be quite high.

If we again calculate the effective input inductance from the plot values, we see it equals 2.86mh. This again is only a 1.4% drop in the value of L1.

So, as the question has been asked, what good is it?

Our induction source in these sim examples has come from the Primary L1 which is energized from the supply Vs. We have nearly defeated the Lenz effect but we are still using a symmetrical transformer. Without a topology change to create an asymmetrical transformer, we will always experience a COP<1.

However, while we are trying to solve the symmetry problem, we could use a different induction source such as a moving PM field as this might change the result as initial tests seem to indicate.

The schematic in Fig. 1 below shows a proposed use of the RLE concept.

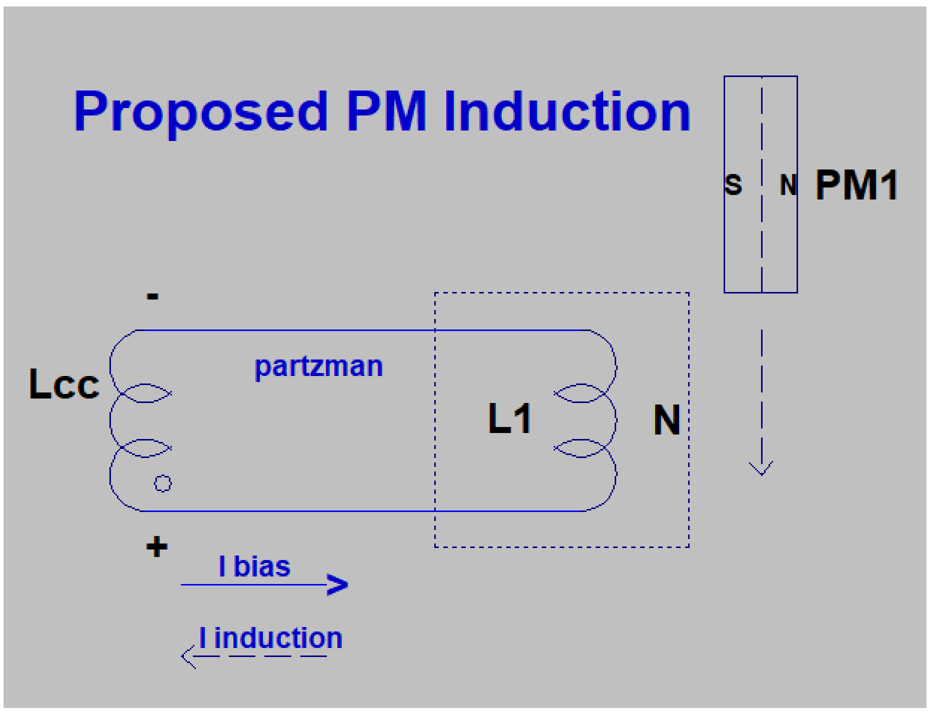


Figure 1

The scheme involves an air core inductor L1 and permanent magnet PM1 that would be positioned in a fashion that as PM1 passes the face of L1, a current is produced in L1. Initially, the inductor Lcc along with L1 are charged with a fixed current in the polarity shown. As PM1 approaches L1, an opposite current is forced into Lcc via the induction in L1. This action results in an increase in current as well as energy in Lcc. Although not shown, at the proper time, the current in Lcc is clamped and L1 is disconnected.

Due to the fact that the load on the induced current in L1 is a constant current source Lcc, there is little to no drag on PM1. In addition, the magnetic polarity of L1 under bias in relation to PM1 are such that an attractive force is present as PM1 approaches L1.

Fig. 2 below shows an actual scope shot of the above schematic from the bench.

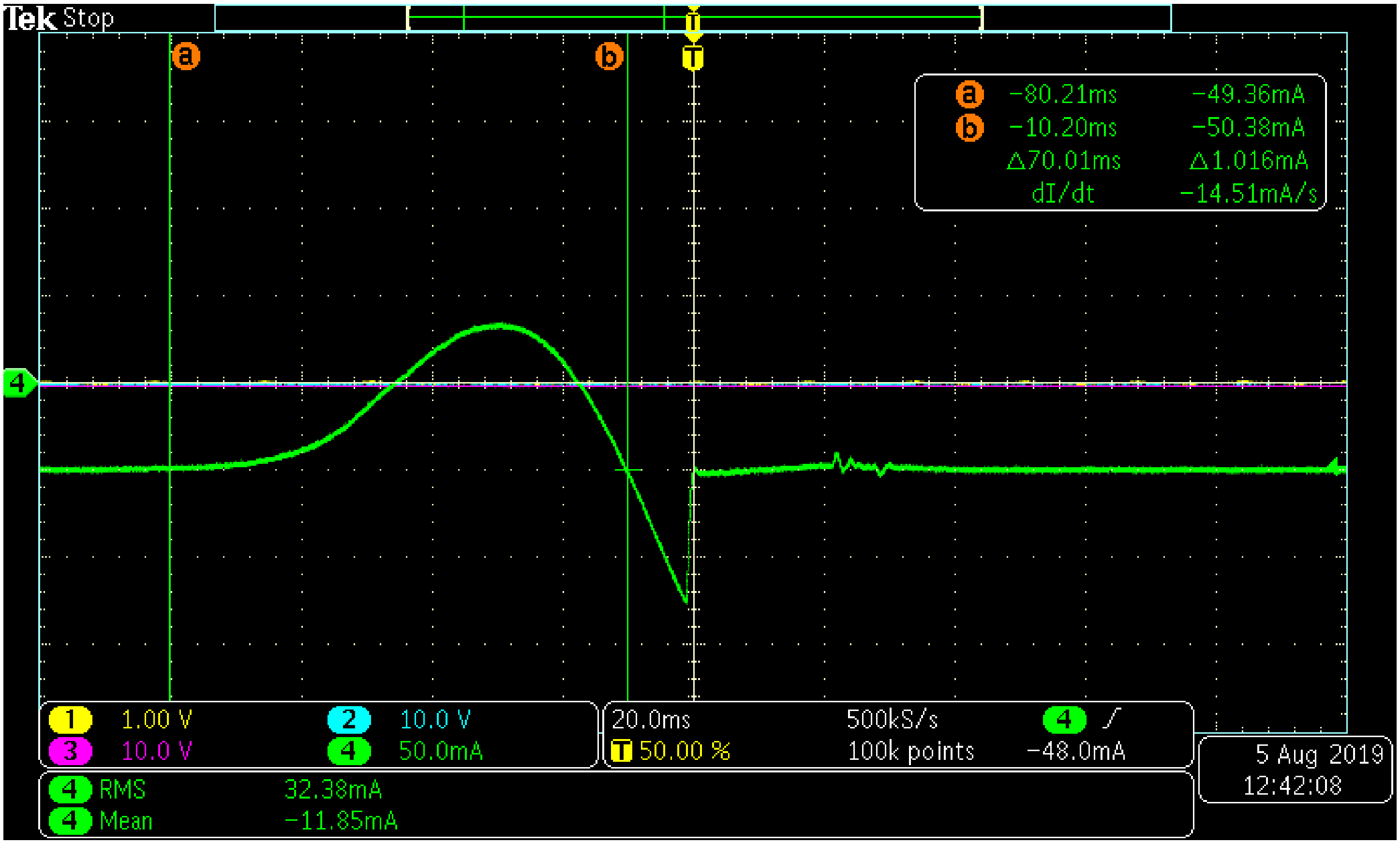


Figure 2

The bias current in this case was 50ma and the PM was passed by the coil by hand. Attraction was confirmed between L1 and PM1.

The next step is to build a suitable platform to test the overall concept.

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