Montana 500 Newsletter

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Montana Cross Country T Assn.
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Helena, MT 59602

www.montana500.org

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Cover: Photo taken in 2011 on day one. Photo by Jillian Robison

EDITOR'S PROPAGANDA

Tom Carnegie

As promised, one more newsletter. It has been rough getting it out. A special thanks to Janice Hutchinson for helping me get this out.

We have just finished a big ol' speedster run in Spokane. For some strange reason, the Tuesday night bunch decided to host an endurance run. The bulk of the planning fell onto Stormo and me. Why we took this on so close to the Montana 500 is a mystery to me, but we did. As such, I think that Stormo and I have neglected our Montana 500 cars a bit. Mine is pretty much ready. I have a new top and a half blown up motor that I am hoping will make it 500 miles. Last I heard, Stormo hadn't driven his car at all since last year. Most of the Spokane group is about as ready as they are going to get, I think. Jamie Allen decided to break his left arm. He says it is good enough to operate the spark lever. Skeeter, iffy. Ed Marshall is trying to make it. From California, Garrett should be ready. Sergio should be ready. Sonny may have two cars? That's what I heard. In Montana, Mike Cuffe should be ready. Doug's motor is done. Don't know if it is in the car, but I'd bet it is. Iowa? Brown-Powers should be there. Florida? Milt Roorda will not be there. Colorado? Don't know. Any others? Don't know.

Keep your eye on www.montana500.com for last minute updates.

President’s Message

This space reserved for President’s message.

Coil Comparison

Tom Carnegie

With the availability of both new and used coils I was curious to quantify the qualities of both. The Spokane folks have had excellent luck with the new wooden coils from Bittner. I was hoping that I could find some quantifiable reason for this. I had originally planned this as a how-to article, but I think I will down play the how-to part and concentrate on reporting what I found. I put a couple of dozen Model T coils through various tests. I had original Ford coils, new plastic coils, new Bittner coils, coils made in the 50's by KW, a Kingston coil from the T era marked "Special", and a Ford coil with a laminated core.

The core issue.

The core construction of T coils fall broadly into two types: What I call "Bundle of wires" and laminated construction.

On the left is the more common "bundle of wires" on the right is the laminated construction. The newer coils all seem to be of the laminated construction kind. That includes the KW coils made in the 1950's.

¿ Q pasa?

So, what is Q factor? The “Q” stands for quality. Simply put. Q is the ratio of energy put into the system divided by the energy stored. There are many applications of Q factor besides coils. For instance, a clock's pendulum has a Q factor. A pendulum is an oscillator. If you swing a pendulum it will swing at a certain rate for a period of time and eventually come to a stop, without some sort of further input. The friction of the bearings, plus the wind resistance will dampen the oscillations. Any friction or dampening will lower the Q factor of an oscillator. Sometimes this is desirable. An example would be shock absorbers on a car. In the case of a coil, Q factor means that the coil is good at being a coil. In addition to being a coil, all coils have resistance and to a certain degree, some capacitance. These non-inductive characteristics lower the coil's Q factor, just as friction in a pendulum's bearings.

Now that I have it, what do I do with it?

How does a high Q factor make a coil better? What will a coil with a high Q factor do that one with a low Q factor won't? Short answer: not much really. Of the coils that I tested, even the ones with the lowest Q factor seemed to run pretty well, at moderate speeds. So why worry? I will explore this more and we can talk about it in a future article. For now I am just going to give the results of my tests.

How do you do it?

Simply put, I make a resonant circuit then adjust the input frequency until it passes half the power. I divide the resonant frequency by that frequency span (the bandwidth). This gives the Q factor. A more detailed explanation follows the results.

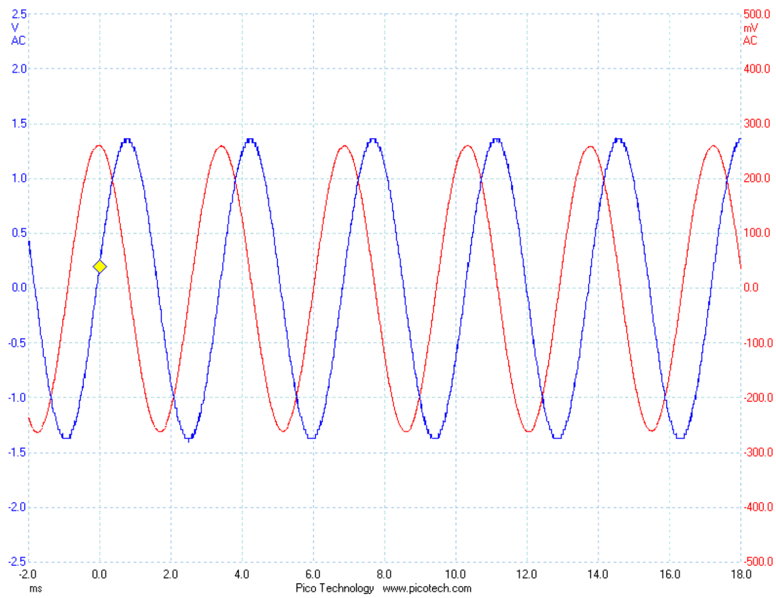
Name	Description	Reactance	Resistance	Resonance	Q factor	Inductance
Coil #W	Ford LC	6.02	0.298	278.00	5.91	3.27
Coil #28	Bittner LC	6.68	0.358	264.00	5.18	3.63
Coil #25	Bittner LC	6.66	0.363	262.00	5.14	3.69
Coil #27	Bittner LC	6.66	0.360	262.00	5.14	3.69
Coil #26	Bittner LC	6.74	0.363	263.00	5.06	3.66
Special	Kingston WC	6.10	0.346	271.00	5.02	3.44
Coil #14	KW LC	6.08	0.291	278.00	4.96	3.27
Coil #F	KW LC	6.12	0.279	274.00	4.89	3.37
Coil #22	Ford WC	5.78	0.306	281.00	4.32	3.20
Coil #C	Ford WC	6.10	0.311	270.00	4.22	3.47
Coil #7	Ford WC	6.20	0.319	271.00	4.11	3.44
Coil #B	Ford WC	5.98	0.321	276.00	4.06	3.32
Coil #6	Ford WC	5.74	0.314	287.00	3.93	3.07
Coil #4	Ford WC	5.42	0.314	289.00	3.80	3.03
Coil #A	Ford WC	6.00	0.311	275.00	3.77	3.35
Coil #E	Ford WC	5.34	0.295	289.00	3.75	3.03
Coil #D	Ford WC	5.12	0.294	299.00	3.74	2.83
Coil #X	Ford WC	6.30	0.300	283.00	3.68	3.16
Coil #35	Plastic LC	5.34	0.270	294.00	3.50	2.93
Coil #33	Plastic LC	5.20	0.269	308.00	3.38	2.67
Coil #36	Plastic LC	5.46	0.255	303.00	3.37	2.76
Coil #34	Plastic LC	5.32	0.275	302.00	3.36	2.77
Coil #12	Ford WC	6.00	0.337	296.00	3.22	2.89

The names are just arbitrary names that I gave these coils so that I could tell them apart. Coil "W" is a Ford script coil with a laminated core. The only one I've ever seen. "LC" stands for "laminated core", "WC" stands for "wire core". Reactance and resistance are in ohms. Induction is in millihenries, and resonance is in hertz. The Bittner coils are newly manufactured and say "Genuine KW" on them. The Kingston coils says "Kokomo Electric" on it, and also has "SPECIAL" stamped into it. And special it is. The KW LC coils are ones that I believe were made in the 1950's. I don't know when or who made the plastic coils. All of the rest are typical Ford coils of the style used up to 1927. No brass top coils were tested.

The following is a more detailed explanation of my test procedure.

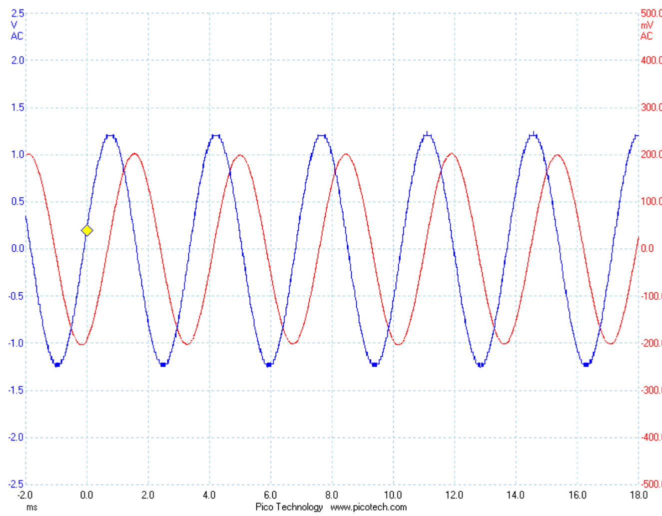
If you hook a coil in series with a capacitor, it will have a certain resonant frequency. In my case I used a 100 uf capacitor, which resulted in a resonant frequency of around 300 hz. I chose this frequency because a T magneto runs at near this frequency at high speed. The signal I used was a sine wave. The Model T magneto puts out a wave with harmonic distortion. This changes the form factor of the wave, which changes the effect of the iron losses in the core of the coil. Some day I may test with an actual magneto wave form and see what happens. The resonant frequencies are all different because I used the same capacitor on all of the coils. There are plusses and minuses to this. A plus is that the Q factor of the capacitor can be largely ignored, which I did. The Q factor listed is actually the Q factor of the entire circuit. A minus is that the Q factor of the coils should ideally be taken at the same frequency, as Q factor can vary with frequency. As a practical matter, I don't think it changes much in the narrow band of frequencies that I tested in.

If you run an AC signal through a capacitor alone, the current will lead the voltage, as shown in the trace below.



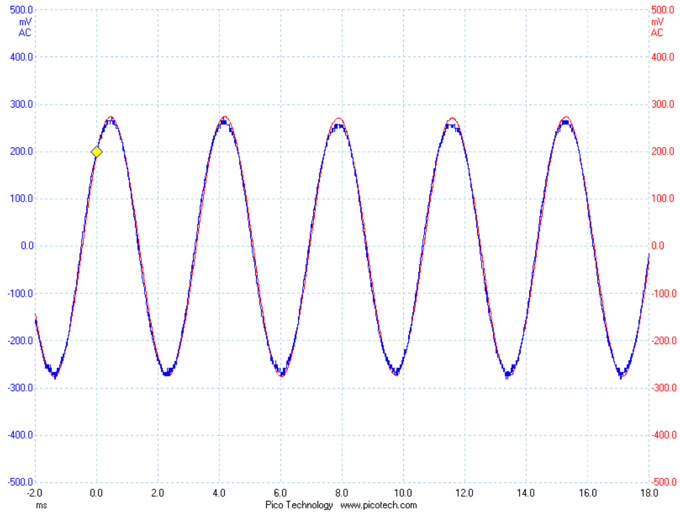
The red trace shows the current, blue the voltage.

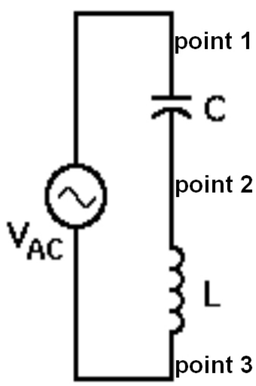
In an inductive circuit, the opposite is true. The current lags the voltage, as shown in the trace below.



Again, red is current, blue is voltage.

If you hook a capacitor and an inductor in series, above or below a certain frequency the circuit will act more like an inductor or a capacitor. At a certain frequency, it will act like a wire. That certain frequency is the resonant frequency of that circuit. Every LC (inductor and capacitor) circuit has one. When resonance is achieved, the oscilloscope trace looks like the following. The voltage and current are in synch.





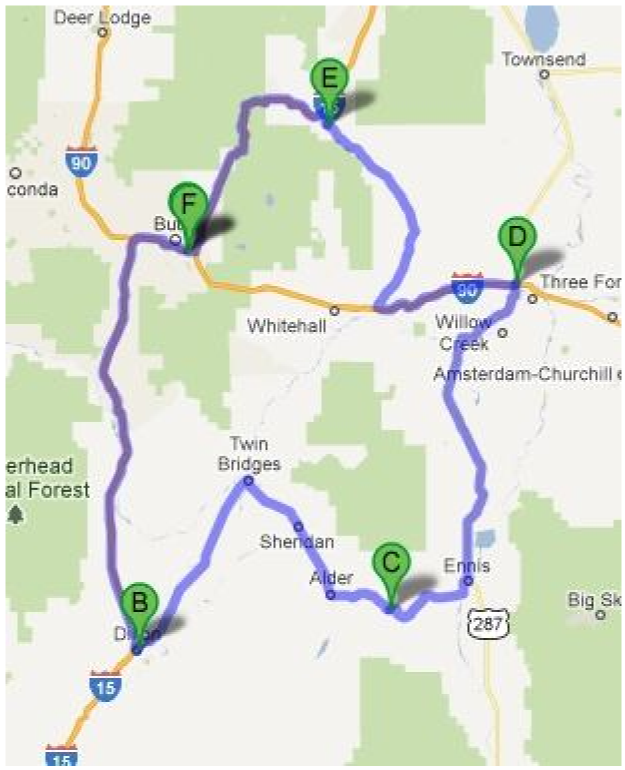
This is a schematic of an LC circuit. A curious thing happens when you insert an AC voltage at the resonant frequency. As I said before, the circuit acts more or less like a wire, so essentially you have a short circuit across your power supply and current will be at the maximum. Now, suppose you injected 1V rms into the circuit (point 1 and 3), then took a voltage measurement at point 1 and point 2, or at point 2 and point 3. You would likely find that there is more than 1V volt across the coil or across the capacitor. In fact, the voltage will be nearly the Q factor multiplied by the input voltage. To test a coil, I would hook it into a circuit like the one above, then adjust the signal generator until I would have maximum voltage across the coil with an input voltage of 1V rms. That frequency would be the resonant frequency. I would note the current in the circuit, then adjust the frequency above and below until the current would be .707 (down 3db) times the value as at resonance, with the same 1V input. This would give me the bandwidth. Resonant frequency divided by bandwidth equals the Q factor value.

DC resistance was measured with a “four wire” Kelvin meter set up. The reactance is at 300 hz.

Routes:

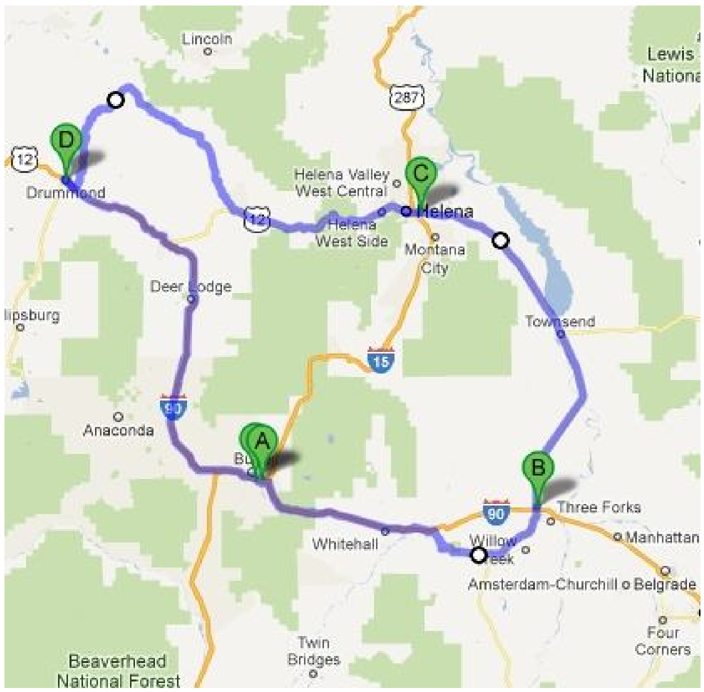
Donald Carnegie and Mike Stormo, along with some help from locals in Butte have been working on the routes for 2012. There are some difficulties when trying to do something from 300 miles away, but Google maps allows us to virtually drive the route. Hopefully it will all work out. Following are the tentative routes for 2012.

Day one:



Butte to Dillon for gas and coffee. 61 miles. Dillon to Virginia City for lunch, through Twin Bridges, under time. 55 miles. Tour to Ennis, then from Ennis to Wheat for coffee and doughnuts. 46 miles. From Wheat to Boulder for gas. 52 miles. Then, Boulder to Butte. 36 Miles. Total for day: 250 miles.

Day Two:



Butte to Wheat, via Cardwell for gas. 54 miles. Wheat to East Helena for lunch. 57 miles. Helena to Drummond via Helmville for gas. 77 miles. Drummond to Butte. 66 miles. Total for the day, 254 miles.

Day Three:

Tour to Anaconda. Run back to Butte on Big Hole/Mill Creek road.

70 miles. Total mileage for run, approximately 574.

Montana Cross Country T Assn.
7516 E. Mission Ave.
Spokane Valley, WA 99212