

Tesla Bifilar Coil, Resonance, and Lenz Drag — Excerpt

User comment / question:

This is a quote from Nikola Tesla about the inductive bifilar wound coil (where A2 connects to B1)...

"I have found that in every coil there exists a certain relation between its self-induction and capacity that permits a current of given frequency and potential to pass through it with no other opposition than that of ohmic resistance, or, in other words, as though it possessed no self-induction. This is due to the mutual relations existing between the special character of the current and the self-induction and capacity of the coil, the latter quantity being just capable of neutralizing the self-induction for that frequency."

I know of experimenters who have shown that using inductive bifilar wound coils in a generator configuration results in dramatic reduction of Lenz drag. Here is an exact quote on the energeticforum from Aaron Murakami in response to Tesla's quote above:

"That's from Tesla's bifilar patent that turns the inductors into capacitors. At certain frequencies, there's basically no back EMF and that winding method can be used to reduce drag with generators. Several of us have done it here."

Assistant response:

You're quoting Tesla correctly, and his point is real physics — but it's about reactance cancellation at resonance, not about eliminating Lenz's law. The energeticforum interpretation is mixing a true resonance effect with a much stronger claim ("basically no back-EMF / reduce drag while still getting power") that doesn't follow unless the extracted real power is also reduced.

1) What Tesla is actually saying in that patent:

Tesla explains that any coil has distributed capacitance, and if capacitance and inductance are in the right proportion, their reactances cancel at a particular frequency. A real coil is roughly $R + L$ in series with an effective C between turns. At the resonant frequency $\omega_0 = 1/\sqrt{LC}$, the reactive terms cancel so $Z(\omega_0) \approx R$. That's what "as though it possessed no self-induction" means: no net reactance, only ohmic resistance.

2) What the inductive (series-aiding, A2→B1) bifilar winding changes:

That winding forces larger voltage differences between adjacent turns, greatly increasing inter-turn (distributed) capacitance. So C is bigger and the resonant frequency is lower/more practical. The coil behaves like a built-in LC resonator.

3) Where Lenz drag comes from and what resonance can change:

Lenz drag is the mechanical reaction associated with real power transfer. Average drag tracks the in-phase current component that delivers watts to a load. Reactive current (90° out of phase) stores and returns energy each cycle, producing little average drag.

At resonance, a bifilar coil can support large circulating reactive currents while drawing little real power from the rotor; this can look like reduced drag. But when you load it to extract substantial real power, the in-phase current rises and average drag rises with it. Resonance changes phase and waveform, not conservation of energy.

4) Why experimenters see reduced drag in practice:

Common grounded reasons include: (a) power-factor effects causing mostly reactive current at resonance; (b) timing of current pulses relative to flux change reducing peak drag; (c) load mismatch or measurement comparisons at unequal real power. These effects are consistent with Tesla's resonance point and do not require a Lenz-law loophole.

Bottom line:

Tesla's bifilar coil is a smart way to increase distributed capacitance and shape resonance/phase behavior. It can reduce reactive opposition and sometimes lower perceived drag at a given operating point, but it doesn't eliminate Lenz drag when real power extraction is held equal.