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Subject: Re: Back EMF?

Posted by [Wayne Parham](#) on Mon, 02 May 2011 13:10:55 GMT

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I appreciate the nod and I hope nobody was offended.

Putting personalities aside, just looking at the facts, it really isn't accurate to say a 12" or 15" woofer is more or less likely to generate greater back-EMF than a woofer with smaller cone diameter. It isn't even the diameter that matters, it's the mass. And that's not the only thing that comes into play. There's the amount of mechanical damping verses electrical damping, and there's the strength of the motor, the magnetic strength and the voice coil impedance.

I've measured woofers that created such strong back-EMF they actually induced current sufficient to make sound in adjacent drivers connected through a passive crossover network. This is unusual, of course, but it is an extreme example of back-EMF. A driver like this has to be connected directly to an amplifier output, and the amplifier would need to have good damping factor, i.e. low output impedance. No tube amp would work well with a driver like this. Ironically, it wasn't even that large - it had a 6" diameter cone.

The kind of woofer I expect to have the most trouble with is the one with a fairly heavy cone and very loose suspension. It's designed to be used as a subwoofer. That kind of woofer often generates a lot of back-EMF. The truth is, that kind of tuning is popular in car subwoofers, and there are a lot of them with cones from 6" to 10". The problem isn't limited to drivers larger than 12", in fact, I'd say the ones most likely to be a problem are the little ones with real heavy cones. Nothing to damp them but the amp.

High-efficiency drivers tend to have lighter cones and stronger motors. That's not to say they are all immune to back-EMF - I've seen a few with fairly high impedance at resonance ( $Z_{max}$ ), which is an indirect indicator of back-EMF. And that's really the problem, in most cases, because you're not usually dealing with back-EMF at the extreme of the example I gave above. Usually, it's the impedance fluctuation interacting with the tube amplifier's output impedance that is the problem. This creates a voltage divider that varies with frequency, which is another way of saying it creates a filter. The amplitude response is adversely affected as a result.

More information:

Back-EMF

$Z_{max}$

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