
Subject: Re: Woofer cooling device - Destructive test
Posted by [Wayne Parham](#) on Fri, 26 Aug 2005 03:11:55 GMT
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At 15 minutes, the magnet is pretty much heat soaked. Without a cooling device, it's about 165° - 170° Fahrenheit at the front pole piece. It actually rises to this level fairly quickly, over the course of a few minutes. But then the temperature rise is very slow, which is why I assumed it was done rising after 15 or 20 minutes. Initial test results What I realized yesterday, is that temperature wasn't done rising after 15 minutes, it just slowed down. When the test was run for a longer period, the temperature continued to rise until the voice coil separated from the former and it began to buzz. I didn't expect this to happen. I didn't think the woofer would fail at this signal level. What I expected was that temperature would hold constant. I was planning to confirm this with temperature measurements taken at two hours for both the stock woofer and the one with the heat exchanger installed. But the stock woofer didn't make it that long. I think there is a power level below which the woofer can be run indefinitely without a thermal failure. I expect there is a point which you run into a power verses time curve, and over that power level, the more power you apply, the less time it takes to reach a point of thermal failure. In other words, maybe the woofer will take 35 volts forever without a thermal failure, but by 38 volts, maybe it will fail after 10 hours of continuous use. Then maybe 39 volts damages it in 5 hours and 40 volts kills it in two. That's the kind of power rating curve I think you can expect. The thing is, I expected that the 40 volt level was safe to run indefinitely. I didn't think this woofer would fail until it reached 42 or 45 volts. I thought maybe if I sent a continuous signal, it might be too much, and the voice coil might eventually fail. Then again, when the signal is removed, pumping action stops and there is no cooling airflow, so the temperature surges momentarily before it starts to drop. So perhaps a continuous signal would actually cause less thermal stress than one cycled 15 seconds on and 15 seconds off. It might be helpful to make more measurements, and I plan to do so as time permits. It would probably be good to plot temperatures by the minute, maybe reducing measurement intervals to every five minutes after a while. This could be done in ambient cool air, and perhaps in a small sealed box for comparison. Each of these will be done with and without the heat exchanger, in order to study the limits more closely. One thing is certain. The speaker with the heat exchanger stayed considerably cooler than the one without. There was a 57° difference at the pole piece, and this probably wasn't the most severe test that could have been performed. Putting the speaker inside a small box instead of a nice cool 72° room would probably have made the difference even greater. Then again, since the speaker failed, I'd say 190° or 195° pole piece temperature probably marks its red line. Without the heat exchanger, we crossed this line in less than an hour and a half. With the heat exchanger installed, it ran two hours at a relatively cool 138° inside at its hottest point. The back of the magnet was barely warm, at under 115°. So the heat exchanger did a great job of holding motor temperatures down and preventing voice coil failure.
