Subject: Re: Heat sink, Heat exchange for driver/cabinet
Posted by Wayne Parham on Sun, 05 Nov 2023 21:19:02 GMT
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Not a stupid question at all.

I think any driver would benefit from a cooling plug, some more than others. The cooling plug philosophy isn't intended to replace convection (vented) cooling but rather to augment it. It is really just a heat sink that conducts heat away from the pole piece and the magnet and is usually attached to some kind of plate that radiates and/or convects heat out of the system.

It's really useful in a horn-loaded application because diaphragm motion is limited. Since diaphragm motion is limited, convection cooling is limited too. Convection cooling is made possible by the pumping action from the cone cap pushing air across the voice coil and through the vent. But if the cone is horn-loaded, excursion is reduced and so convection cooling is reduced too. That's where cooling plugs help the most - They help reduce the heat in an application where venting is less effective.

This is also true at higher frequencies. Convection cooling works best in the bass frequencies because of cone excursion. So not only does horn-loading reduce excursion, but it's also reduced at higher frequencies. So ironically, you'll see thermal failures occur when a vented driver receives high-power, high-frequency signals without much on the low end. That's one reason why you really want to low-pass high-power subwoofers. It's also why clipping tends to increase the likelihood of thermal failures in speakers - it has a disproportionally large amount of high-frequency energy.