

Wednesday, May 27, 2015

## Understanding convection cooled power supplies

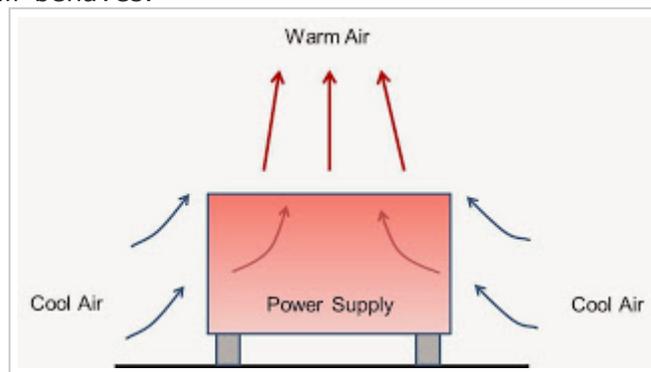
There are a number of commonly used terms to describe cooling methods in the power supply industry:

- Fan cooled - Unit has an internal fan
- Convection cooled - Unit requires no fan cooling
- Forced air cooled - Unit requires external airflow
- Conduction cooled - Unit relies on a cold plate to remove the waste heat

The most misunderstood and hence most misapplied is probably convection cooled. Many Engineers assume that a convection cooled power supply is one that does not need any airflow to operate.

One definition of convection is "The transfer of heat by the circulation or movement of the heated parts of a liquid or gas". In our case – the circulation or movement of hot air.

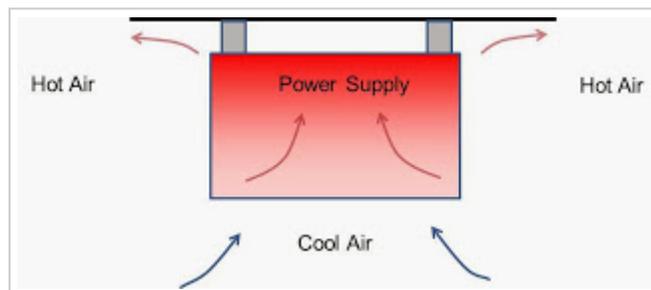
Open frame power supplies, for example, are typically mounted on a flat surface upon standoffs, and below, we can see how the air behaves.



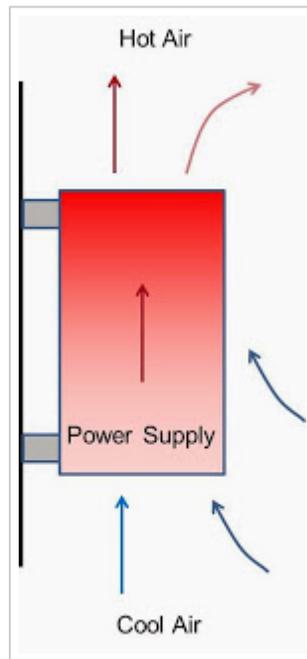
As the hot air rises, cooler air is drawn in from the sides. Although the airspeed is quite low, just 0.3m/s, it is sufficient to reduce internal temperatures. During the safety certification process for the power supply, this is taken into account during thermal testing.

It is very important to ensure that there is adequate space for the air to be drawn in from the sides and allowed to exit above the power supply. A distance of 50mm is considered adequate.

Orientation of the product is also very important. Most manufacturers will state a recommended mounting orientation and any de-rating associated if that is not followed. Mounting the product upside down for example can severely reduce field life unless heavy de-rating is applied, and is often forbidden.



The ramifications of mounting the power supply vertically should also be studied. Ideally the input (bulk) and output electrolytic capacitors should be located at the bottom, where the temperature will be the coolest.



If in doubt, consult the manufacturer's installation manual. For high density products, recommended maximum component temperatures will be advised for critical parts.

Power Guy