



Wall Industries, Inc.



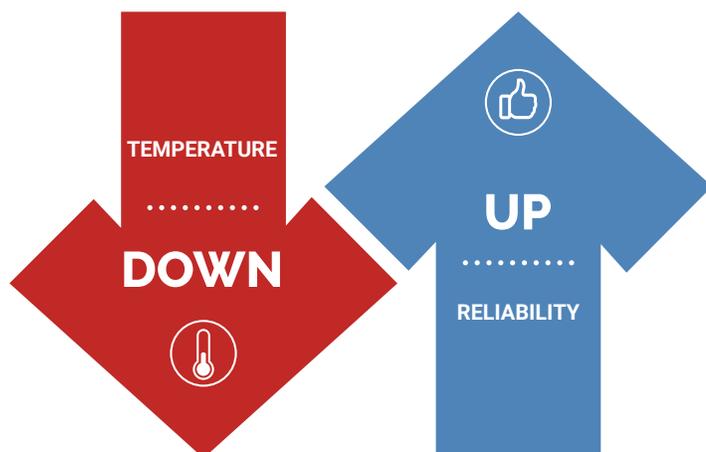
Your Comprehensive Guide to Power Supplies in High Temperature Environments

Introduction

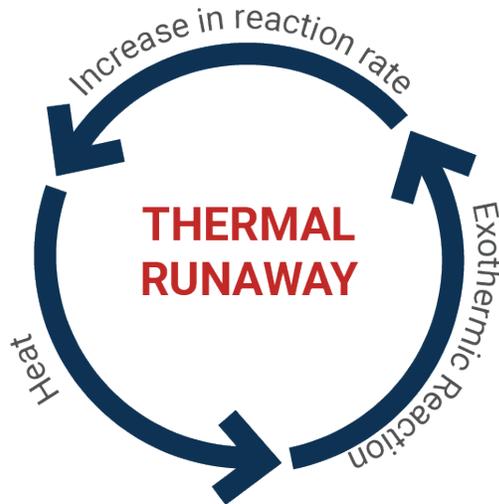
A high temperature environment can pose one of the largest threats to the reliability of your power supply. Not only can it stop your supply from working and shorten its life-span, but having to compensate for high temperature can add to the weight and size of your supply, which can affect your whole design. If you are planning to put your electronics to work in a high temperature environments (or if you didn't design for it to begin with), this guide can help make sure you're prepared for anything.

1. What effect will high temperature have on my supply?

High temperature has several negative effects on the performance of your power supply. It is pretty clear that a high temperature environment can cause your supply to overheat. Since your power supply has a specific efficiency, energy will inevitably be wasted as heat (in watts), which will lead to an increase of ambient temperature within a system. This will decrease the reliability of the supplies' components.



High temperature environments can also cause insulators to fail and mechanical connections to loosen. This happens as a result of high temperatures causing changes to material properties within a supply, like expansion, which can ultimately shorten the lifespan of the supply. As mechanical connections expand and loosen, the connectors can experience a thermal runaway due to increased impedance at the point of connection.



2. What applications pose the biggest threat?

There are many applications and environments that pose threats to your power supply in terms of high temperature. The most apparent threat are those environments that offer restricted cooling options. Environments that have no moving air or offer little capability for heat sinking or high thermal impedance heat sink tend to have the highest temperatures. This means that a supply in any mobile environment, such as an automotive, railway, or robotics application, will face harsh conditions. External environments, such as the desert or warmer climates throughout the globe, will automatically have a higher temperature for the overall application, not to mention the increase in temperature when the supply starts to function.

MOBILE ENVIRONMENTS



will face *harsher* temperature conditions

Even if there are some forms of external cooling available to your power supply, high temperature can pose a threat to your supply. For example, if liquid cooling is being utilized, the whole supply is not protected from the dangers of high temperatures. Liquid cooling will only cool the components of a supply that are mounted to the cold plate, which means most of the components are left exposed to the high temperature environment. Mechanical packaging of the supply has to be closely addressed in these cases.

3. What is the best way to deal with a high temperature environment?

While Designing Your Project

If you know your end product will be in a high heat environment, there are a few questions you can ask during the design stages:

Is there any cooling method already available, such as moving air or liquid?

-If **yes** and moving air: How is the cooling method ducted over the supply? How many LFM are there, and at what temperature?

-If **yes** and liquid cooling: What is the temperature and flow rate of the liquid? What is the thermal impedance of any heatsink surface? How do you package the supply to make the best use of a cold plate?

Reminder: Special packaging or unique components may need to be used to make use of the cooling already available. This can impact the cost of your design.

-If **no**: move to the next question.

What can be done to combat high temperature if no cooling method is available?

-Am I able to add a heatsink if necessary? Heat sink will add to the size, weight, and cost of your supply.

-If **yes**: How will the heat of the supply change the temperature of the heatsink?

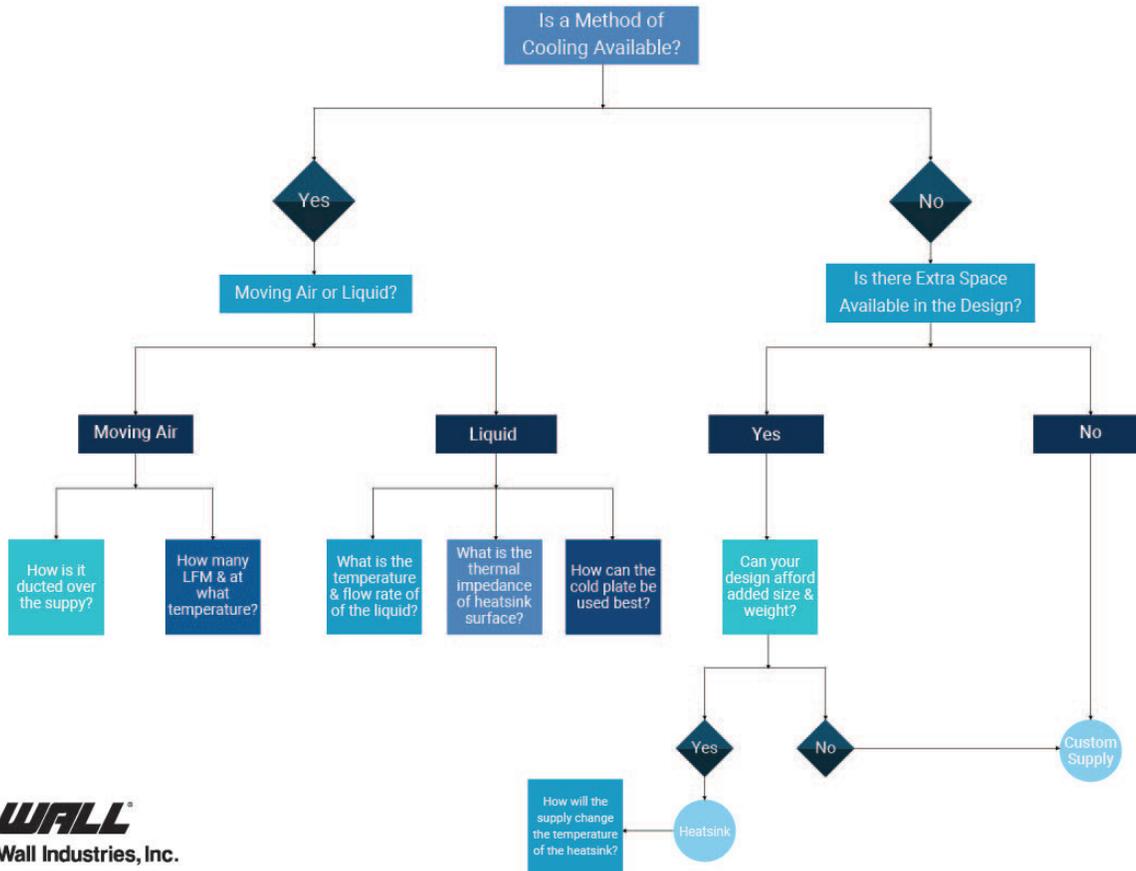
-If **no**: move to the next question.

Do we have the means to design something custom?

-A custom supply may be necessary if the other methods are not able to work. Higher efficiencies and custom packaging may benefit your design.

Pay close attention to the temperature ranges, guidelines for cooling, max temperature operation, and any de-rating information listed within data sheets. Also look at the efficiency curve of a power supply noting at which power level it is most efficient. It is best to choose a supply that will fall within "highest efficiency" point when used in your system. If your environment will prove to result in a temperature that is too high for a supply, consider a custom supply. Designers can often accommodate temperature needs more easily.

What to Consider when Designing for High Temperature



After Installation

If you see effects of high temperature on your supply after it has been installed, it can be a tricky situation. You can certainly replace the device with one that is suited for higher temperatures, but this can be time consuming and expensive. Attaching a heatsink is an option, but it may not be possible due to size and weight restrictions. It may also be appropriate to look into a custom-made supply. Make sure you take size, airflow, and thermal impedance into consideration with whatever solution you go with.

Conclusion

High temperature environments will always be something to keep an eye on when designing a power project. As long as you note it early in the design process, it can be easily addressed and remedied. If you are experiencing difficulties with a high temperature environment, give our team a call. We are ready to power your next project.

How can we help you?

To speak with our power supply and conversion specialists, contact us any time at 888-597-9255 or sales@wallindustries.com. We can't wait to power your success.