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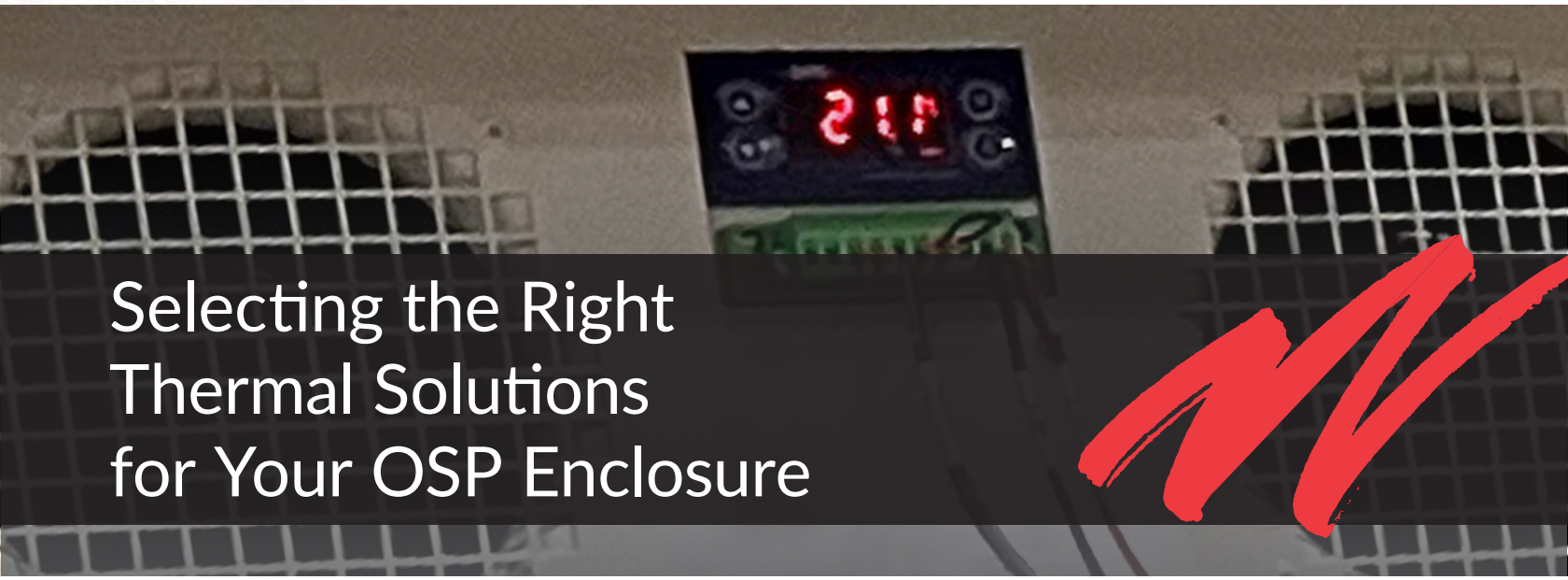

Selecting the Right Thermal Solutions for Your OSP Enclosure

September 2023

Introduction

As you sort through all the outdoor enclosures on the market today and crunch the numbers on such business considerations as prices, warranties, availability, etc., be sure to spend some time identifying the best enclosure thermal system for your network devices. Manufacturers typically offer a range of enclosure cooling options topped by actively cooled enclosures with heat exchangers or air conditioners.

In this document, we will describe each enclosure thermal system option in general in order from lowest to highest cost, and discuss the factors which determine the best system for your network's needs.

Why Do Enclosures Need a Cooling System?

Typical devices in your enclosure may include sensitive electronics with ratings for power consumption, power dissipation, and operating temperature. By choosing the right cooling option, you will ensure that the electronics in your enclosure will be able to operate in the temperature rating specified by the equipment OEM. This is vital to maintain a reliable and robust solution for your network deployment.

Cost Considerations

The next thing to consider is the relative cost of each system, so you can make sure you plan accordingly to meet the expense. This must factor into ongoing operation and maintenance of the system as well as the purchase price.

	NMT No Thermal System	NAF Direct Air Cooling	HE Heat Exchanger	AC Air Conditioner
Initial Expense	Low	Medium	Medium	High
Maintenance Cost	None	Medium	Low	High
Closed Loop Cooling	No	No	Yes	Yes
Humidity Removal	No	No	No	Yes
Cooling Below Ambient Temperature	No	No	No	Yes
Heater Available	No	No	No	Yes

Table 1: Summary for each thermal option.

No Thermal System

The lowest cost deployment starts with an enclosure with no active thermal assistance. Such an enclosure lacks fans, filters or other active cooling components. This system (pictured below), which Westell refers to as "NMT," allows the cabinet to be sealed (no outside air exchange). These enclosures require no power for fans or active cooling devices, and have no moving parts or filters. Maintenance needs are minimal to nonexistent. If such a cabinet will accommodate your network equipment, you will enjoy the lowest cost and still have a very reliable option. Best practices suggest performing a thermal analysis or test to confirm that your equipment can operate within the temperature rating in this environment and potential solar load.

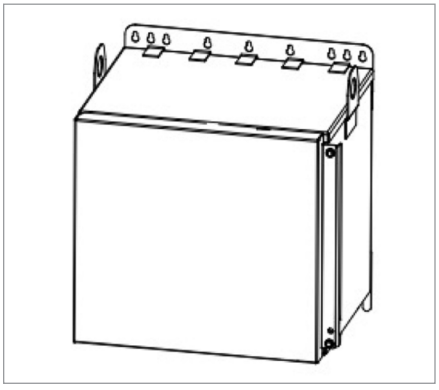

Figure 1: OSP enclosure without a thermal system.

Direct Air Cooling:

This option actively circulates filtered air through the cabinet to remove heat from your heat generating components. Westell refers to this as "NAF," and an example appears in Figure 2. This system has air intake and exhaust fans and an air filter. The 48VDC fans have a proven record of a long life in harsh conditions. The other key component to this system is the air filter that keeps the enclosure interior free of airborne dust, dirt, and etc. NAF systems very effectively use cooler ambient air to inhibit rising temperatures within the enclosure. This is like keeping your windows open at night to let a cool breeze into your home. A potential challenge with this solution is maintenance. You should pro-actively schedule maintenance to clear vents and clean or replace the air filters to make sure you are getting sufficient air flow through the system. A potential drawback is the ingress of particles or vapors that can get through the filter (for example, water vapor, smaller particulates, salt mist, fog, etc.). Corrosive vapors could shorten the useful life of your enclosure's electronics.

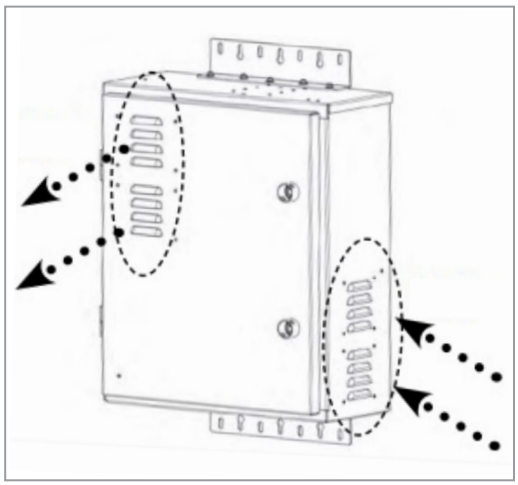

Figure 2: OSP enclosure with direct air cooling.

Heat Exchanger Cooling:

These systems, typically used for active or sensitive electronics, use a closed loop heat exchanger with two separate air flows, illustrated in Figure 3. Westell refers to this as a "HE" enclosure. The internal loop air flow blows out the bottom of the heat exchanger, flows upward picking up heat from the heat generating components, and then enters the top of the heat exchanger. In the middle, sits a heat exchanger core, where air flows through the core, and ultimately removes heat to the external loop. The external loop air then flows across the heat exchanger core, and picks up the heat from the internal loop, exhausting it to the outside. Each air flow (internal and external) utilize 48VDC fans to move the air across the heat exchanger core.

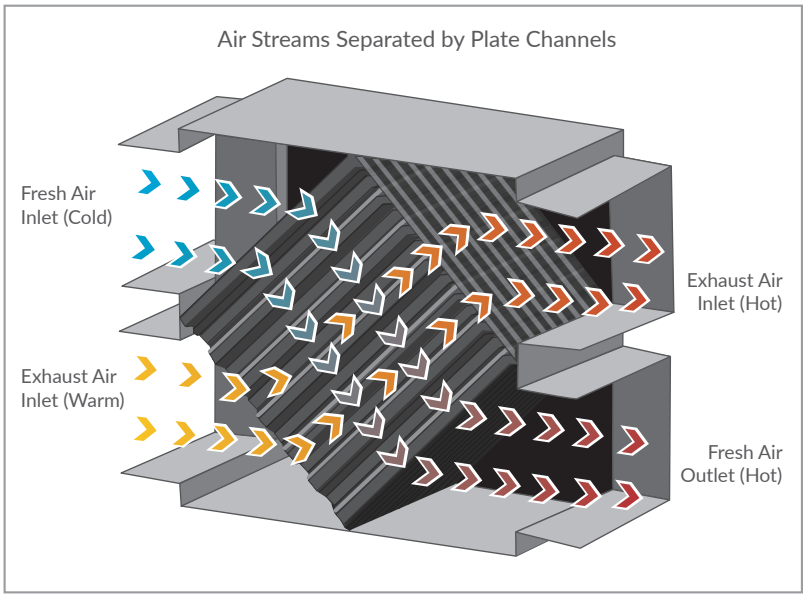

Figure 3: Illustration of heat exchanger cooling.

This system is very reliable and does not require any type of filter. Outside air contaminants cannot enter the enclosure. This solution is ideal if your equipment has a temperature rating of 65°C or higher. This "HE" enclosure then allows the appropriate amount of temperature rise to be maintained and provide consistent and reliable temperatures even in the hottest points in North America (where temperatures can reach 46°C).

Air Conditioner Cooling:

This is the most expensive thermal solution, illustrated in Figure 4, and it utilizes an air conditioner to maintain temperature in your enclosure. Westell refers to this as an "AC" enclosure. The typical air conditioner that you might see resembles systems in your house. During the summer months, when the temperature reaches 100°F, most people turn on their air conditioner and like to keep the temperature in their house a more comfortable 70-75°F. As you can see in the Figure 4, the air conditioner can cool the air inside your home lower than the outside temperature. It does this through the use of a compressor, evaporator, and condenser system to actively remove heat and humidity. This system utilizes fans, compressors, and refrigerant to operate effectively. The cost effectiveness of this most expensive solution depends on the electronics inside your enclosure. If your equipment has a temperature rating of 40-55°C, we would strongly recommend that you pursue this cooling option. In North America, we typically use 46°C as the high end temperature limit, so if your equipment has a temperature rating of 40°C, you will need to deploy this solution to make sure your network is reliable and robust.

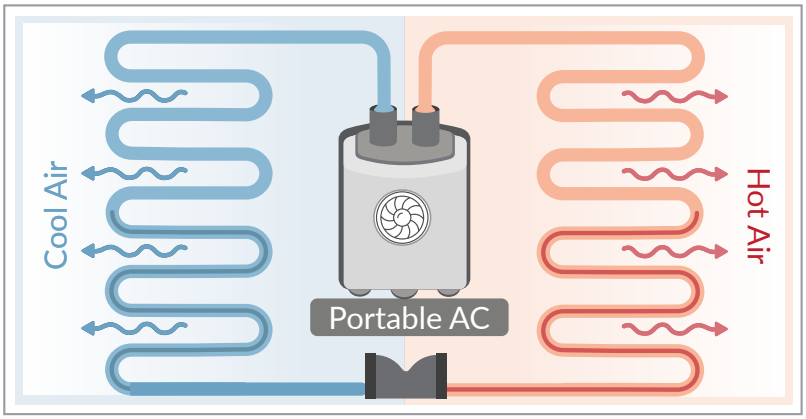

Figure 4: Illustration of portable air conditioning.

Conclusion

Each of the 4 thermal systems outlined have pros and cons and, depending on your circumstances, they can provide a reliable solution at an affordable price. Selecting which one is right for you starts with defining your operating environment and what you plan to install inside your enclosures. The outside ambient temperature, the power dissipation details, and the temperature ratings of your equipment will allow you to quickly identify viable cooling options for your network. Table 1 points out the advantages of each potential system. These are key details that will help you determine which is the correct enclosure and cooling system to choose. If you are ever in doubt, please feel free to reach out to Westell; we are more than happy to help you select the correct Boxer® enclosure and associated cooling system to meet your needs.

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