GREAT LAKES CASE & CABINET
Invest in Solid Engineering

COOLING ENCLOSURES 101

COOLING GENERAL TERMINOLOGY

1 ton of cooling = 12,000 Btu's/Hr.

1 kilowatt of power = 3,412 Btu's/Hr.

1 ton of cooling equates to approximately 3.5 kilowatts of power consumed.

The quickest way to estimate the amount of cooling air flow needed through an enclosure is as follows: ***multiply 125 CFM x the amount of Kilowatts per enclosure***. This is a general total air flow requirement through the enclosure regardless of delivery or extraction method; Hot or Cold Aisle Containment, Air Manager, Chimney Duct, or even simple front & rear vented doors. (Based a 25 degree temperature rise)

5kW Rack needs to be design for 625 CFM

10kW Rack needs to be design for 1250 CFM

20kW Rack needs to be design for 2500 CFM

We need to know 3 things to calculate air flow required in an enclosure.

1. ***Watts***: How much heat is being generated by the equipment
2. ***ΔT*** "Delta T": how much heat can I allow to build up in the enclosure ($\Delta T = T_{Inside} - T_{Outside}$) °F
3. ***CFM*** "Cubic Feet per Minute": How much air is needed to move the heat away

We only need to know 2 of these things, and then we can calculate the 3rd. This allows for 3 scenarios.

Scenario 1: I know the Watts in the enclosure and I know the ΔT I can live with. Imagine a franchise company that has developed a standard enclosure to ship to all of their facilities? Every enclosure will have the same equipment in it using 3000 Watts. From the equipment specs, we know we can have a ΔT of 20°F (65°F in the cold aisle and 85 °F inside the cabinet). How much air is needed?

$$CFM = \frac{Watts}{(.316 \times \Delta T)} \qquad CFM = \frac{3000}{(.316 \times 20)} \qquad \boldsymbol{CFM = 475\ CFM}$$

Scenario 2: I know the CFM available to me from the Air Conditioner and I know the ΔT I can live with. If I know what my air system can deliver 1600 CFM, and I know I can have a ΔT of 15°F, how much equipment can I load up into the enclosure? We need to find the Watts.

$$Watts = .316 \times CFM \times \Delta T \qquad Watts = .316 \times 1600 \times 15 \qquad \boldsymbol{Watts = 7584\ W}$$

Scenario 3: I know the CFM available to me from the CRAC unit and I know the Watts from my equipment. If I know what my air system can deliver 800 CFM, and I know I have a 6500 Watts, how much ΔT can I expect? We need to find the ΔT.

$$\Delta T = \frac{Watts}{(.316 \times CFM)} \qquad \Delta T = \frac{6500}{(.316 \times 800)} \qquad \boldsymbol{\Delta T = 25°F}$$

Use the chart on the back to quickly get the missing value that you need. If you know a ΔT and CFM, then see where they intersect on the chart to find Watts. If you know Watts and CFM, see where they intersect to find a close ΔT.