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Bertech Bulletin 0708:

Cooling Computer Server Racks with Industrial Control Cabinet Air Conditioners

Control cabinet air conditioners have long been used to provide cooling for electronic equipment such as PLCs and variable speed drives in hostile factory environments, allowing necessary cooling of the equipment and isolation from the surrounding environment, to promote greater reliability, and fewer environment-related breakdowns.

Rack enclosure manufacturers are turning to control cabinet air conditioners to offer alternative cooling solutions for high power & heat density server equipment, for reasons including the ability to isolate the enclosed equipment from the surrounding environment, and avoidance of the high capital cost of cooling an entire room.

This bulletin provides a brief checklist of the issues which will determine successful deployment of control cabinet air conditioners in server rack applications.

1. Selection Parameters

Selection of an air conditioner of appropriate configuration and cooling capacity for any enclosure cooling application relies on the availability of a range of data, including:

- The amount of heat dissipated by the server and ancillary equipment, in Watts or BTU/hr.
- The expected minimum and maximum ambient (surrounding) temperatures in the vicinity of the server rack.
- The design enclosure temperature (refer below).
- The dimensions of the rack enclosure, necessary to allow estimation of the heat transfer through the surfaces of the enclosure due to temperature difference, if any.
- Description of the environment in which the enclosure is to be installed, noting any hazards such as dust, moisture, or corrosive elements. Is the enclosure inside or outside, exposed to sun or rain?

2. Correct Operating Temperature

Note that industrial control cabinet air conditioners are designed to operate more efficiently at higher enclosure temperatures, typically 35ºC or more. Enclosure temperatures less than 25ºC are not recommended, due to low operating efficiency, and the potential for condensation of moisture on components.

3. Enclosure Sealing

Ensure that the enclosure is sealed with dust-tight gaskets, and sealing glands around all entering cables. The air conditioner may operate at lower efficiency due to entry of higher temperature ambient air and condensation of additional moisture in ambient air entering the enclosure. Enclosures containing UPS batteries may require a small amount of venting to purge hydrogen gas, which will need to be taken into account when selecting an air conditioner.

4. Air Distribution

Ensure that the cooled supply air from the air conditioner is distributed to all “hot spots” within the rack enclosure. Obstructions (such as rack panels, cable bundles, etc.) placed in front of the air conditioner may prevent the air from reaching the critical equipment, thereby not

providing cooling where it is required. Obstructions can also lead to short-circuiting of cooled air to the return air intake, leading to rapid cooling cycling and premature compressor failure, in addition to inadequate cooling of the enclosure.
Side-mount air conditioners, with their bottom supply / top return configuration, are generally preferable to top-mount units from an air distribution perspective.

5. Location

Industrial control cabinet air conditioners present an ideal solution to many otherwise difficult situations where the surrounding environment is hostile to application of server racks, such as high temperature, hostile contaminants within the ambient air (dust, moisture, corrosive elements), or outdoor applications. Special industrial cabinet air conditioners are available for corrosive environments, for washdown environments, and for outdoor applications.
These units may not be suitable for some situations, including:

- Where the surrounding environment cannot accept the heat rejected from the air conditioner. All air-cooled air conditioning equipment rejects heat to its surrounding environment, at a level greater than the amount of cooling provided. If an air conditioned rack enclosure is installed within a small room or cupboard with inadequate ventilation, this heat of rejection may result in excessively high ambient/surrounding temperature. Similarly, installation of an air conditioned rack enclosure in a computer room whose existing computer room air conditioning (CRAC) system is already over-stressed may create additional problems. While the server contained within the rack enclosure may be kept comfortably cool by the control cabinet air conditioner, the additional heat rejected into the computer room may stress the CRAC system even more.
- Where the surrounding environment is noise sensitive. Air conditioners use fans to move air through the heat rejection (condenser) coil, and an unavoidable consequence of this air movement is noise. Control cabinet air conditioners produce noise at levels which may be deemed unacceptable in quiet environments, such as offices.

6. Do you really need an air conditioner?

In situations where the surrounding environment is not hostile to the enclosed server equipment, forced air cooling may be the most suitable approach. e.g. In a computer room with adequate cool and clean air, the most effective approach may be to allow the servers to draw cooling air through a perforated front door or from under a raised floor space (for under-floor CRAC systems), and exhaust through the rear.

An understanding of the issues outlined above will help with the selection of suitable equipment for cooling of server rack enclosures and may avoid application problems later on, but if these factors are at all unclear, seek the assistance of a professional, who can offer expert advice.

For more information, contact:

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BERTECH Industrial Environments Pty.Ltd.
Representatives for McLean Thermal control cabinet air conditioners:
- Indoor industrial cabinet air conditioner, 230 to 2930 Watts
- Outdoor cabinet air conditioners, 200 to 5310 Watts
- Outdoor shelter air conditioners, 6340 to 11,200 Watts
- Harsh environment/NEMA 4X cabinet air conditioners, 440 to 2200 Watts

Fans, blowers, filterfans also available.

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