



Engineering White Paper

**APPLICATION CONSIDERATIONS
FOR COOLING SMALL COMPUTER
AND SERVER ROOMS
A PRODUCT FEATURE COMPARISON**

*By J. Kipland Kiger, PE
G Blackmon & Associates*



Introduction

Too often, precision air conditioning is only considered when humidity control is required. If the application does not demand humidity control, comfort cooling is installed. In fact, the combination of recent economic conditions and an increasingly competitive market have led to a rise in the number of server rooms and data closets being served by traditional comfort cooling.

These applications can be air-cooled with a traditional, residential-style split system, or utilize a cooling only water-source heat pump or a chilled water fan coil unit. These systems appear attractive to the installer because of their apparent low up-front costs. However, with some analysis, the cost differences between precision and comfort cooling systems are not what they first appear.

General Applications Considerations

Sensible Cooling Capacity

The first thing to consider when comparing costs of cooling units is the amount of sensible cooling available. Since almost all of the loads in these rooms are sensible heat, units should be selected on their sensible capacities. The higher latent capacity of comfort units actually hurts their performance in this application by unnecessarily lowering the humidity in the room.

In addition, comfort cooling units are usually rated at the ARI standard of 80 degrees F entering air temperature — not nearly cool enough for computers and servers. One comfort manufacturer's two-ton unit

actually de-rates to one ton of sensible cooling when adjusted for a 72 degrees F entering air temperature.

Be sure to compare the cost of units with the same sensible capacity at the same entering conditions and not just “two-ton versus two-ton.” A lower tonnage precision air conditioning system will probably match the higher tonnage comfort unit for most applications.

Access

Small precision ceiling units, which are designed for one-side only service access and filter replacement, utilize tight room space more efficiently. Several comfort cooling units require multi-side access, which restricts where they can be installed and can increase ducting requirements and cost. One comfort unit actually requires bottom access, making installation of the code-mandated auxiliary drain pan virtually impossible.

Condensate Pump Power, Drains and Alarms

Because of limited above-ceiling space, many small units require condensate pumps. Liebert condensate pumps get their power from the unit and do not require an additional power feed. Most comfort units require an additional electrical feed (usually at a different voltage) for the pump, increasing overall installed cost.

Also, if a Liebert condensate pump detects an overflow, it shuts off the unit and sends an alarm to the wall-mounted controller. The comfort cooling pump sends its alarm by overflowing water onto the floor.

Be sure to compare the cost of units at the same sensible capacity at the same entering conditions...

Comfort cooling units are designed for intermittent operation and typically do not have the required motors for continuous duty.

(If the pump is installed in the auxiliary pan with an overflow switch, it will shut the unit down; however, the owner will not know the unit is off until the room gets hot.)

Finally, since Liebert units are internally trapped, the required number of field solder joints is reduced, further saving cost. Some comfort units actually have more than one required drain connection, adding additional labor cost.

Remote shutdown

Many small server rooms have either an FM200 fire suppression system or an Emergency Power Off (EPO) system. Both of these require the air conditioning unit to be shut down immediately upon alarm. Liebert units come standard with remote shutdown contacts. Comfort units must be specially wired to accomplish this task, increasing the owner's cost.

Monitoring

Usually, smaller rooms are not continuously occupied. Notification of a problem with the unit is very important. Liebert units come standard with a common alarm contact which can be connected to a variety of alarm or management systems. Since this contact picks up all alarms within the unit, not just temperature, potential problems (such as a dirty filter or clogged condensate line) can be found and fixed prior to the room getting out of control. Also, Liebert offers optional Web or Ethernet cards for the units to allow the owner to cost effectively monitor these rooms.

Continuous Operation and Filtration

Liebert evaporator fan motors are designed to run continuously to help eliminate hot spots in rooms and provide for increased filtration. Ducted units have 4-inch pleated filters as standard. Even though their fans can be put in the "on" position, comfort cooling units are designed for intermittent operation and typically do not have the required motors for continuous duty. Typical comfort cooling filters are 1-inch throw-away, which can catch large contaminants, but are not very effective in controlling dust.

Air-Cooled Application Considerations

Low ambient controls

Small Liebert systems come standard with low ambient controls to -20 degrees F. This is important since the room will likely require air conditioning regardless of outdoor conditions. Low ambient controls must be added to comfort cooling systems at an increased cost and generally are rated only down to 0 degrees F or 20 degrees F. Often this option requires field installation, raising costs even further.

Voltage Range

Since many air-cooled comfort units are actually residential units, they are designed around a nominal input voltage of 240 Volts. However, in a commercial building, this voltage usually comes from a three-phase panel, making the actual input voltage nominally 208V. This voltage is very close to being out of range for some of these units.

Precision air conditioning systems, such as the Liebert Mini-Mate2, are designed specifically to cool electronic equipment. Their high sensible heat ratio and continuous-duty design makes them the best choice for small computer rooms and closets.

One manufacturer lists their minimum voltage as 207 volts. Liebert's small systems are rated at 208/230 to cover the entire range of possible commercial voltages.

Water Cooled Application Considerations

Liebert units come standard with a variety of water-regulating valves pre-installed at the factory. Specifically, two or three-way valves are available in standard and high pressure ratings to suit numerous applications. Comfort cooling units require the purchase and installation of an external valve, adding material and labor cost.

Compressorized Application Considerations

Hot gas bypass

Because of load uncertainty or future growth, hot gas bypass is a frequent addition to a small unit. It is standard on every compressorized Liebert Mini-Mate2.

Providing hot gas bypass extends the compressor life by reducing the number of compressor cycles if the load of the room does not match the unit capacity. This is often the case when simple room load estimates have been made (or when room equipment loads are not operating at full capacity).

Another benefit is enhanced humidity control. As offered with Liebert microprocessor controls, hot gas bypass reduces the latent (or dehumidification) capacity of the Mini-Mate2 coil, thus allowing more of the water vapor to stay in the space.

Hot gas bypass warms the evaporator coil and is an effective means to dry the coil.

Yet, during a call for dehumidification, Liebert controls will disable the hot gas bypass mode, thus providing maximum latent removal.

Chilled Water Application Considerations

Control Valves and Controls

Liebert units come standard with a variety of control valves, including high pressure, pre-installed at the factory. Comfort cooling units do not. Also, since the thermostat and control valve must be purchased separately, these items must be designed and integrated in the field, likely adding relays and wiring. This not only adds field cost, but increases project management time as separate orders must be placed and shipments tracked.

Starters and Motor Mounting

Liebert units do not require external starters. Most chilled water units require external starters, adding material and labor cost. Also, many chilled water units have the motor "shipped loose" which adds field labor time.

Conclusion

Precision air conditioning systems are designed specifically to cool electronic equipment. Their high sensible heat ratio and continuous-duty design makes them ideal for small computer rooms and closets. They also include a number of features that simplify and reduce installation cost. Consequently, precision cooling units are almost always a more effective and cost efficient choice.



LIEBERT CORPORATION

1050 DEARBORN DRIVE

P.O. BOX 29186

COLUMBUS, OHIO 43229

800.877.9222 (U.S. & CANADA ONLY)

614.888.0246 (OUTSIDE U.S.)

FAX: 614.841.6022

www.liebert.com

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