Spot-Cooling Solutions

for Emergency Situations

Spot-cooling systems can help companies prepare for—or prevent—problems when summer temperatures are on the rise

Spot-cooling systems are portable problem solvers. Roll them in, duct them out, turn them on, and relief begins, whether you are cooling overheated employees or helping mitigate a disaster. Designed to be a temporary fix, many spot-cooling systems find a permanent place in businesses and buildings, either to supplement existing air conditioning or as a redundancy solution.

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Some of the spot-cooling applications most common during summer include:

- Supplementing a building's main air-conditioning system, balancing temperatures, and cooling hot spots.
- Cooling older buildings lacking central air conditioning.
- Spot cooling production processes, assembly lines, and warehouses.
- Maintaining temperatures in server rooms and data centers.
- Cooling outdoor environments, such as sporting events, and assisting firefighters.
- Dehumidifying applications to preserve products and enhance comfort and productivity.
- Emergency drying and dehumidifying following floods and hurricanes.

A spot-cooling air conditioner dehumidifies and dries an office board room.

AIR VS. WATER

Spot-cooling portable air conditioners come in two types: air-cooled and water-cooled. Air-cooled units pump in cool air and reject hot air through ductwork. Water-cooled units are connected to a water source. They pump in cool air and use water to reject hot air. (Water-cooled portable air conditioners are different from evaporative air conditioners, such as swamp coolers.)

Both solutions have similar capac-

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ity options, electrical requirements, and costs to purchase, rent, or operate. However, the similarities end there, leaving each type with its own list of potential advantages and disadvantages.

AIR-COOLED UNITS

The advantages of air-cooled portable air conditioners begin with options and flexibility. Air-cooled units are more common, making them more plentiful—a plus in emergencies. There is a wider range of air-cooled products, which creates more choices. Also, air-cooled units can be set up more quickly. Because they do not require a water source, they tend to be more flexible, with an ability to cool and dehumidify almost anywhere an electrical connection is available.

Potential disadvantages include the units' size and waste-heat output. Because liquid is more efficient at heat exchange, water-cooled units are smaller than air-cooled units. However, waste heat can become an advantage in some emergency situations, such as flooding, in which it can be ducted to expedite drying.

WATER-COOLED UNITS

The advantages of water-cooled portableair conditioners include smaller sizes and greater efficiency rates. Plus, there is no need to duct waste heat. This enables these units to go places air-cooled systems cannot—for example, inside a vault with firewalls that do not accommodate ductwork.

The main disadvantage of water-cooled portable air conditioners lies primarily in their need for water. Preplanned applications typically include water lines in a design. However, locations that need emergency spot cooling might not have access to water. In emergency situations, getting a water line could prove challenging, if not impossible. Some water-cooled units offer the ability to connect to a tap, while the unused hot water is rejected back to a sink to drain. (Be aware that this option is questioned for wasting water and is illegal in some states.) Other issues can arise from the need to keep water pressure and temperature within a specific range.

A spot-cooling system cools a server room.

SIZING UP THE RIGHT UNIT

Spot-cooling units—air-cooled or water-cooled—can be grouped into three categories according to capacities and electrical demands. The majority of units fall into the first two categories:

- 110/115 v: The smaller portable spot-cooling units, these have cooling capacities of 10,000 to 18,000 Btu (approximately 1 to 1.5 tons).
- 208/230 v: With cooling capaci-

Being Proactive

No one can predict when a summer emergency or disaster will strike, but there are a few steps you can take to prepare:

- Identify areas that could be vulnerable to excessive summer heat or require emergency spot cooling, such as a data center or server closet.
- Identify the type of cooling solution best suited for an area. Typical considerations include capacity, footprint, ducting capability, or water access.
- Identify the type of electrical outlets available. If there are potential problems in a large area, ensure that there are proper electrical outlets (such as three-phase 460-v outlets) to accommodate larger spot-cooling units. Getting new electrical options during an emergency might be impossible.
- If a water-cooled portable air-conditioning unit is suitable, ensure that there is access to water.
- If an air-cooled portable air-conditioning unit is suitable, identify the areas where it will be possible to duct waste heat. Typically, it is ducted outside, into a ceiling air plenum, or to a less-critical area than the one being cooled. In an emergency-drying situation, waste heat can be ducted to moisture to help expedite drying.
- Know which spot-cooling distributors in your area offer 24/7 service. Some do; some do not. The nature of emergencies dictates that service could be needed during off-hours.

Winds of Change

In what seems like seasonal irony, summer brings fiery heat, along with plenty of water. The National Oceanic and Atmospheric Administration has predicted a 75-percent chance that the Atlantic hurricane season will be "above average" in 2007. What does this mean? It means that there is a strong likelihood 13 to 17 named storms, seven to 10 hurricanes, and three to five "major" (Category 3) hurricanes will occur. Compare this with a normal season, which has 11 named storms, six hurricanes, and two major hurricanes.

Moisture from excessive rain, floods, and hurricanes can devastate buildings with blatant physical damage, mold, and mildew.

Extracting moisture quickly after a flood or spill is critical. Once spores set, there is roughly a 24-hr window to prevent them from spreading. Air-cooled spot-cooling units can help dehumidify and speed up the drying process by ducting waste heat to moisture.

ties of 24,000 to 36,000 Btu (approximately 2 to 3 tons), these units are useful for larger spot-cooling applications.

• 460 v: With cooling capacities of up to 60,000 Btu (up to 5 tons), these are the largest spot-cooling units.

Most units are on wheels, and larger units often are transported on small trailers. Footprints run the gamut from small to extremely large. One manufacturer produces a small (15.5-in. high) ceiling-mounted spot-cooling unit designed to fit into tight spaces and that can be ducted into a ceiling.

CALCULATING A SOLUTION

There are countless variables to consider when charting an appropriate solution for various spot-cooling needs. The factors to consider in a building include room size, number of windows, exposure direction (north, south, east, west), insulation factors, R factors, and the floor the affected area is on.

These six steps constitute a "rule-of-thumb" approach to calculating heat loads:

Step 1. Calculate the area of the space to be cooled (in square feet), and multiply by 30.

Step 2. Calculate the heat gain through the windows. If the windows do not have shading, multiply the result by 1.4.

Step 3. Calculate the heat generated by occupants. Allow 500 Btu per person.

Step 4. Calculate the heat generated by each item of machinery, such as copiers, computers, ovens, etc. Find the power in watts for each item, add them together, and multiply by 3.4.

Step 5. Calculate the heat generated by lighting. Find the total wattage for all lighting, and multiply by 4.25.

Step 6. Primary cooling: Add the results of the previous steps to find the total heat load. (All elements are measured in British thermal units [Btu].)

• Total heat load (in Btu) = area Btu + total window Btu + occupant Btu + equipment Btu + lighting Btu.

• Supplement-cooling load (in Btu) = ([area Btu + total window Btu + lighting Btu] x ⅓) + occupant Btu + equipment Btu.

Or, supplemental-cooling load (in Btu) = total heat load (in Btu) + existing cooling (in Btu).

WHEN AN IDEAL SOLUTION IS NOT

At first glance, choosing an ideal solution seems to be driven by determining whether an air- or water-cooled unit suits your needs and matching a capacity to the situation. One might assume a large area would require a larger unit. Oddly, it might not work out that way.

Unless you are prepared for a summer emergency, cooling-solution choices are driven primarily by the electrical outlets available. For example, an emergency could be served well by a 5-ton spot-cooling unit, but if an area has only 110/115-v outlets, and a three-phase, 460-v outlet cannot be obtained quickly, multiple smaller spot-cooling units will be needed.

Other considerations include ducting possibilities for air-cooled units and water access and pressure and temperature considerations for water-cooled units. An ideal solution may not be possible in the pandemonium of an emergency. Knowing what can and cannot be accommodated ahead of time—and making any necessary changes—can spell the difference between a solution and a meltdown.

CONCLUSION

Another important, but often overlooked, consideration about spot cooling is availability. During summer emergency situations, heat waves, and disasters (floods, fires, hurricanes), spot-cooling rental fleets quickly become depleted. Even sales inventory can dwindle rapidly, leaving few, if any, cooling options. Purchasing one or a small number of units can be the best protection. It is a balancing decision of risks and costs. Capital could be spent to secure a few units for an emergency that may or may not take place. On the other hand, an emergency could strike at any time, and the needed spot-cooling solution might not be found.

Chances are standby units will not stand idle. Many people use them to supplement cooling throughout the year, for comfort in a crowded conference room, to help in an area in which air conditioning is being repaired, and in other temporary, non-emergency situations.

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