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Cooling Video Walls

Arrays of video panels have become common at point of sale locations, lobbies, restaurants, airports, or virtually anywhere advertisers have an opportunity to bring their message to groups of people. The advent of high definition, very bright video panels coupled with digital systems and software that can manipulate a single large image or multiple smaller images have made the video wall a compelling vehicle for visual communication and have largely replaced video projectors.

In cases such as airport arrival/departure displays, panels are unenclosed and suspended in free air; any heat generated dissipates harmlessly.

In other installations, display-generated heat must be considered to avoid damage. How the panels are mounted determines if they are likely to overheat in operation. We'll discuss two common mounting arrangements and how to solve the thermal problems they create.

The first and most common mounting arrangement (Case 1) is video panels mounted with faces exposed on a surface close to an existing wall, creating a volume wide and high but shallow. If the sides of this "wall sandwich" are closed, we've limited the panels' ability to take in fresh air and exhaust the heat generated by their internal circuitry. (An area 8' wide by 8' high by 6" deep contains only 32 cubic feet of air, not enough to absorb a significant amount of heat.) Fine-pitch LED video panel modules, frequently mounted in large arrays, are installed this way; there is usually only 3 to 4 inches of space between the back of the panels (or "cabinets" holding multiple panels) and the mounting surface.

A second mounting method (Case 2) adds a transparent protective barrier in front of the displays. Designed to keep curious fingers away from the display surfaces or to prevent outright vandalism, this barrier also reduces the amount of heat the panels can radiate into the viewing area.

Let's put some numbers on a typical example and see how serious the heat problem might be…

Specification sheets for several frequently-used video displays in the 40" to 60" range from major manufacturers indicate they consume 120 to150 watts, frequently incorporate fan-forced cooling, and should not operate in environments above 105 degrees. There are variations among models and manufacturers, but these numbers are typical.

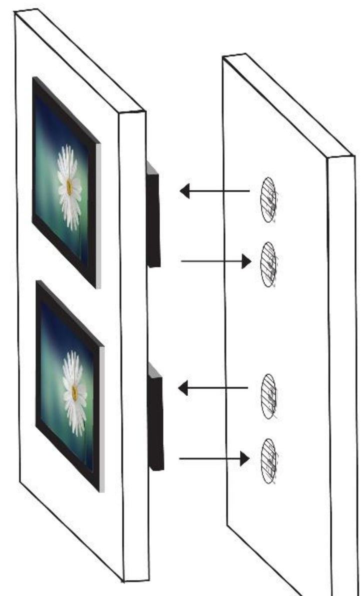
We'll use the formula CFM = BTU/(1.08)ΔT, where ΔT is the highest temperature rise we're willing to accept, BTU is the amount of heat to be removed, and CFM is the amount of air we must move through the display we're cooling in cubic feet per minute to keep the temperature rise from exceeding the limit (ΔT) we've set.

We'll let that maximum temperature rise be 20 degrees (increasing from a 75 degree room temperature to a maximum – and safe - 95 degree operating temperature). Since 150 watts is equivalent to 510 BTU/hour (1000watts = 3400 BTU/hour) , the formula tells us that we need an airflow of about 23 CFM per panel to keep operating temperatures within our safe limit.

At a flow rate of 23 CFM, the 32 cubic feet of air enclosed behind the panels in the example above would circulate through one panel in less than 2 minutes. We know that the circulating air would give up some of its heat to the wall surfaces as it passes over them; that's the good news…

The not-so-good news is that we aren't going to have just one panel in this video wall – 8 or 10 or more is common. With 10 panels, we'd need an airflow of about 230 CFM. Unless the surrounding wall surfaces are highly heat-conductive (not likely), they won't absorb much of the panels' heat. As the air temperature increases, so will the panels' internal temperature. With most walls in use more than 10 hours a day, trouble isn't far away.

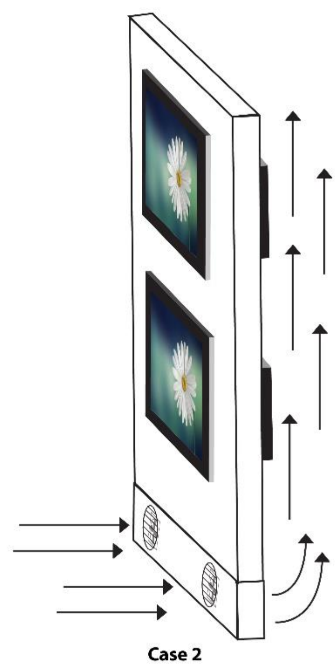
Let’s go back to the first mounting arrangement (Case 1) and see how we might keep our panels at a safe temperature. If the wall behind the panels is an interior wall, and behind it there’s an open utility area, a pair of small fans such as the ATM System 3e can be used per panel, with one fan pushing fresh air toward a panel’s intake opening, while a second fan pulls heated air away from the panel’s exhaust vent. Two fans per panel may seem excessive, but they’re small, inexpensive, very quiet, use very little power, and reduce lifecycle system costs by protecting expensive equipment.



Case 1

When using the second mounting arrangement discussed above, (Case 2) or If there’s no space behind the wall in Case 1 to move air in and out of because it’s an exterior wall, or if we’re not allowed to mount fans due to aesthetics, we need another way to bring fresh air to the space behind the panels. Two new products from ATM, Cool-wall I and II, can move significant amounts of air from the room to the area behind the panels.

Available as the Cool-wall I for heat loads up to about 800 watts, and the Cool-wall II, for heat loads approaching 2000 watts, They consist of narrow panels with six fans and a thermal control unit with remote sensor. The Cool-wall I uses 60mm fans, while the larger Cool-wall II uses 90 mm fans. The Cool-Wall I moves about 200 CFM, generating a low noise level of 23 dBA, while the Cool-wall II moves about 400 CFM at a noise level of only 26 dBA. One or more panels as needed would typically be mounted close to floor level, just below any protective glass panel, blowing fresh air into the space behind the panels with the space between the panels and the wall behind them open at the top. Alternately, they could be mounted high, pulling warmed air upwards, with a simple passive grille installed low for fresh air to enter.



Case 2

The Cool-wall I, at 24” wide, and the Cool-wall II, at 30” wide, are sized to produce a wide curtain of air flow to cool heat sources distributed over a sizable area. Other ATM systems are easily adapted to video wall cooling; engineering assistance is always available to aid in product selection and installation.

Cool-wall I

Cool-wall II