

# THE LATEST



## Solving Data Center Hot Spots: A practical solution

The problem of data center hot spots is a constant concern for mission critical owners. In some cases when a hot spot occurs, the excess heat may cause equipment to fail. Without the proper tools, it can be impossible to see the cause and effect of changing floor tiles on the data center floor.

Recently, a client was having issues with hot spots in their data center. To resolve the problem they added more perforated tiles to the room and to their surprise, the more tiles they added, the more hot spots began to appear. Although counterintuitive to some, increasing the number of perforated tiles can exacerbate a low flow problem. The additional perforated tiles reduces the air pressure in the underfloor air plenum which reduces the air flow through the existing perforated tiles. This effect becomes particularly pronounced in data centers that are already operating with low underfloor pressure, caused by the poor management of perforated tiles and other openings in the raised floor.

To analyze the situation, Swanson Rink added pressure sensors to monitor the underfloor pressure, as well as rack temperature sensors to monitor incoming supply air temperature to the servers.

Using the underfloor air pressure sensors and accompanying software analysis tools, Swanson Rink created a live visual map of the underfloor air pressure. Figure 1 below shows the data center before the perforated tiles were reconfigured. The perforated floor tiles were poorly distributed causing a loss of pressure in some areas. Figure 2 shows the underfloor air pressure after rearranging and eliminating unnecessary floor tiles to properly distribute the air flow.

### UNDERFLOOR TEMPERATURE MAP

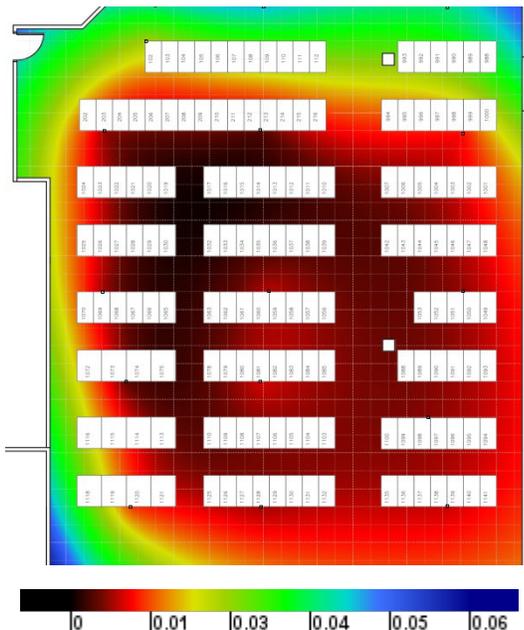


Figure 1: BEFORE

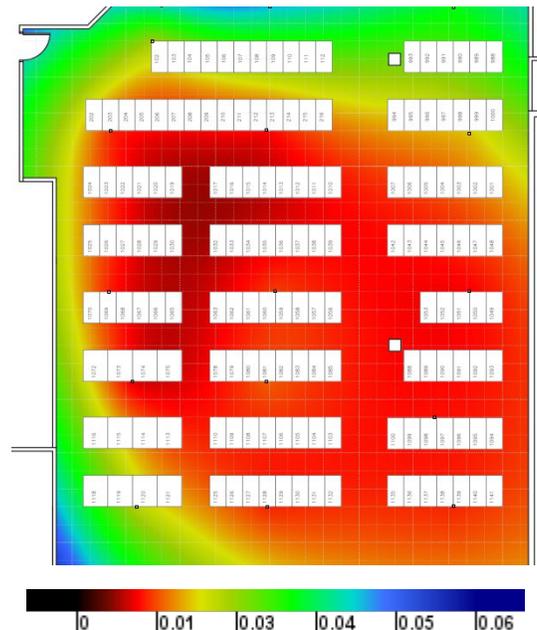


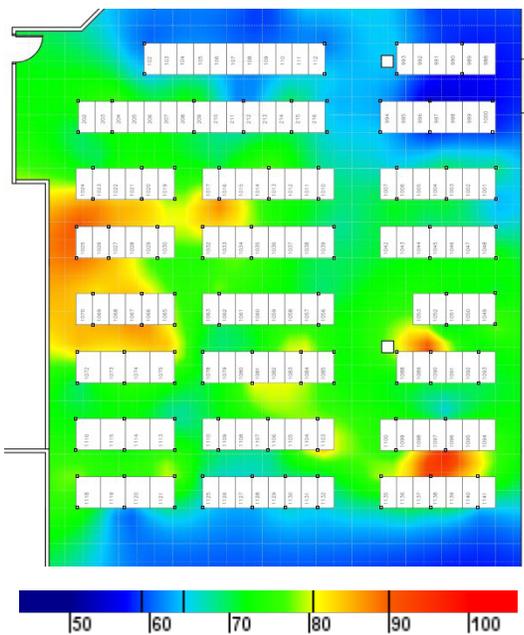
Figure 2: AFTER

With these sensors in place, the team was able to reduce the number of perforated floor tiles and adjust the locations for hot and cold aisle configuration which solved the pressure issues. The return grilles in the ceiling were also reconfigured to ensure proper placement in the hot aisles.

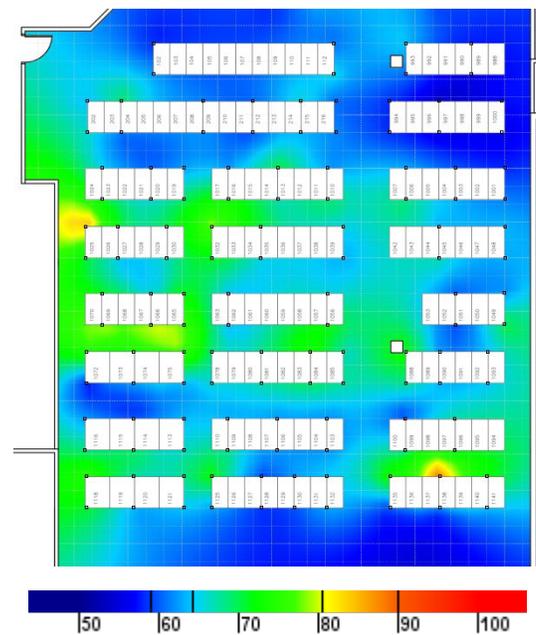
Improperly managed floor tiles not only affect the underfloor air pressure, but more importantly they affect the conditions in which the servers and racks operate on the floor. Using rack mounted temperature sensors and analysis software, Swanson Rink created a thermal image of the data center which clearly identifies hot spots and pinpoints the locations where hot air recirculation was occurring. Figures 3 and 4 show the before and after effects of properly laid out perforated floor tiles and return grilles in the data center. Hot air recirculation was virtually eliminated and hot spots were reduced to a minimum. Once the data center air flow is properly balanced, additional actions can be taken to improve the operating efficiency of the data center. For example, the computer room air conditioning units' (CRAC) and air handling units' supply temperatures can be raised to a more efficient operating condition. In a data center with a chilled water system, an increase in chilled water supply and return temperature translates to more economizer hours and reduced operating cost.

The advantage of using temperature sensors when raising the temperatures in the data center is that the operator is assured that the increased temperature is not adversely impacting server operations. This allows the operator to watch the temperature map and slowly increase temperatures until an optimal temperature is reached.

#### RAISED FLOOR TEMPERATURE MAP

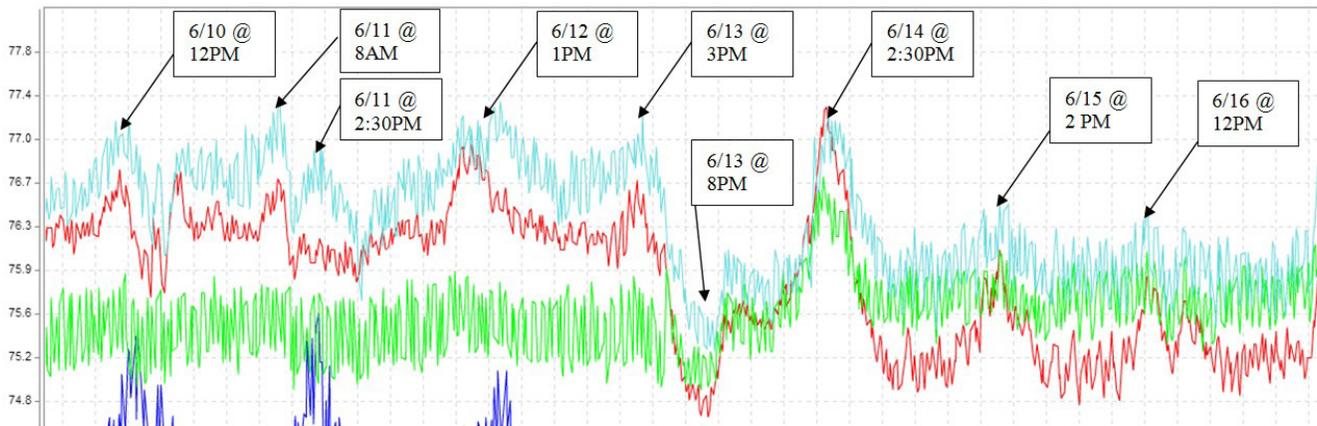


**Figure 3:** Improper layout of perforated floor tiles and ceiling return grilles causes hot air to recirculate



**Figure 4:** After reconfiguring the floor tiles and ceiling return grilles, hot air recirculation was eliminated

A visual temperature and pressure monitoring system not only tells the operator the health of the data center, but it can also help identify any variability in the IT load throughout the day and how the CRAC units are responding to the variability. Figure 5 shows that for these particular servers, the server loads peak near midday as a result of increase in demand from users. The low load demand such as the one that occurred at 8pm on June 13 shows an anomaly that could correlate to an actual event.



**Figure 5:** Identify peak load time and equipment response

Data center operators often find themselves reacting rather than managing their data center as the IT load evolves and they typically rely on IT personnel to notify them when certain areas become too hot. Often times cooling issues in the data center are related to poor air flow tile management or poor rack layout, not lack of capacity

Swanson Rink provides a quick non-invasive service that has no impact to your current operations and can immediately provide you with actionable information regarding your data center's temperature and humidity profile. With our engineering expertise and state of the art tools we can provide temporary data center monitoring, giving data center managers and facilities operators the information they need to make changes or to plan for changes in the data center environment.

For more information on Swanson Rink's Data Center Consulting Services, feel free to reach out to:

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