Technology Connection LLC:

Case Study: A New Style of Virtual Containment for Raised Floor Environments in the Data Center Space

Location: A High Tech Fortune 50 Company

Objective: Reduce Energy Cost

Performed by:

Steven Howell – President
Technology Connection LLC

Jeffrey Myrdek - Global Director of Energy & Sustainability Account Lead for CBRE
CBRE

Table of Contents

Executive Summary and Project Overview

Technology Connection was engaged by CBRE and a High Tech Fortune 50 Company to provide an energy savings solution to the data center space utilizing Virtual Containment. This project was started on Monday April 25th, 2016 and finished on Friday April 29th, 2016. The objective was to install turbulent airflow tiles with subfloor air balancers to break down thermal layers in the cold aisle which creates a Containment Affect and provides cooler rack intake temperatures along with dialing up set points at the chilled water plant by a total of 4 degrees (F) to achieve energy savings. The entire process was documented and data points were taken by both Technology Connection and CBRE to verify the success of the project and the energy efficiencies achieved.

Results:

Average Inlet Temperature Pre Install at the 3' Level:	77.94° F
Average Inlet Temperature Post Install at the 3' Level:	76.44° F
Average Drop of:	**1.5° F**
Average Inlet Temperature Pre Install at the 6' Level:	80.20° F
Average Inlet Temperature Post Install at the 6' Level:	78.46° F
Average Drop of:	**1.8° F**
Estimated Energy Savings:	231,032 kWh
Total Increase in Chiller Plant Set Point:	4° F (Objective was 4° F)
Energy Savings from Chiller Plant Set Point Increase:	67,038 kWh
Total Energy Savings from Server Fan Speed Decrease:	257,049.93 kWh
Total Energy Savings Achieved:	324,084.93 kWh
Percentage of Estimated Savings:	140.3%
Project Cost:	$41,500.00

Summary of Procedure

Current Site Conditions:

Upon arrival, this site had a total of 237 High Flow vented tiles that were placed in front of equipment racks. The temperatures throughout the cold aisles varied widely. The warmest recorded inlet temperature was 90° F.

There was a significant amount of warm air mixing with cold air throughout the environment that was caused by several factors:

- Large openings in unused rack space allowing hot air return fans to penetrate the cold aisle
- Equipment rows varied in length allowing hot air to recirculate into the cold aisle
- Some rack mounted equipment was mounted with hot air exhausting into the cold aisle

The installation process involved the installation of 58 Turbulent Air Flow tiles and the removal of 58 existing High Flow tiles in the cold aisles, 4 Air Balancers placed in the sub floor, and the relocation of some existing High Flow tiles. The placement of the tiles and Air Balancers had previously been determined by the software analysis from the initial assessment and current conditions found.

As part of the Installation process, A post installation report was prepared using temperature data points collected from the site before and after the solution was installed. These data points are used to document the airflow performance and efficiency of the current datacenter arrangement.

Airflow efficiency is directly correlated to the temperature and its ability to cool equipment. The cooler the airflow, the better it will be able to cool equipment. Temperature readings were collected using a Fluke IR Thermometer at both the 3 and 6-foot level.

Before installation was started, our trained installation team recorded temperature readings from 116 established locations within the site, twice per day. One set of 116 readings was taking at 8:00AM and the second set of 116 readings was taken at 4:00PM. These readings showed the trend in improvement throughout the installation process as well as a baseline at the beginning and an established improvement summary at the end of the installation. Of the 232 daily readings taken, 140 of the readings showed an improvement from Pre-Install all the way through Post Install after the set point was raised 4°F. Of these 140 improvement points, 114 of them showed an improvement of 2° or more. All inlet temperatures at every rack location were scanned each day to verify that no new hot spots had developed.

Summary of Improvements:

Average Drop in Server Inlet Temperature:

3′ Level: **1.5°** 6′ Level: **1.8°**

Daily Change Breakdown

	3 Foot	6 Foot
Monday - Pre Tile Average Intake Temp:	77.9°F	80.2°F
Tuesday – Post Tile Average Intake Temp:	76.9 °F	79.1°F
Tuesday – Pre Air Balancer Average Intake Temp:	76.9°F	79.1°F
Wednesday – Post Air Balancer Average Intake Temp:	75.1°F	76.9°F
Wednesday – Pre 2°F Set Point Dial Up:	75.1°F	76.9°F
Thursday – Post 2°F Set Point Dial Up:	76.2°F	78.0°F
Thursday – Pre 2°F Set Point Dial Up:	76.2°F	78.0°F
Friday – Post 2°F Set Point Dial Up:	76.4°F	78.4°F

Savings:

By delivering more of the total CFM to the heat load, we are improving overall air stratification which has enabled the client to drop the server temperatures at the top of the rack. With improved airflow distribution, we were able to increase the chilled water supply set point by 4° (F). This set point increase saved 67,038 kWh. Along with the set point increase, an average hourly load demand decrease of 52.25 AMPS (measured by Starline Energy Demand Meters) was achieved from reduced server fan speeds. The site ran on 3 phase, AC line to neutral voltage, with a power factor of .9. The total energy saved annually based on this AMP reduction average for drops in server fan speed is 257,049.93 kWH annually. Annually the savings through these two measured sources is 324,084.93 kWh.