Liquid Web Data Center
Lansing, Michigan

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Fabric Ductwork Solves Data Center's Air Distribution Challenges While Providing Adjustability For Future Expansion

Lansing, MI -- Controlling server temperatures is a critical challenge for any data center. After exploring standard air dispersion and air flow-based solutions to this problem, international data center provider Liquid Web decided to use a more innovative approach when retrofitting its multi-server Michigan location. Rather than using traditional metal ductwork, Liquid Web opted for a first-of-its-kind air-distribution system for rack cooling, using fabric ductwork with directional diffusers.

The project began in 2016. Working with a team of outside engineers as well as internal data center managers, the company developed plans and then beta-tested a fabric ductwork system to cool the center's cold aisles. After initial trial success, Liquid Web's facilities team proposed using the new system for a comprehensive

redesign of the company's 75,000 sq. ft. Michigan facility.

Cooling Challenges

As in most data center facilities, Liquid Web's data centers had long deployed an open-air area strategy for controlling server temperatures. Multiple server rows were spread throughout the vast facility and collectively cooled by a network of CRAC units, each with diffusers in their individual plenums. However, this set-up created hot and cold spots between the spaced diffusers, rather than a consistent, cool environment that each server rack required for peak performance.

Liquid Web facility managers were forced to fully utilize the 39 up flow air conditioning units in order to distribute the necessary airflow throughout the space. Unfortunately, this approach wasted energy and was

Photo 1

not effective in cooling the server racks, as airflow was rarely focused towards the load.

"While our existing infrastructure was able to effectively cool the data

centers heat load, our facility was not operating efficiently when it came to air distribution and server rack cooling," said Aaron Reif, Data Center Project Manager at Liquid Web. "After the initial focused-air distribution tests, our team was ready to retrofit

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the entire air distribution process with fabric ducts."

As digital data usage grows exponentially every year, the costs to operate and cool numerous server racks are proportionally rising. Fortunately, Liquid Web was able to utilize the Property Assessed Clean Energy (PACE) program to partially finance the cost-savings retrofitting project. The PACE program allows for private lenders to fund energy efficient upgrades for buildings in a variety of categories, including heating, ventilation, and air conditioning.

Photo 2

A Retrofitted Layout

The first challenge was converting the open-air facility to a series of directed-air areas. As seen in photo 1, the facility is divided into 8 sections of 12 server rows, each using clear curtain walls. These dedicated sections create focused micro-climates, which allowed for the targeted, controlled cooling of server racks.

Liquid Web's engineers then turned their attention to air conditioning (A/C). Each of the original 39 A/C units, which ranged from 64KW-90KW, were removed. In their place, 22 A/C units each operating at 165 KW of cooling capacity were installed in the facility. Improving

on the outdated loosely balanced A/C system, the retrofitted design operates as an N+1 redundancy environment, covering the 8 server sections seamlessly. In this setup, the network is built to have at least one independent backup A/C unit per section in the case of component failure. As the facility's servers house and protect various company's essential data, ensuring consistent temperature control and air distribution is paramount.

Air And Data Distribution

With the layout and air-cooling concerns addressed, Liquid Web looked to DuctSox to solve one of the most complicated challenges: air distribution.

As part of the new layout, a raised plenum surface was built at the end of each row. Fitted with a customized adapter designed with the help of Encon EPM and fabricated by Dee Cramer, the fabric ducts extend vertically towards the ceiling (see Photo 2). At that point, a 90-degree turn extends the duct horizontally across the length of each narrow server row. In addition to a porous strip of material on each duct's

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underside that distributes air throughout the server space, adjustable nozzles force air in targeted directions at the server racks. Each directional diffuser can be adjusted or shut off depending on the evolving needs of a given row.

"The customization of the fabric duct nozzles solved our air distribution challenges," said Reif. "Combined with the flexibility to

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decide the frequency of nozzles along each duct, the fabric ductwork system gave our team the ability to tailor the airflow for each server section."

Mounting of the duct was another key consideration in this project. Unlike heavy metal ductwork options, the light-weight fabric makeup of DuctSox made ceiling suspension possible. Using a custom hanging system, the fabric ducts are connected to the ceiling grid and positioned above the cold aisles in each server section allowing for air distribution as close to the load as possible.

"The fact that DuctSox were less expensive than alternatives and incredibly lightweight made this project installation possible," continued Reif, "As our server demands continue to grow, we're confident that this air distribution layout can adapt and expand with us."

Results

Since the onset of the facility's retrofitting project in 2017, Liquid Web has experienced a significant reduction in energy consumption
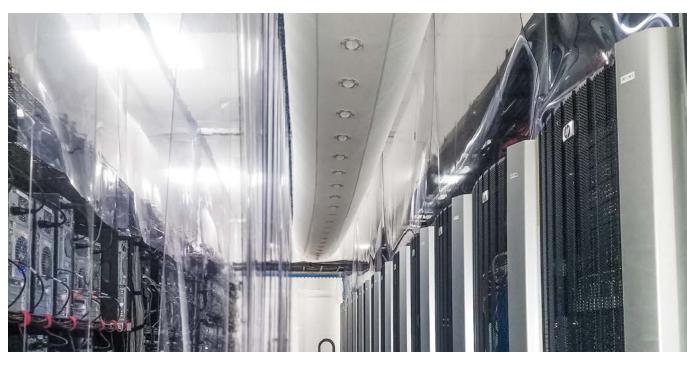

Photo 3

(and costs). The retrofitted layout and DuctSox dispersion methods cut energy usage by more than 6,000,000 kw/hr, which is a savings of more than $600,000.

Looking ahead, Liquid Web is projected to save another 1,000,000 kw/hr in 2021, which would be the fourth consecutive

year that the facility would experience an energy consumption reduction of that level.

Liquid Web has over 500,000 websites under management serving more than 30,000 SMB global customers. For this fast growing web hosting provider, upgrading infrastructure to adopt

environmentally friendly solutions and scale costs while maintaining 100% uptime is part of a long term strategy for success.

For more information about Liquid Web and DuctSox, visit their websites at www.liquidweb.com and www.ductsox.com.

For more information about how a DuctSox system may improve the energy efficiency of your data center go to: *info.ductsox.com/datasox*

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