Healthcare

FANWALL TECHNOLOGY® *Case Study*

Improving System Reliability

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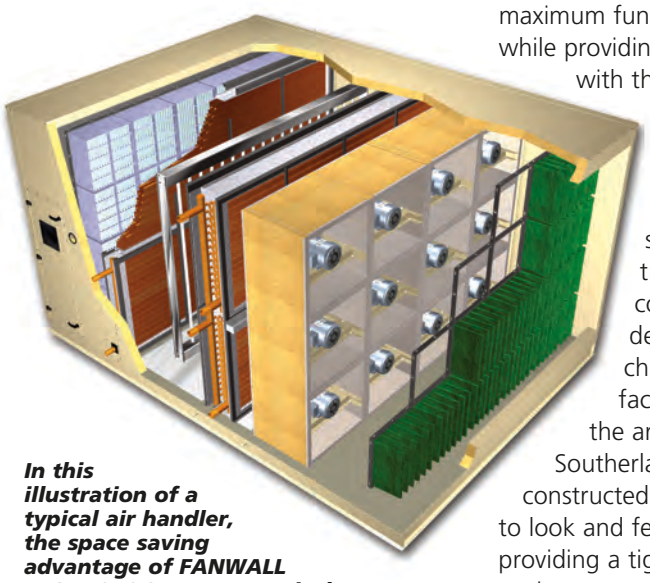
With a new building already under construction, a children's healthcare facility in Dallas made a change in the design of one of its critical air handlers. That change will provide greatly increased reliability in limited equipment space, as well as reduce the acoustic signature. The change, the installation of FANWALL TECHNOLOGY® within a Temtrol® air handler, was initiated by the facility owner at the suggestion of trusted advisers.

At a Glance

- Owner of 57,000 sq ft healthcare building wanted redundancy in fan capability for an air handler serving critical surgical area of children's healthcare facility
- Budget constraints and advanced construction status made adding additional full-sized fan or air handler impractical
- Solution: FANWALL TECHNOLOGY, which allowed the single fan to be replaced with a multiple-fan unit engineered for this specific application
- Unit moves 13,615 cfm at a total static pressure of 7.25 inches, providing abundant supply air at variable temperatures down to 60°F and below
- Additional benefits include lower acoustic levels and improved airflow through coil and filters.

Our Children's House at Baylor



In this illustration of a typical air handler, the space saving advantage of FANWALL TECHNOLOGY over a typical single fan is apparent. Also, because of the multiple-fan design, the downstream airflow is smooth and uniform.

New Children's Healthcare Facility

The facility is called Our Children's House at Baylor in Dallas. It is the newest of several similar facilities operated by the Baylor Health Care System in the Dallas–Ft. Worth region. The facilities are dedicated to improving the health and quality of life of children with special needs. A team of experienced pediatric specialists aims to help children achieve and maintain maximum function and independence, while providing them and their families with the treatment and support resources they need.

The new facility is designed to allow medical specialists to evaluate and treat patients in a warm, comfortable environment designed especially for children. The two-story facility was designed by the architectural firm Page Southerland Page LLP. It was constructed by MEDCO Construction to look and feel like a home while providing a tightly controlled physical environment, especially in the treatment areas. One of many unique features is a gabled, residential-type roof façade at the front of the building, which actually serves as a visual barrier for the flat "working" roof upon which the air handlers and other building utilities are mounted.

Critical Space Limitations

Charles Eversole is the HVAC Manager with Trammell Crow Healthcare Services, which has been the operator of Baylor's facilities since 2001. He was involved throughout the design and construction phases of the two-story 57,000-square-foot building and explains some of the challenges. "Baylor wanted to create an attractive residential 'home' look to the facility for the children it served." This posed some limitations on the space available for HVAC equipment, especially on the roof. For mechanical systems, Eversole worked closely with the engineer of record, Fred Henke of Piazza Engineering.

Piazza designed a system that uses three Temtrol roof-mounted air handlers served by air-cooled chillers located on the ground level in the rear of the building. Eversole notes, "Also involved on this project was Rusty Vaughn from Texas AirSystems, a representative for Nortek Air Solutions products, including Temtrol equipment. I've worked with Rusty a lot in the past and respect his judgment."

Construction of the building was well under way when Eversole conferred with Vaughn and Henke, asking about alternatives to the design for a critical application—an air handler serving the three surgical suites and related treatment areas. The original air handler was a single-fan design due to the rooftop space limitations.

Fred Henke from Piazza Engineering explains, "While we were in the final design stages, the lack of redundancy—being equipped with only one fan—increasingly concerned Charles."

Eversole explains, "This really bothered us from a reliability standpoint. I was concerned that we were relying on a single fan for supply air for that location." He adds, "With the other air handlers, I was okay with the single-fan systems, but temperature control and ventilation in the surgical and treatment areas are so critical."

Looking for Improved System Reliability

"At that point, the air handlers were already ordered and the roof curbs had been installed. We were limited in what we could do." Eversole notes that Vaughn's firm, Texas AirSystems, is very experienced in meeting specialized

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needs, and he did have an idea. "Rusty suggested using a FANWALL® system in the Temtrol unit."

The air-handler manufacturer, Temtrol, is a Nortek Air Solutions brand. Another Nortek Air Solutions brand, Huntair, developed and patented a system called "FANWALL TECHNOLOGY®". This product features multiple, smaller diameter, direct-drive fans that can be mounted in a narrow-profile array.

The FANWALL TECHNOLOGY array features a very low acoustic signature, minimal airway-tunnel turbulence and, most important for this project, high reliability through redundant fans and motors. Vaughn immediately began investigating the possibility of replacing the single plug fan in the critical air handler with a FANWALL solution.

FANWALL Solution Presented to Owner

Vaughn consulted Fred Henke from Piazza Engineering, and they presented the idea to Eversole, who was enthusiastic. Henke from Piazza Engineering notes that Vaughn had a demonstration unit set up to show the advantages to the FANWALL approach. "That really helped persuade Charles and me that this was a viable solution," he says. Working with Temtrol, Henke and Vaughn were able to modify the design for the third air handler to replace the plug fan with a FANWALL array. Temtrol was able to do this within the tight construction schedule.

"This solution was a godsend. Now we are prepared for any type of event. It gives us redundancy, better airflow, and acoustic performance in a small package."

Vaughn points out, "We think there are a lot of applications where FANWALL TECHNOLOGY makes sense. In this case, fan redundancy is the primary benefit. In other cases, it is the space-saving aspect of this system, or the very low noise levels that it produces."

He explains that the mounting of multiple smaller-diameter fans means the entire air-handler box can be much shorter than the equivalent air handler with a single fan. "That's a major benefit for some owners as it frees up floor space," Vaughn indicates. "Another aspect is the uniform-velocity profile of the air immediately downstream and upstream from the fan array, as compared to a single-fan system of the same capacity." This pattern results in more-uniform velocity profiles through coils and filters. Lower airway-tunnel turbulence leads to more-efficient filtration and practically ideal heat-transfer conditions in unit-mounted components.

Always Standby Capacity

In the case of Our Children's House, the revised air handler has a FANWALL array with six individual fans, two wide and stacked three high. One of the six fans is held in standby, with a damper system to prevent backflow. Eversole points out that the system can meet the specified airflow with only four of the fans operating and, in the worst case, could do a reasonably good job with

The unit control panel includes redundant variable-frequency drives for the fan motors. This ensures heightened system reliability. The panel also includes circuit protection equipment and system interfaces with building automation systems using standard protocols.

Charles Eversole, the HVAC Manager for the building, initiated the search for a fan system that would provide increased system reliability through fan-unit redundancy.

Because of its direct-drive design and smaller fan diameters, the FANWALL has a lower acoustic impact, especially in the lower frequencies, which are more difficult to attenuate.

just three. "We've actually got double redundancy, so I feel quite secure that we can always meet the required airflows and temperatures in this critical area of the building."

The individual fans have aluminum fan wheels turned by heavy-duty, three-phase, direct-drive motors operating at 208 Vac. Vaughn points out, "The direct-drive feature means higher reliability, with fewer bearings that by design require minimal maintenance. Because the fans are direct driven, there are no belts to maintain. This reduces maintenance costs."

Variable Frequency Drives

He adds that the fan rotors are precision balanced and there is no need for spring isolation for the FANWALL array. The fans are equipped with two variable-frequency drives (VFDs), either one of which can operate all six motors. The system is designed to alternate the two VFDs to give them equal hours and ensure availability of a backup. Again, in the worst case, the six fans could all be operated effectively on line voltage at 60 Hz.

According to Fred Henke, in addition to the added system redundancy, another benefit is the lower acoustic signature of the FANWALL system. "I was very impressed at the low noise level of this product. I believe that's a result of the laminar air flow, the smaller motor sizes, and the direct-drive design. It really is remarkably quiet considering the volume of air it is moving."

Serves Three Surgical Suites

The air handler serves three surgical suites, providing 13,615 cfm at a total static pressure of 7.25 inches. The air is comprehensively filtered, with two-inch 30% pleated flat filters and a 45% bag filter upstream of the FANWALL, then a 95% bag filter and final ceiling-mounted HEPA filters mounted external to the air handler. The system also has a plug fan for the return to the air handler, but Vaughn notes that the system can still operate effectively in the event of the loss of the return-air fan.

Eversole points out that, in the surgical suites, temperatures of 60°F or even lower are often requested. The temperature requirements in the spaces can change quickly with different surgeons and varying procedures. "With 20 air changes an hour, we can respond to changing temperature requirements quickly."

Redundancy and Performance in a Small Package

"This was a very timely solution," he says. "It gives us redundancy, better airflow, and acoustic performance in a small package." He appreciates the help they received from Rusty at Texas AirSystems and from Fred at Piazza Engineering in getting this revised system designed and implemented. He smiles, "Now that I know about this solution, we will definitely be considering it for additional projects in the near future."

Temtrol is a brand of Nortek Air Solutions, LLC, which is a leader in innovative custom and engineered HVAC solutions for commercial, industrial and critical environments through our brands of Governair, Huntair, Mammoth, Temtrol, Venmar CES, Ventrol and Webco. Nortek Air Solutions is a subsidiary of Nortek, Inc., a global diversified company whose many market leading brands deliver broad capabilities and a wide array of innovative, technology-driven products and solutions for lifestyle improvements at home and at work.

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