A multi-function health services facility in Springfield, Missouri is a showcase for sophisticated air quality management. The Turner Center is a unit of the CoxHealth system and is part of the Cox South healthcare campus in south Springfield. Building functions include urgent care, pediatric and adult outpatient services, a pharmacy, and numerous medical provider offices. The building was completed in the early 1980s. Due to the need for additional space and the building’s changing functions, improvements in the building’s mechanical plant were needed. These improvements resulted in a building mechanical system that is not only effective, but ultimately much more efficient.

Needed Something Special

To better serve the variety of healthcare functions in the building, the CoxHealth administration wanted to improve ventilation rates and achieve better control over building humidity levels. They also wanted a system with high operating efficiency – something that doesn’t always go hand-in-hand with high ventilation rates. The Governair Series WF air handling unit with energy recovery and FANWALL TECHNOLOGY® was a perfect solution.
Energy Saving 100% Outdoor Air Design

The original plant used a water cooled chiller system and penthouse air handler with VAV distribution. With the facility additions and the need for improved indoor air quality, CoxHealth approached Telios Engineering of Dallas, Texas and Lead Engineer Shannon McCall from that firm, looking for help with a redesign. McCall contacted local design/build contractor Springfield Engineering Company to work with him on the project. The original design had building air recirculation and mixing with a minimum outside air setpoint. At the time, the existing facility was also struggling to maintain desired humidity levels. The new design used 100% outside air for maximum ventilation. This required a whole new approach.

Capturing Energy from Exhaust Air

The system selected was a Governair custom air handler using an energy recovery ventilation (ERV) approach. This unit was installed in line with the outside air intake of the existing air handler. This concept uses energy recovery wheels to condition incoming outdoor air, recovering the energy from the building exhaust. Springfield Engineering Company Field Superintendent Kenny Stokes indicates that the system was designed to be complementary to the existing penthouse air handler. It receives exhaust air from the building, transferring its energy to the new supply air stream, and then delivers that treated supply air to the existing air handler for distribution to the building. Stokes worked closely with the hospital and the engineer to plan the installation to meet a challenging schedule.

ERV is an energy recovery process that exchanges the energy contained in normally exhausted building space air and uses it to treat incoming ventilation air. During warm seasons, the system pre-cools and dehumidifies, and in the cooler seasons, humidifies and pre-heats the supply airstream before entering the air handling unit. The benefit of using energy recovery is the ability to meet rigorous ventilation and energy standards, while improving indoor air quality and minimizing the need to add heating or cooling plant capacity.

Project engineer Shannon McCall explains that the ERV was selected both to improve the air change rates for the building, and to compensate for a low existing chiller tonnage.

“Previously, the building was struggling to hold temperature in the summer, but the ERV is supplementing the chillers and the building is now holding at a comfortable temperature.”

For the Turner Center project, the three energy recovery wheels are 10.6 feet in diameter and are installed side by side along the width of the unit. Under summer design conditions incoming outdoor air at 98° F / 77° F DB/WB is pre-cooled to 84° / 69°. Under winter design conditions, outdoor air at -4° / -4° DB/WB is pre-heated to 42° / 41°. Summer wheel effectiveness is 66% and winter effectiveness is 71%.

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<tr>
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<th>Estimated Capital Equip. Savings with Reduced Loads</th>
<th>Estimated Yearly Energy Savings with ERV</th>
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<tbody>
<tr>
<td><strong>Summer</strong></td>
<td>$154,991</td>
<td>$206,064</td>
</tr>
<tr>
<td><strong>Winter</strong></td>
<td>$180,704</td>
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Assumptions: Electrical cost $0.04/kWh, Gas cost $1.13/therm
These summer and winter effective values greatly decrease the amount of energy required from the chilled water, and heating systems thus resulting in noticeably lower energy requirements. Decreasing the entering coil conditions from 98°F / 77°F to 84°F / 69°F takes a major load off of the water coils during the peak operating hours in the summer and allows for a relatively fast return on the initial investment of this project while still delivering 100% outside air to the occupants.

The wheels rotate at 20 rpm, each turned by a ¾ HP electric motor. The face velocity of air across the wheel is 866 ft./min. on the supply side, and 740 ft./min. on the return side. The ventilation air is pre-filtered before going through the energy wheels to help increase heat transfer by maintaining a clean wheel. Final conditioning of treated supply air including heating, cooling and final filtration is accomplished in the existing air handler. The performance of the total energy wheels is AHRI Certified™.

The FANWALL Solution

To overcome the additional static pressure caused by adding the ERV system, additional fan capacity was needed. The Governair custom air handler designed for this project uses a total of 18 FANWALL® fan cells. These are installed in the ERV unit nine wide and stacked two high. For maximum effectiveness, energy wheels require an even airflow across the face. The FANWALL system is ideal for this application as they provide a "piston of airflow" through the air tunnel.

Further, the fan units are equipped with variable frequency drives (VFDs) to permit operation over a wide range of airflows. Each fan wheel is 18 inches in diameter and has a five horsepower motor providing a maximum flow of 4,889 cfm, for a total system capacity of 88,000 cfm. The FANWALL cells have high individual efficiencies and through redundancy, provide improved reliability for the entire package. Because this was a rooftop installation, fan acoustics was a lesser issue. However, the FANWALL units do have excellent acoustic profiles and can also be used in more acoustically sensitive applications.

Owner’s representative Gary Whittenberg adds, “The FANWALL...
units’ ease of installation and minimal maintenance requirements also made them a good fit for this application.”

The total ERV system is housed in Governair’s rugged Series WF cabinet featuring a fully welded, phenolic coated tubular steel framing system for maximum flexibility and strength. The 16 ga. exterior casing was provided with Governair’s standard 2500-hr salt spray coating system. The assembled unit is 33 feet long, 16 feet wide and 12 feet high. The unit has upper and lower decks that correspond to exhaust and supply airflows approaching and exiting the energy wheels. Each deck has access doors at multiple locations. The unit, totaling 42,000 lbs., was shipped in two sections and assembled on the site.

Breaking down the airflow into an array of smaller fans reduced the fan section as much as 40% from a single or dual-fan section. This reduction saves on equipment rigging costs and avoids excessive roof loads.

Challenging Schedule

According to Stokes, delivery of the unit required planning. “With two very large over-sized semi-loads, there was a lot of coordination required from the hospital and security staffs.” Springfield Engineering Company worked with Aaron Fields of Fields Mechanical Systems, Inc., the local Governair representative, in designing the system and coordinating delivery.

Fields points out that the project allowed CoxHealth to continue to use the existing air handler, with only a brief system outage while the new package was installed. Fields says, “We had just one day to set the unit sections on the rooftop. Once the unit was set, we waited until the following weekend to tie the unit into the penthouse and bring it on line.” He says that Stokes coordinated the unit installation and the startup process. He notes, “The facility was operating within a few hours after tying in the duct and electrical.”

Customer Satisfaction

Fields emphasizes that the drivers for the project were maintaining air quality while meeting ventilation rates, and maintaining operating efficiency. He points out, “Since the installation, zero complaints have been logged from the facility maintenance staff.” Stokes adds, “I believe that CoxHealth is satisfied with the purpose and installation of the ERV unit.”

Gary Whittenberg from CoxHealth states, “Since this unit has been installed, we’ve not had one complaint about odor or any complaints about lack of cooling. The system recovers enough energy to supplement the existing system as well as providing 100% fresh air to the facility.”

Improved air quality, energy recovery, high efficiency FANWALL TECHNOLOGY® and Governair Series WF custom air handlers, a winning combination for any season.