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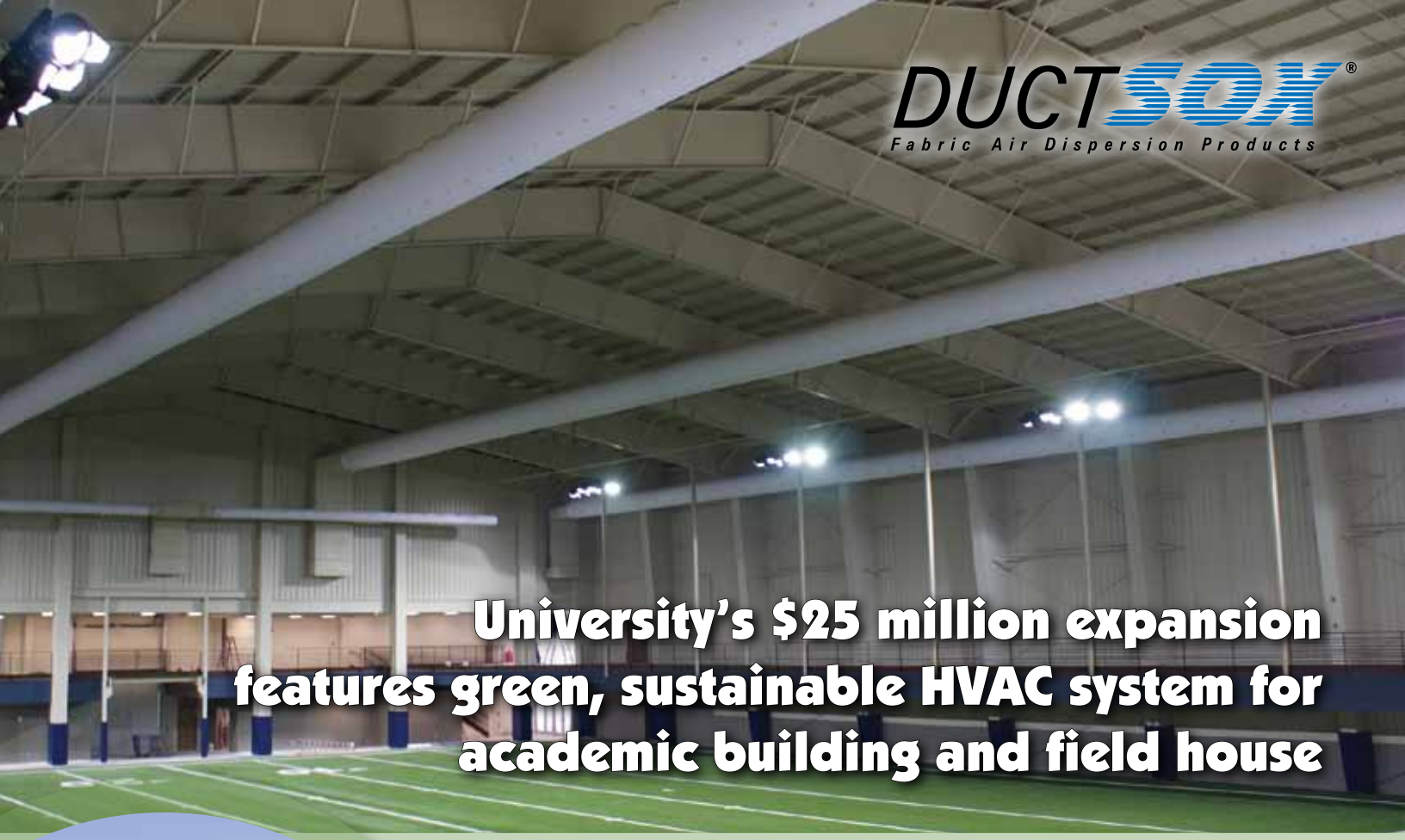

University's $25 million expansion features green, sustainable HVAC system for academic building and field house

William Penn University's $25 million construction project for two individual academic and athletic buildings is the largest and greenest expansion in the private university's 135-year history. The Oskaloosa, Iowa-based institution's latest project features geothermal heating/cooling, fabric ductwork, energy recovery ventilators (ERVs), a state-of-the-art building automation system and other cutting-edge technology, making them two of the greenest campus buildings in the Midwest.

Fabric ductwork by DuctSox, Dubuque, Iowa; an underground geothermal field system anchored with water-source heat pumps and ERVs is what makes the 155,000-square-foot Penn Activity Center (PAC) the most efficient building on campus, according to Michael Vogt, a project engineer for design/build mechanical contractor, Cunningham, Inc., Oskaloosa. Cunningham's green design helped the university qualify for a $275,000 incentive. Additionally, the Associated Building Contractors (ABC) of Iowa recently recognized the design with a first place award in its "Excellence in HVAC" competition.

Vogt believes the sustainable combination of geothermal, fabric duct and ERVs would typically earn points for Leadership in Energy and Environmental Design (LEED®) certification by the U.S. Green Building Council. For example, fabric duct is considerably greener than its metal counterpart, and it regularly helps rack up LEED credits. While fabric duct's main purpose was to save the value-engineered project over 60 percent in HVAC ductwork installation costs versus metal duct, it also offers a green strategy of evenly-distributed heating/cooling space temperatures. This leads to shorter, energy-saving mechanical equipment run times.

Besides better air comfort, fabric duct also helped Cunningham solve engineering problems presented by the PAC's aesthetic gable roof that rises to a 45-foot-high pinnacle. While high ceilings are mandatory for sports activity height

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clearances, they also necessitate an air distribution system with a high throw capable of reaching the floor. Metal duct is capable of high throws, but metal duct registers typically placed every 10 feet result in uneven, drafty air throws. Meanwhile, the four 290-foot runs of 48-inch-round TufTex that Vogt specified has three-inch-diameter high throw orifices running the entire length, capable of reaching the floor with heat in the winter. Tuftex is a premium fabric in DuctSox's multi-product line. "There's a noticeable difference between the air comfort in the PAC and other large athletic buildings with metal duct/register systems," said Vogt. "Plus, the college saved tens of thousands of dollars in installation labor costs because lightweight fabric duct is so much faster and safer for workers to install in elevated places."

Maintaining air comfort on the second floor perimeter running track was an air distribution challenge as well. While the 200-foot-long ducts condition the track on each long side, the building's shorter end caps are independently supplied each with a 100-foot-long run. One end supplies the third floor mezzanine cardiovascular workout area and has factory-engineered orifices that allow the air to evenly spill down to the track on the second floor.

The fabric duct also offers a more aesthetic, streamlined appearance than spiral metal duct/registers. The main disadvantage to all fabric duct in the past was its limp appearance when not inflated during idle equipment periods. However, Cunningham's specification of DuctSox's 3 x 1 hanging system, which supports the duct at the 10, 12 and 2 o'clock positions, makes the duct look 85 percent inflated during idle periods. Brian Vandeventer, vice president of sales, Rist & Associates, a Des Moines, Iowa-based manufacturer's representative, served as a DuctSox factory liaison for the specification. Perhaps the major energy saver on the project is the geothermal system that supplies the ductwork for the PAC and the 55,000-square-foot academic building, the Musco Technology Center (MTC). The PAC's six 20-ton heat pumps continually receive 55°F water from a geothermal well field that both buildings draw from with two 460-V, 25 hp. pumps. The well field has 25 miles of underground horizontal piping bored at 15, 30 and 45-foot depths. Varieties of smaller heat pumps are located throughout the facility servicing locker rooms, showers, offices and exercise rooms.

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While the geothermal system handles the sensible heat load of the building, Vogt specified various ERV models to handle the latent heat load by recovering energy from the return air. Cunningham's design also features energy-saving flexibility wherein everyday routine activities are handled with minimum energy usage. However, during larger capacities of up to 3,000 people such as graduation or other special events, the CO2 sensors from the building automation system activate the HVAC systems to full capability.

The MTC, named after Musco Sports Lighting whose president and CEO, Joe Crookham, donated $12 million to the project, also includes energy-saving measures of a dust collector for the wood shops and air handlers for the welding lab.

William Penn University's state-of-the-art design is expected to be a role model for other campus buildings nationwide that want to combine green and sustainable features with indoor air comfort and quality.

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