

**Challenge:**

Improve air flow to increase the amount of fresh air and lower the temperature inside five livestock complex stalling barns as a supplement to roof louver ventilation and one structure's two pre-existing exhaust fans.

Solution:

A total of (19) 16-foot and 20-foot diameter Entrematic I-Class™ industrial HVLS fans operated via either a central computer or smart phones interfaced with a pre-existing building management system.

Results:

High volume of air movement from the center of each barn to the outside walls, which provides a higher level of comfort and safety for livestock, staff, as well as event promoters and managers.

Application:

Expo Square Built Ford Tough Livestock Complex

Environment:

Livestock Stalling Barns

Geography:

Tulsa, Oklahoma

I-Class™ Industrial HVLS Fans Keep Air Cooler and 'Moo'ving in Livestock Complex Stalling Barns

Tulsa is home to an iconic and colorful art deco architectural landmark simply named The Pavilion. Its construction in 1931 marked the birth of the Tulsa State Fair, the largest of Oklahoma’s two annual state fairs. Nearly 90 years later, The Pavilion is now one of several structures that make up the fairgrounds’ 240 acres, collectively known as Expo Square.

In the early 2000s, Expo Square embarked on a multi-phase, multi-million-dollar improvement program funded with Tulsa County excise and sales taxes, as well as user fees. The end result was a brand new multi-structure livestock facility, currently sponsored by Ford Motor Co. and aptly named the Built Ford Tough Livestock Complex.

Completed in 2008, the year-round livestock complex consists of eight separate structures—all named after various Ford car and truck models—that include open-sided stalling barns (two of which have since been retrofitted with steel roll-up doors) and several livestock exhibition arenas.

Heat, odors can quickly lead to discomfort

Architecturally, the livestock complex also includes a raised center ridge roofline and nine cupolas with louvers that open and close to allow hot air within the individual barns a way to escape, especially during the hotter summer months. Also, and because it can also feature an event arena, the complex’s highly used Explorer Barn contains two exhaust fans that operate when needed.

Still, with the barns’ roof louvers open, the temperatures inside can often reach in excess of 90 degrees F, especially during the summer months when outside temperatures soar to 100 degrees F or higher. In the fall during the Tulsa State Fair, however, temperatures in the stalling barns tend to range much cooler in the 70s and 80s F.

“Add to that a stalling barn full of livestock with the heat and odor they generate, you can quickly end up with an uncomfortable experience for both animals and the people handling them,” said Ray Jordan, Project Manager, Expo Center. Since the barns are open-sided structures, that does help with cross ventilation as long as there’s a decent breeze available. But the wind is not always that reliable.

HVLS fans assist mother nature

After several years of operation, Expo Square management realized that the livestock complex needed extra help with interior climate control and air movement.

To help ensure that temperatures inside the stalling barns remain comfortable on the hottest days, and to keep livestock comfortable and fresh air in motion, Expo Square installed (19) 20-foot and 16-foot diameter Entrematic I-Class™ industrial HVLS (high volume low speed) fans throughout five livestock complex stalling barns in the fall of 2015.



“We can push the fans to their 7 mph maximum, but half that speed is usually plenty for the amount of air movement we need.”

– Ray Jordan, Project Manager, Expo Square, Tulsa, Oklahoma

The following table illustrates the breakdown of the installed fans and their locations within the complex:

Entrematic Industrial HVLS Fans Breakdown
Built Ford Tough Livestock Complex – Expo Square
Tulsa, Oklahoma

Stalling Barns Fan Location	Industrial HVLS Fan Diameter (total feet)	Number of Industrial HVLS Fans
F-150 Barn	16	4
Expedition Barn	20	3
Oklahoma Ford Dealers Barn	20	4
Explorer Barn	20	4
Super Duty Barn	16	4
Total Industrial HVLS Fans		19

Jordan, who’s a retired public professional engineer with degrees in agricultural and civil engineering, and who works at Expo Square on a part-time basis, oversaw the industrial HVLS fan installations at the livestock complex. As a whole, Expo Square maintains a staff of 30 full-time maintenance personnel that includes building engineers and licensed electricians.

“The fans help to keep pulling in fresh air to help us deal with the livestock odors you would expect with barns full of animals,” Jordan pointed out. “Our Explorer Barn is one our most heavily used buildings, and during the last fair, we used the barn to house swine. We had to be particularly careful about the heat in that barn due to the type of animal stalled and their sensitivity to heat.”

Jordan explained that a 20-foot fan provides about 160 feet of air movement emanating in any one direction, which equates to about 20,000 square feet of total coverage with just one fan. "I'm always surprised with how well they push air to the outer perimeters," Jordan said, adding he typically runs the fans about 3 mph or less for adequate coverage. "We can push the fans to their 7 mph maximum, but half that speed is usually plenty for the amount of air movement we need."

Entrematic met all required specs

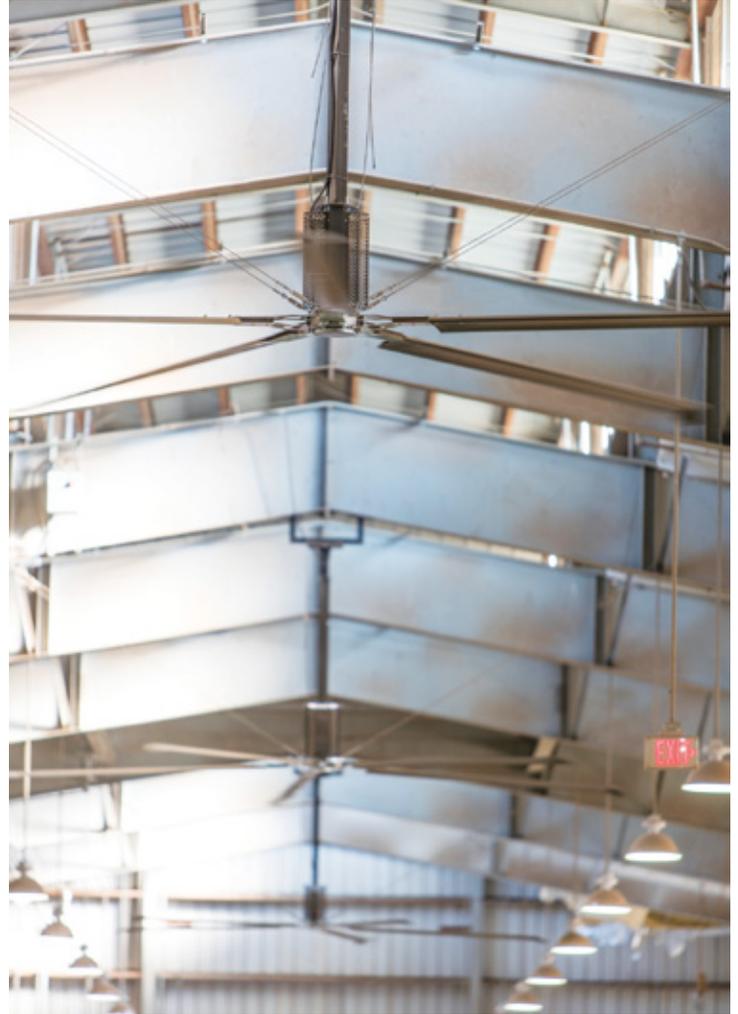
Jordan further explained that he selected the 20-foot and 16-foot diameter size fans for various reasons. He admitted that 24-foot fans did receive consideration, but that size diameter presented an issue with existing light bays and relocating several lights. As a result, Jordan said the 20-foot fans for those instances were the perfect solution.

Operating under the Tulsa County Public Facilities Authority, and before obtaining its Entrematic industrial HVLS fans, Expo Square sent out a request for competitive bids. Jordan related that even though HVLS fan manufacturers other than Entrematic did place bids, their cost was simply too high. "In one case, the manufacturer recommended not only a cheaper fan model, but it didn't provide the coverage we needed, nor did it meet our key specifications. Entrematic met all aspects of our bid specs and the overall project cost was in line with our budget."

The barns that contain the 20-foot fans feature fans installed down the middle of the structure, which provides sufficient coverage over all of the stalls and out to the barn sides. Jordan remarked that the fans were very easy to install. The 20-foot fans, for example, took between 2 to 2-1/2 hours to install per fan.

During the design process, Jordan positioned the 16-foot diameter fans along the slope of their barn roofs. This provides proper coverage that reaches from the building sides to the center aisle, with plenty of overlap in between. The F-150 and Super Duty barns that contain the 16-foot fans are about 50 feet wider than the other three barns that contain Entrematic fans.

Hanging the fans approximately 19 feet above the floor surface ensured they wouldn't produce any strobe effects. "And with so much dirt trucked in and out of the barns so quickly, it's good to have the fans higher than the lights," Jordan explained. "Should a dump truck raise his bed high enough, I'd rather he take out a light before a fan."



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– Ray Jordan, Project Manager, Expo Square, Tulsa, Oklahoma

The fans are networked to the livestock complex's central building management system, which was installed in the early 2000s. Because Expo Square didn't want to "reinvent the wheel" and bring in a separate control system for the fans, Entrematic included a card in each fan that interfaces directly with the Expo Square HVAC system which also controls air handlers, lighting, etc.

Reversing fans provides added benefit

"We can control the fans network via a central computer or even with a smart phone, which is a huge advantage for us," Jordan said. For example, Jordan can easily reverse the fans as needed to draw air up from the floor level and move it out through the roof louvers while drawing in more outside air from the open sides of the barns.



“The 20-foot fans are only drawing three to four amps each, so the fans overall are nowhere close to being a high energy usage issue.”

– Ray Jordan, Project Manager, Expo Square, Tulsa, Oklahoma

With 19 fans operating so far throughout Expo Square’s Built Ford Tough Livestock Complex, power consumption concerns have not even surfaced as a concern, according to Jordan. “The 20-foot fans are only drawing three to four amps each, so the fans are nowhere close to being a high energy usage issue.”

Jordan said Complex staff, as well as livestock event managers and promoters, are pleased with the Entrematic industrial HVLS fans and how well they circulate air in the barns. “You can definitely feel the air flow no matter where you stand in the barns. The higher-end horse shows feature a lot of decorations, and even though the fans are moving slowly, you can easily notice flower petals swaying in the breeze.”

Next up on the agenda for Expo Square’s Built Ford Tough Livestock Complex is a new race horse stalling barn that’s currently in the architectural design phase. The race horse stalling barn will open in April 2018 and Jordan is looking forward to the fairgrounds’ newest addition. Furthermore, due to all of the benefits that Entrematic fans are providing throughout livestock complex, Jordan revealed that plans even call for industrial HVLS fans in that barn as well.

For more information about Entrematic’s I-Class industrial HVLS fan products and features, log on to www.entrematicfans.com/industrial, or contact us at **866-696-2464**.

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