Aviagen™ Turkeys

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BASIC FAN MAINTENANCE
IMPROVE PERFORMANCE AND LOWER ELECTRICAL COST

GARRETT L. VAN WICKLEN – EXTENSION POULTRY ENGINEER – UNIVERSITY OF DELAWARE

Turkey brooder and finishing barns employ a wide variety of ventilation systems ranging from totally enclosed barns with state-of-the-art tunnel ventilation to naturally ventilated barns that use stir fans. One thing these systems have in common is that providing basic maintenance to ventilation fans can improve their performance, reduce electrical cost, and improve the bird growth environment.

Basic fan maintenance is so simple that many growers don't realize the benefits that some attention can produce. The areas discussed in this bulletin include cleaning fan shutters, replacing worn fan belts and pulleys, and checking the alignment of the fan and motor pulleys. While many growers feel these maintenance points are a waste of time, each of these steps can provide an economic return in terms of improved equipment performance and resulting bird growth.

CLEANING FAN SHUTTERS

Almost all fans have shutters (louvers) that close when the fan is not operating to prevent warm air from flowing out of the barn and light from outdoors from entering the barn. As a fan begins to operate, the pressure from the fan pushes or pulls the aluminum or plastic shutter panels open to allow airflow. It's common in most poultry barns that over time a moist mixture of dust, litter, bird skin debris and feathers is deposited on the shutter surface. A deposit on shutters can significantly increase the shutter weight so that the shutters open less during fan operation.

Propeller fans typically used for poultry barn ventilation are designed to move large volumes of air against relatively low-pressure resistance. A fan shutter that is fully open imparts resistance to fan airflow. ***A fan shutter that is partially open because of a dirty, and therefore heavier, shutter imparts significantly more resistance to airflow.*** Not only does the fan motor have to work harder (use more electrical current) to move air, but ultimately less air will be moved per minute (cfm). That means more electricity is used and less air is moved when fan shutters are dirty or when the fan shutter linkage is not moving freely. Additionally, moving less air will create an environment in the barn that limits bird growth and health.

Many growers think that dirty fan shutters don't really hurt the bottom line enough to matter; they'll clean the shutters when (or if) they have the time. Let's examine a real example our team measured in a poultry barn and attach some costs to dirty fan shutters.

As part of a poultry barn evaluation, the airflow rate of individual fans was tested using a highly accurate testing device. While testing a relatively new 48-inch diameter tunnel fan, we noticed the shutter panels were coated with about an inch of a chalky substance. Before cleaning the shutter, a flow rate test revealed that the fan was moving 12,470 cfm of air and consuming 7.58 amps. Using a simple putty knife, the shutter panels were roughly cleaned in about a minute and the flow rate retested. With cleaner shutters, the fan now moved air at 18,330 cfm and used 6.95 amps. ***Quickly cleaning the shutters resulted in the fan moving 47% more air per minute while using 8.3% less electrical current.***

Is it worth the time to clean the shutters?

Assuming this tunnel fan operates 2000 hours per year, the savings in electricity at 12 cents per kWh would be $36.28 per year for each such fan. Cleaning one fan doesn't appear to save much money, yet cleaning 10 fans would amount to saving $363 per year. Beyond the savings of electricity, the fan motor will operate at a lower temperature, thereby extending its life.

The total benefit of clean fan shutters doesn't end with the modest electrical savings and extended motor life. The 47% increase in airflow rate with several clean fan shutters might be the difference between a tunnel air velocity of 600 feet/minute (fpm) and 400 fpm.

What does that do to bird growth and feed conversion?

While research hasn't been done on turkeys, there has been research done on chickens. While turkeys are definitely not chickens, the resulting trends likely extend to turkey production. Research on chickens done at the USDA-Poultry

Research Lab at Starkville, MS, exposed the birds to 400 and 600 fpm tunnel air velocities over the final 4 weeks of a 7-week flock. Birds exposed to 600 fpm showed a 0.42 lb. weight advantage compared with birds exposed to 400 fpm (7.07 lb. vs. 6.65 lb.). A similar advantage was seen in feed conversion with birds exposed to 600 fpm. If these trends in body weight and feed conversion carry over to turkeys, cleaning fan shutters becomes a worthwhile endeavor.

REPLACING WORN FAN BELTS AND PULLEYS

Many growers are very surprised to learn that fan belts don't stretch. Fan belts wear from their sides and drop lower into the pulleys. As with cleaning fan shutters, many growers don't care that a fan belt is riding low in the pulleys. They will replace the belt as close to its breaking (sometimes after the fact) as possible. This might not be a wise strategy.

What's the difference in a fan belt riding a little over a ¼-inch lower in a pulley as it wears?

It's similar to using a pulley that is ½-inch smaller in diameter. ***That smaller-diameter fan pulley will result in the fan blades turning at a lower speed (rpm) and that will result in approximately 20 percent less airflow per minute from the fan.*** Of course, the motor will still consume the same electricity compared to a fan using the correct-sized pulley. Maximize fan performance by changing fan belts as they wear; don't wait until the belt breaks.

How can you identify a worn fan belt?

The top of the belt should ride slightly above the top of the fan pulley. A worn fan belt will drop down into the pulley so that the top of the belt cannot be seen in the pulley.

Figure 1.
A worn fan belt riding low in the pulley reduces the effective pulley size. This belt should be replaced.

Figure 2.
A new fan belt rides high in the pulley so that the top of the belt rides just above the top of the pulley.

Figure 3.
Front view of a new belt riding slightly above the pulley

Figure 4.
A front view of a worn belt riding low in the pulley

MOTOR AND FAN PULLEY ALIGNMENT

Pulleys on the fan and the motor must be properly aligned. If they are out of alignment, the fan belt will rapidly wear and need premature replacement. It also is likely that misaligned pulleys will cause inefficient transfer of power from the motor to the fan. The diagrams to to the right show correct and incorrect pulley alignment.

Another important alignment problem occurs when the motor is pulled up or down because it is not supported properly on the fan frame. This situation will cause the fan belt to twist and wear prematurely.

The simple use of a straight edge laid flat on the face of one pulley can indicate its alignment in relation to the other pulley. Adjusting pulley position on the shaft can save money on fan belts and produce efficient fan operation.

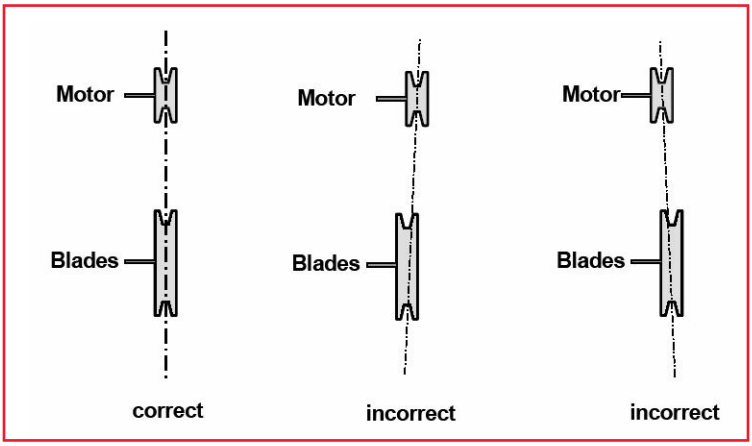

Figure 5.
Correct and incorrect alignment of motor and fan pulleys

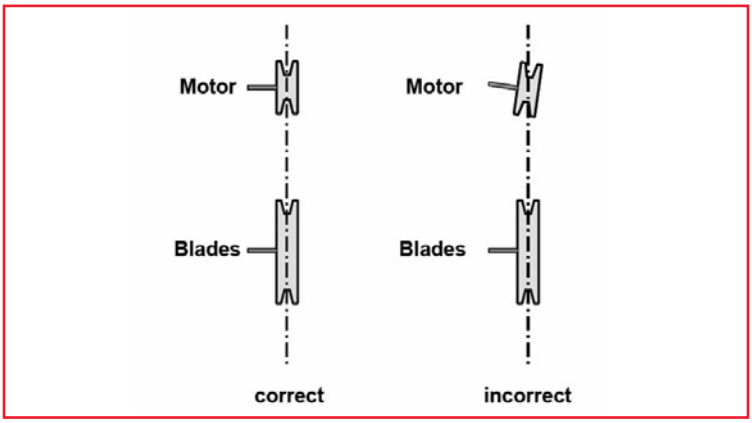

Figure 6.
Correct and incorrect alignment where the motor pulley is pulled up or down

Figure 7.
This fan motor and pulley are being pulled upward because of poor support on the fan frame.

ABOUT THE AUTHOR

Dr. Van Wicklen earned his B.S. and M.S. degrees from the Dept. of Biological & Agricultural Engineering at North Carolina State University and then earned his Ph.D. from Cornell University as a student in the Dept. of Agricultural Engineering. He spent 21 years on the faculty at the University of Georgia Dept. of Biological & Agricultural Engineering, focusing on research in the area of air quality and energy use in poultry and swine housing. He also taught courses in heat transfer and ventilation of animal housing and industrial environments. In 2002, Dr. Van Wicklen joined the Dept. of Bioresources Engineering at the University of Delaware as an Extension Poultry Engineer. His office is located at the Carvel Research & Education Center located near Georgetown, DE, in the heart of Delmarva's poultry production area.

Contributions to this article also made by Michael Czarick – Extension Engineer • Poultry – The University of Georgia.

Aviagen Turkeys Inc.
31186 Midland Trail, East • Lewisburg, West Virginia 24901 • USA
Tel: +1 304 793 2680 Fax: +1 304 793 2684
turkeysinc@aviagen.com

Aviagen Turkeys Ltd.
Chowley Five, Chowley Oak Business Park • Tattenhall, Cheshire CH3 9GA
Tel: +44 (0)1829 772020 Fax: +44 (0)1829 772059
turkeysltd@aviagen.com

Web: www.aviagen.com