The University of Georgia

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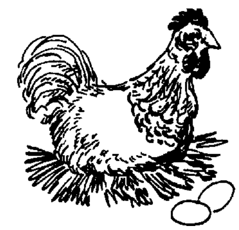

COMMERCIAL EGG TIP...

FAN PERFORMANCE FACTORS

There are three performance factors to consider when purchasing an exhaust fan for a tunnel-ventilated poultry house: air moving capacity, energy efficiency, and air flow ratio. Knowing the air moving capacity of an exhaust fan, at a static pressure of 0.05", helps a grower determine how many fans a house will require. For instance, let's say a grower is going to build an 100,000 bird layer house. To obtain the desired air exchange rate and air speed a minimum of 600,000 cfm of exhaust fan capacity will be needed. If a fan being considered for purchase moves 19,000 cfm at a static pressure of 0.05", 32 fans would need to be purchased. If the fan moved 23,000 cfm, approximately 26 fans would be required.

On the other hand, knowing a fan's energy efficiency rating helps a grower select a fan that will keep operating costs to a minimum. The higher a fan's energy efficiency rating, the lower a grower's electricity bill will be. For instance, selecting a fan with an energy efficiency rating of 22 cfm/watt will reduce fan operating cost approximately 20% over one with an energy efficiency rating of 18 cfm/watt.

The performance factor most likely to be ignored when purchasing fans is air flow ratio, which is just as important as air moving capacity or energy efficiency rating. The amount of air a fan moves decreases as static pressure increases. The higher the static pressure, the harder it is for the fan to draw air into the house and the lower the amount of air moved by the fan. Reduced fan output results in decreased air speed and air exchange rate, leading to increased heat stress related problems. How much a fan's output decreases as static pressure increases varies significantly from fan to fan. One of the best ways to evaluate a fan's ability to move air as static pressure increases is by its air flow ratio. A fan's air flow ratio (A.F.R.) is determined by dividing its air moving capacity at a static pressure of 0.20" by the amount of air it moves at a 0.05" static pressure:

Air Flow Ratio = cfm (@ 0.20") / cfm (@ 0.05")

PUTTING KNOWLEDGE TO WORK

If a fan moved the same amount of air at a static pressure of 0.20" that it does at 0.05", the air flow ratio would be equal to one. If a fan moved 20,000 cfm at a 0.05" and 15,000 at a 0.20" its air flow ratio would be 0.75 (A.F.R. = 15,000 / 20,000 = 0.75). In other words, the fan's air moving capacity decreases by 25% as the static pressure increases from 0.05" to 0.20". Air flow ratios for most fans range between 0.40 and 0.85, which means the output of most fans decreases somewhere between 60 and 15% as static pressure increases from 0.05" to 0.20"

Though a tunnel-ventilated house operating at a static pressure of 0.20" is rare, at times pressure may be much higher than one may realize. For instance, in a tunnel-ventilated house with evaporative cooling pads a static pressure of 0.10" is fairly common. However, the static pressure being measured is only a an indication of the amount of work the fans have to do to pull the air through the pads and down the house. The static pressure does not reflect how much work is required to pull the air through the dusty shutters. This static pressure can only be measured by placing a static pressure gauge between the shutter and the exhaust fan which is next to impossible to do. Research has shown a dusty shutter can add 0.05" or more to the static pressure being read, so the actual static pressure the fans are working against may be over a 0.15" at times.

An added pressure a fan has to work against on occasion that is very difficult to measure is wind pressure. A 25 mph wind blowing directly against fans can increase the static pressure these fans are working against by 0.28", dramatically reducing their air moving capacity. Though this strong of a wind is rare during hot weather, it is important to realize that wind speeds as low as 5 to 10 mph can significantly increase the static pressure the fans are working against. This wind effect can be observed on a windy day. A strong breeze hits a tunnel fan and the shutters on the fan partially close. The wind lets up and the shutters open again.

The advantage of a fan with a high air flow ratio is that as shutters and pads get dirty or the wind starts to blow, air flow will not be affected nearly as much as with fans having a low air flow ratio. For example, if shutters went without cleaning or the wind started to blow on a hot day, air flow may only decrease 10% with a fan that had a high air flow ratio, whereas air flow may decrease 30% or more with a fan that had a low air flow ratio.

It is important to note that there are a number of fans that have a very good air flow ratio but a poor energy efficiency rating. Conversely, there are many fans that have a good energy efficiency rating, but a poor air flow ratio. What is important in a fan is balance. At a minimum a fan should have an energy efficiency rating of at least 19 cfm/watt and an air flow ratio of at least 0.71. But, do not set your sites too low...there are fans that have energy efficiency ratings of 23 cfm/watt and air flow ratios over 0.80.

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County Extension Coordinator/Agent

Consult with your poultry company representative before making management changes.

“Your local County Extension Agent is a source of more information on this subject.”