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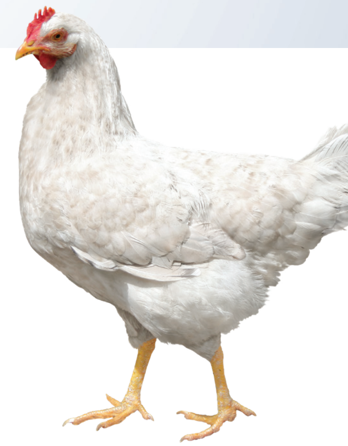

Hot Weather Ventilation for Pullets: Advantage of Combining Light Traps

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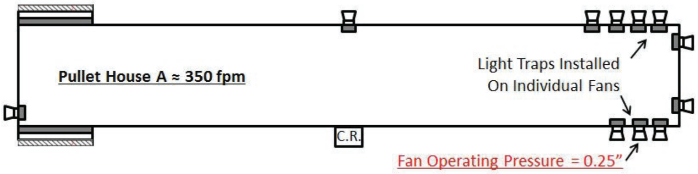
Key Points:

- Analyzing and adjusting light traps can result in significant electrical cost savings each year
- Keep light traps and cooling pads clean
- Do routine fan maintenance
- Further increase system performance and efficiency by combining light traps on tunnel fans into a shared bank

What can be done to older pullet houses to increase tunnel ventilation air speed and lower electricity costs during hot weather? Trying to decide where to spend money on a pullet house can be a real challenge. Consider combining the light traps into a false wall or shared arrangement to improve operating efficiency. Light traps are devices used to keep light out while allowing air to flow through the house. This allows a grower to effectively ventilate the house without disrupting the flock lighting program. Many pullet houses (House A) were constructed using only one light trap per fan in the early days of tunnel ventilation.

While this method of darkening-out a pullet house is effective, it is not the most efficient way to design a house from a ventilation and tunnel air flow standpoint. Most new houses (House B) are designed so that all of the tunnel fans share a bank of combined light traps to improve the efficiency and effectiveness of the system. Let's identify the characteristic differences between the two fan light trap styles and examples of how they perform. Assume all characteristics are the same, except for the arrangement of the light traps on the tunnel fans.



Pullet House A

One light trap per fan arrangement with approximately 350 fpm (feet per minute) full tunnel wind speed with air speed measurements taken in 6 places for a true average. The house is 40’ x 400’ in size with adequate 6” evaporative cooling system and tunnel inlet light traps installed. Notice the total static pressure measurement for each tunnel fan is 0.25” of water column. Light traps are essential to controlling light in a pullet house, but they can drastically reduce fan efficiency and many growers are not aware of the disadvantages light traps have on the ventilation system.

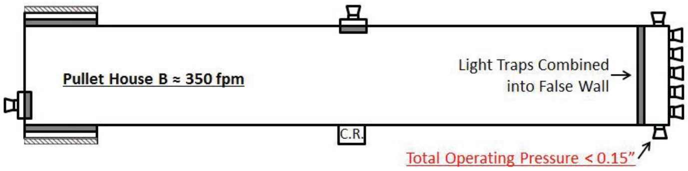
Disadvantage: Since there is only a minimal amount of light trap area installed on each individual fan, each time a ventilation fan is turned on it operates at 0.25” of static pressure. If the light traps become clogged with dust and feathers, static pressures of 0.30” or more can be seen. Raising the pressure the fans work against lowers the operating efficiency of the fans as well as the performance output. This is an inefficient ventilation system design and arrangement. Notice that in order for this house to achieve 350 fpm average wind speed in full tunnel ventilation mode requires a total of 9-50” tunnel fans. The efficiency rating of these fans is 12.1 cfm/watt measured at 0.25” of water column. How much would it cost a grower to operate the fans in this house for the period of one year? Estimating yearly fan run times is difficult and is highly variable based on the number of birds reared, weather, location, and grower management. For this example we will estimate the fans to operate 3,000 hours per year.

Example Calculation: (15,000 cfm) / (12.1 cfm/watt) / (1,000) x (9 fans) x (3,000 hours) x ($0.12/kwh) = $4,016.53. A grower rearing pullets in House A could expect to pay approximately $4,000.00 each year in electrical costs to operate the fans in this house.

What if the grower combined the existing light traps and added the necessary light trap to allow the fans to operate at 0.15” of water column instead of 0.25”? This would significantly increase the operating efficiency of the fans. See the example below.

Pullet House B

Combined light traps into false wall arrangement with approximately 350 fpm full tunnel wind speed. The house is 40' x 400' in size with adequate 6" evaporative cooling system and tunnel inlet light traps installed. Notice the total static pressure measurement for each tunnel fan is 0.15" (actual readings will vary).



Advantage: The tunnel fans using the combined light trap, or false wall arrangement, are operating at significantly lower (approximately 0.10") static pressure compared to the fans in Pullet House A during full tunnel ventilation mode. The advantage here is the fact that all of the fans in the back end of the house are sharing one large bank of light traps. The advantage of Pullet House B's ventilation design allows the fans to operate at much lower static pressures compared to the fans in Pullet House A. As long as the light trap bank is kept clean, the fans should never work against static pressures more than 0.15". When the house is in any ventilation mode that uses less than 100% of the fans behind the false wall, the working pressure will be less than 0.15". For example, if the ventilation level requires only 5 fans to be used, then the operating pressure might only be 0.09" (5 fans are pulling air through a bank of combined light traps designed for 7 fans). Notice also, in Pullet House B the house is designed to use only 7 fans instead of the 9 fans used in Pullet House A. By lowering the operating pressure of the fans by 0.10" (0.25" – 0.15") of static pressure, it only takes 7 fans to achieve 350 fpm of wind speed. Since Pullet House B only needs 7-50" fans, will this reduce the operating cost of the house? Let's estimate the fan electrical costs for Pullet House B.

Example Calculation: (20,400 cfm) / (17.5 cfm/watt) / (1,000) x (7 fans) x (3,000 hours) x ($0.12/kwh) = $2,937.60. A grower rearing pullets in House A could expect to pay less than $3,000.00 each year in electrical costs to operate the fans in Pullet House B.

Summary

Pullet House A uses 9 fans to achieve 350 fpm wind speed and Pullet House B uses only 7 fans, yields the same tunnel air flow of 350 fpm and can save roughly $1,000.00 in electrical cost. The actual cost each grower faces can vary significantly based on hours of operation, efficiency ratings of fans, and electrical cost per kwh. Increasing the electrical cost $0.02/kwh raises the total estimated operational cost of the fan systems about 15% using these examples.

Designing a pullet house ventilation system can be a daunting task and retrofitting one can be even more challenging. Many decisions have to be made and it is hard to decide what will work best in each situation and make good economic sense. What works for one grower might not work for all. If a grower has the resources, he should consider combining light traps and maybe even replacing some fans. It never hurts to weigh the option of moving existing tools to get the optimum performance out of what you already own. Light traps don't use electricity, so adding enough to lower operating pressure and electrical costs pays back a little each time the fan is called to run.

What other benefits do growers see with combining light traps? Growers can do routine and emergency maintenance on fans with pullets in the house without exposing the flock to excessive light and disturbance. Fans shutters and light traps can be cleaned and belts can be inspected and changed, all without having to disrupt the lighting program or the birds or move traps. The convenience of routine maintenance also allows the grower to keep fan operating efficiency and performance at its peak during hot weather months.

There are costs associated with moving fans and light traps into a combined formation and those costs are not calculated into this example. Lumber framing, electrical costs, concrete (if necessary) and labor cannot be overlooked.

Consult your local poultry service representative and equipment dealers for advice on upgrading and retrofitting pullet houses. Visit poultryhouse.com and use the Fan Evaluation Spreadsheet, January 2008 to help you evaluate ventilation fan performance and operation costs.

About the Author:

Dr. Jess Campbell, Extension Assistant Professor, National Poultry Technology Center, at Auburn University. Jess received a BS degree in Poultry Science as well as a doctorate in Educational Leadership from Auburn, and has worked for the University for over 20 years. Jesse maintains the highly educational website, www.poultryhouse.com. His father has raised broilers in North Alabama. Thank you Jess for sharing this information with our QTI Tech Report audience! Campbj1@auburn.edu | 334-844-3546

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