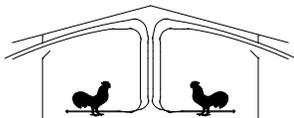




# The University of Georgia

College of Agricultural and Environmental Sciences  
Cooperative Extension



## Poultry Housing Tips

*Why Tunnel Fans with Butterfly Shutters may not be a Good Investment*

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Figure 1. Damaged fans with butterfly shutters

For decades, the “slant wall” fan was the preferred poultry house exhaust fan (Figure 2). Testing found that by simply moving a traditional exterior panel shutter (Figure 4) to the intake side of the fan, the air-moving capacity of the fan was increased five to ten percent. Furthermore, the interior fan shutter location resulted in a reduction in dust collection as well as making it easier to clean than a shutter mounted on the exhaust side of a fan (Figure 3). The slightly slanted fan housing protected the fan motor and components from the rain as well as facilitating the draining of any moisture that collected in the bottom of the fan housing. For decades, tens of thousands of slant wall fans were installed in tunnel-ventilated houses and little if any problems were reported.

The only aspect of the slant wall fan that producers occasionally took issue with was the shutter. Though it was easier to clean than one mounted on the exterior of the fan, it still required frequent cleaning when the fan was being used for tunnel ventilation during hot weather. Furthermore, when being cleaned the shutter blades were often damaged or bent which resulted in the fan shutter not fully closing when the fan was not in use. In partial response to these concerns the “butterfly” shutter, also referred to as a “damper door,” fan was developed (Figure 5). A butterfly shutter typically consists of two large semi-circular pieces of galvanized sheet metal installed on the exhaust side of a fan. The two shutter blades are connected to the fan housing with a vertical hinge and pulled closed through the use of a spring. When fully opened, the two large shutter blades offer minimal resistance to air flow which results in a small increase in the air-moving capacity of a fan when compared to the same fan equipped with a interior shutter. Most importantly, the vertical installation of the shutter blades means that when dust collects on the shutter blades, the additional weight does not affect the opening of the shutter as it does with fans with horizontal shutter blades. Since the accumulation of dust on the butterfly shutter blades does not adversely affect the

air-moving capacity of a tunnel fan, producers are ensured that the maximum air-moving capacity of their fans, and therefore bird cooling, will be maintained over the course of a summer with little or no fan maintenance required. Since the exterior butterfly shutters protect the fan motor and components from the rain and the shutters are mounted vertically, the slanted/tilted housing is not required. Due to the improved performance of fans with butterfly shutters and the fact that they are very easy to maintain they have replaced the traditional slant wall fan as the preferred style of exhaust fan for poultry houses. But, butterfly shutter fans are not without issues.



Figure 2. Slant wall housing



Figure 3. Interior shutters of fan with slant wall housing



Figure 4. Exterior shutter



Figure 5. Tunnel fan with butterfly shutters



Figure 6. Interior view of butterfly shutter fan

One of the most significant underappreciated advantages of a traditional slant wall fan over a butterfly shutter fan is that most of the fan and its components are essentially installed outside the house. The only component that is constantly exposed to the environment within poultry house is the aluminum or plastic fan shutter; the remainder of the components are only exposed to poultry house air when the fan is operating. With a butterfly shutter fan the fan orifice, motor, blades, shutter blades and drive components are in the house 24 hours a day, 365 days a year (Figure 6). Having a piece of equipment constantly exposed to the environment in a poultry house is not necessarily a problem. After all feeders, drinkers, heaters, etc. are exposed to the poultry house environment and though they may become dirty they can last decades in a house. But, an exhaust fan is different, because it simultaneously inside and outside a house.

During cold weather, moisture will quickly condense on any cold surface and the coldest surfaces in a poultry house are typically the exhaust fans. This is because fans are typically constructed of metal, and metal is a conductor of heat. Since the fan is essentially both inside and outside a house it acts like a bridge, quickly transferring heat from inside the house to outside, often leaving the interior fan surfaces just a few degrees above the outside air temperature. Under typical poultry house conditions it is important to realize that a surface need only be approximately ten degrees cooler than the ambient air temperature for condensation to begin forming. The colder it gets outside, the more humid it is inside, the greater the amount

of condensation produced. As a result, condensation will be present on an exhaust fan nearly any time the outside air temperature is below 50°F. This which means of course that on many farms the exhaust fan shutters and or housings will remain wet or at least damp a substantial portion of the winter.

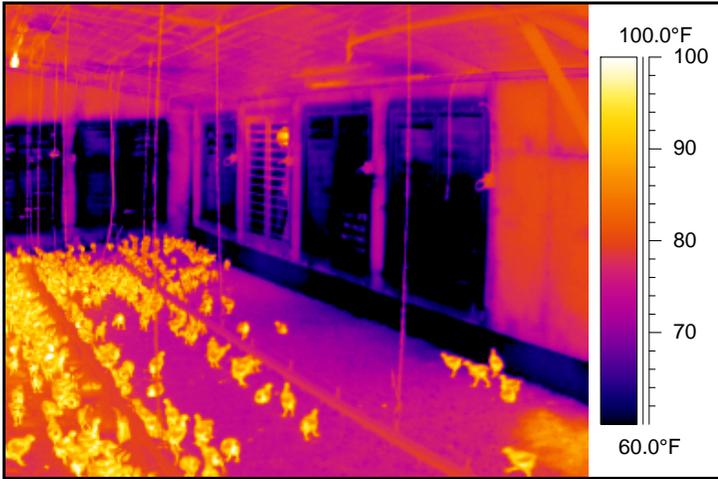


Figure 7. Cold slant wall fans



Figure 8. Condensation forming on fan surface



Figure 9. Condensation formation on fan surfaces and components



Figure 10. Condensation formation on fan surfaces and components



Figure 11. Rust on fan with butterfly shutters

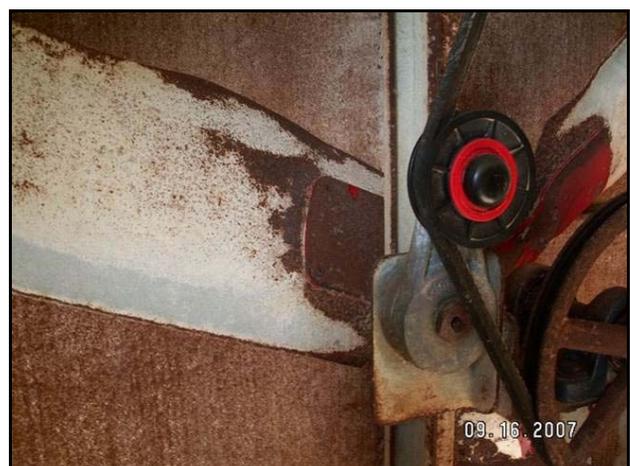


Figure 12. Rust on butterfly fan components.

As we know, moisture and metal are not a desirable combination. Though it is true galvanized metal is less prone to rust than untreated metal, galvanization does not totally protect metal from rust, especially in the presence of ammonia. Ammonia and/or moisture alone isn't necessarily a problem, but when both are present rusting can become a serious issue. It is not just aerial ammonia that we must be concerned about, but ammonia that is in the dust and litter that often cover uncleaned exhaust fans that can accelerate the rusting process of any moist surface.

With a traditional slant wall fan, condensation primarily forms on aluminum or plastic fan shutters which are not susceptible to rust. But with butterfly shutter fans condensation can and will form on essentially all the fan's metal surfaces and components, making them extremely susceptible to rusting (Figures 8, 9 and 10). There are an increasing number of reports from producers of serious rusting issues with butterfly shutter fans. Moisture collecting on fan motors and bearings has led to significant reductions in motor and bearing life on a number of farms. The problems have been significant enough that many producers have had to replace fans that are less than ten years old (Figure 1) and some integrators are no longer allowing fans with butterfly shutters to be installed in new housing.

Some have attributed the rusting to factors such low-quality metal, litter treatments, and/or the use of disinfectants. The rusting is unlikely a result of the quality of the metal. Rusting has been noted among fans from various manufacturers. It is seen just not on the sheet metal but metal pulleys, frames and motors. Nor is rusting likely due to the use of litter treatments. Some of the most significant rust damage has been seen in breeder houses where litter treatments are not used. Furthermore, litter treatments are not typically used in the nonbrooding end where tunnel fans are typically located. It isn't likely due to the use of disinfectants due to the simple fact that disinfectants are rarely used in most poultry houses in the U.S. It's not that these factors couldn't be responsible in part to the rusting issue, but rather it comes down to the simple fact that when you combine moisture, metal and ammonia you have a good breeding ground for rust.



Figure 11. Butterfly shutter fans with cover

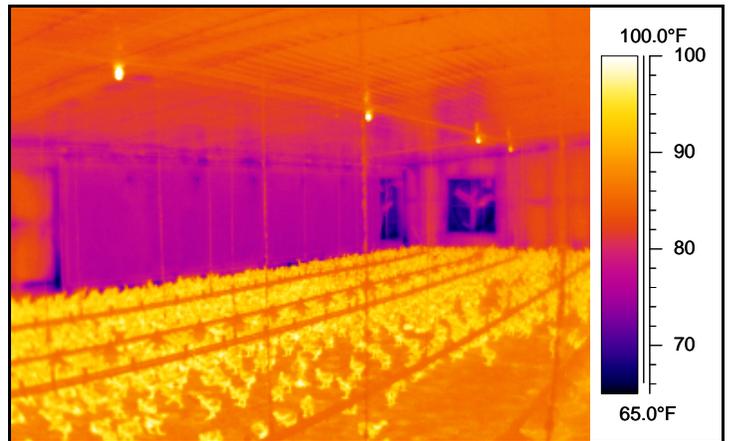


Figure 12. Thermal image of insulated fan cover

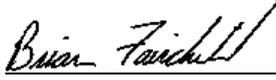
Just because you have fan with butterfly shutters doesn't necessarily mean that you will have a serious rusting issue. There are plenty of 10-year-old fans with butterfly shutters still in use. But these fans are more prone to rusting than traditional slant wall fans and to maximize fan life there are things you might want to consider:

- 1) Clean your fans regularly. Just because the shutters don't have to be cleaned to ensure that fan performance isn't adversely affected doesn't mean the fan doesn't need to be cleaned. The dust that collects on fan surfaces can hold moisture and ammonia which will lead to rust.
- 2) Do not let litter collect in the bottom of the fan housing (Figure 10). The horizontal bottom housing on many fans with butterfly shutters tends to collect litter and dust. Condensation forming on the fan tends to run down and mix with the litter and dust, forming a potentially corrosive slurry that may lead to the rusting out of the bottom of the fan.
- 3) If possible, cover the fans that you do not normally use during cold weather (Figures 11, 12).

- 4) If you are windrowing litter make sure you ventilate to keep moisture and ammonia from building up to excessive levels.
- 5) Ventilate enough during cold weather to keep the relative humidity to a minimum. This will not only help to maximize the life of your fans, but will help to keep your birds healthy as well.

If you're looking to purchase a fan with butterfly shutters and you live in a climate where condensation is a common problem, you may want to consider a fan with housing constructed of fiberglass and/or polyethylene. Though the fan will have a higher initial cost than one with a galvanized sheet metal housing, in the long run it may be well worth the additional investment. Another option would be to purchase a traditional slant wall housing. Though the fan will require more maintenance, it may prove to be a small price relative to having to replace the fans before they have been paid for.

  
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