

Poultry Engineering, Economics & Management

Newsletter of the

National Poultry Technology Center, Auburn University

***Critical Information for Improved Bird Performance Through Better House
and Ventilation System Design, Operation and Management***

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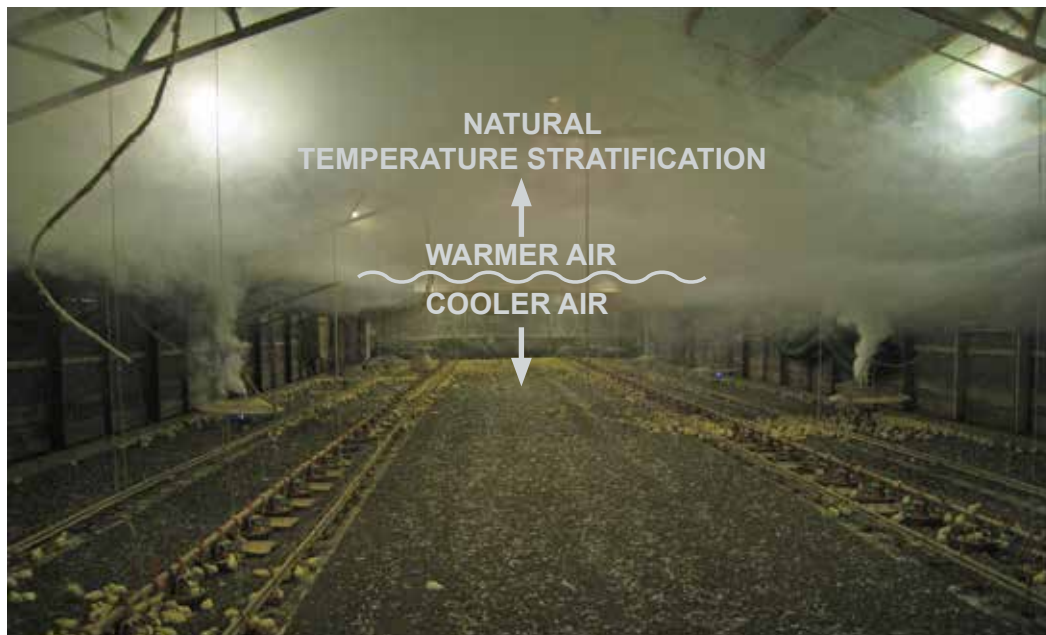
Benefits of Recirculating Fan Systems

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Recirculating fans (aka: stir, ceiling, or mixing fans) have been used in poultry houses for many years to improve in-house growing conditions and save on fuel during cold weather, especially during brooding and preheating. This concept of mixing air is simple, straight forward, and a very effective way for a grower to save money in winter without sacrificing production performance. These systems are not new to the industry and countless growers have realized the benefits of their use. However, we still get questions about how to get the most benefit from recirculating fans. Here are some tips we feel are most helpful.

What are the benefits associated with recirculating fan systems?

Reduced Temperature Stratification: Warm air rises and cold air falls. When the heaters are turned on to preheat the litter to approximately 90°F, average temperatures at the ceiling (measured away from heaters) during preheating and brooding are often much higher than floor temperatures. The level of stratification increases with heater run time. While the goal is to heat the floor, many growers don't realize how much valuable heat rises to the ceiling in the process. Recirculation fans repurpose this residual heat, moving the warmer high-level air to floor-level where it is needed, thus reducing the stratification. Whether a house uses convective or radiant heating systems, proper use of recirculation fans in nearly every case results in cost



Smoke emitters are used in this picture to illustrate what happens to residual heat from brooders during preheating and brooding. Even with the most efficient radiant heaters, much of the heat produced eventually rises to the ceiling away from the chickens. Every effort should be made to recapture this lost heat and make use of it at bird level.

During ventilation cycles, proper minimum ventilation displaces this stratified air, driving it toward the floor. Between ventilation cycles, the only way to recapture stratified heated air and improve temperature uniformity in the house is with stir fans. The goal is to heat and condition the bottom 12 inches in the house – that is where the money is made.

savings from less heater run time and lower fuel use. Most growers using recirculation systems realize enough fuel savings in winter alone to justify the installation and operating cost. Please understand this does not suggest lowering heater or minimum ventilation settings by using recirculation fans. They are to be used as a supplement to the existing company program.

New solid wall houses that are tight and well insulated and located in warm climates growing large birds show less of a fuel saving benefit (potential 5-10%) but have the potential for performance improvements. Older high ceiling houses with side wall curtains with substantial air leaks and very little or no insulation in cold climates growing small chickens have higher fuel saving benefits (potential 25% and higher) and better performance potential, as well.

Increased Floor Temperature Uniformity: Floor temperature uniformity and consistency promotes chick movement throughout the house and promotes adequate feed and water intake during early stages of the growout. Houses that use recirculating fans have more even floor temperatures throughout the house when compared to houses without them. Mixing in-house air keeps cold air leaks from sitting on the litter and drafting chicks during brooding adjacent to their entry points and near feed and water lines.

In curtain sided houses without recirculation fans, growers can find it difficult to achieve and maintain desired floor temperatures at the feed and water lines in winter without burning excess fuel, and may see floor temperature differences of 30 degrees F or more. Recirculation fans work best in these types of houses, in many cases reducing the floor temperature variation range to 5-10 degrees F along feed and water lines.

Solid wall houses have the most trouble in the front half of the brood chamber near the end wall doors and tunnel inlet curtains or doors, primarily because of air leaks. This is where non-uniform floor temperatures are often found in modern houses, and as a result, heating zone 1 almost always runs more than the other zones during brooding. Recirculation systems can help reduce floor temperature problems and excess heater run times if used properly in cold weather. The correct approach is to stop all possible air leaks first, then stir the air.

Improved Litter and Air Quality: Recirculating fans can improve litter quality by continuously circulating warmer air along the floor between minimum ventilation cycles. In essence this increases the moisture removing capability, which is the primary goal of minimum ventilation. Recirculation fans are a great way to supplement the existing minimum ventilation program. Drier litter produces less cake that has to be removed between flocks, along with associated labor and equipment to remove it, and reduces the environmental impact of the farm. Litter quality sets the stage for air quality, and typically houses with good litter have good air quality, as well.

What type of recirculation fan do I need?

Most high ceiling exposed truss houses use a paddle type fan similar to a ceiling fan in a home. These fans are placed about 9 feet or more from the floor under the ceiling peak and spaced evenly down the house between the ceiling-mounted air baffles. It is recommended to use a fan that is designed by a reputable manufacturer for use in poultry houses. Consumer type paddle fans usually don't last very long in poultry houses. These fans should be set to blow air up toward the ceiling and out toward the walls. See the example layout on page 3 for more details.

Dropped insulated ceiling houses have two choices for recirculating fan systems. The most common are 18- to 24-inch basket fans. These fans are housed in a wire basket for protection and some come with fan speed options. These fans usually cost around \$100 each. Basket fans with a more open wire basket are preferred because of the amount of dust that collects on the wire cage. These fans are typically mounted down the center

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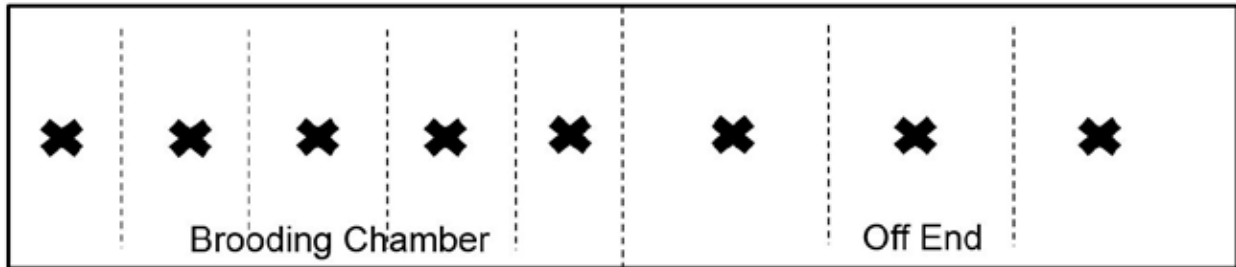


Here are two examples of the most common and cost effective recirculation fan types used in poultry houses. Basket fans (at left) with a more open wire cage design are common in dropped ceiling houses. These are low powered fans blowing air parallel to the ceiling. Paddle fans (at right) are used in high ceiling houses in the up-blowing mode. Fans shown for illustration purposes only and not brand specific.

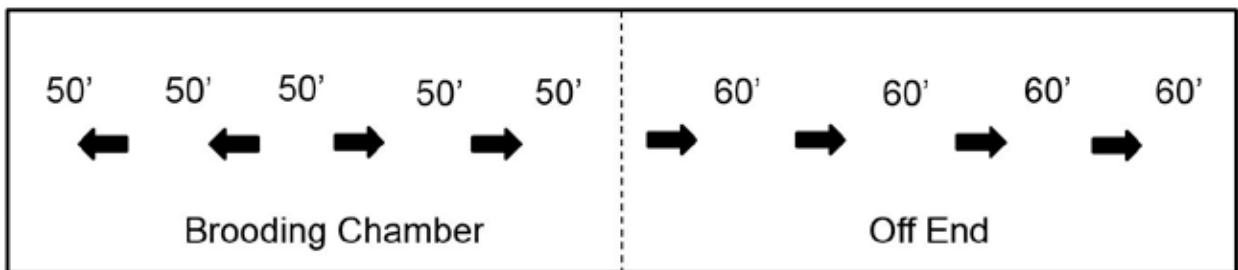
Example layouts for recirculation fans

Dimensions are for educational purposes only. Actual dimensions and layouts should be coordinated with your live production service representative or housing coordinator. Alternate layouts, fan directions, and operation are acceptable.

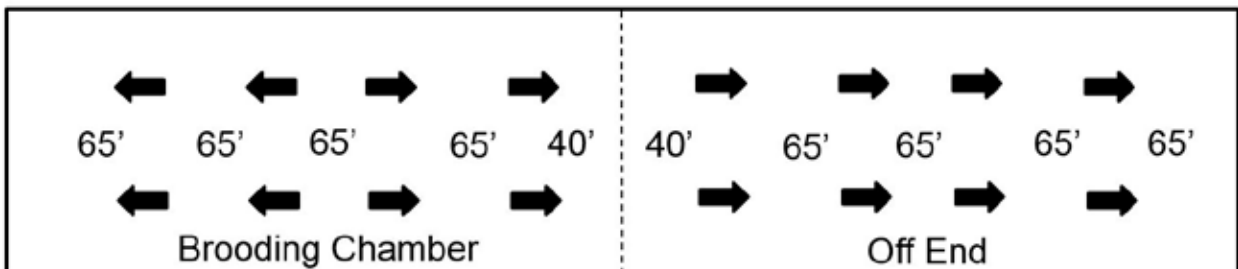
High Ceiling House with Tunnel Curtain Baffles – Paddle Type Fans



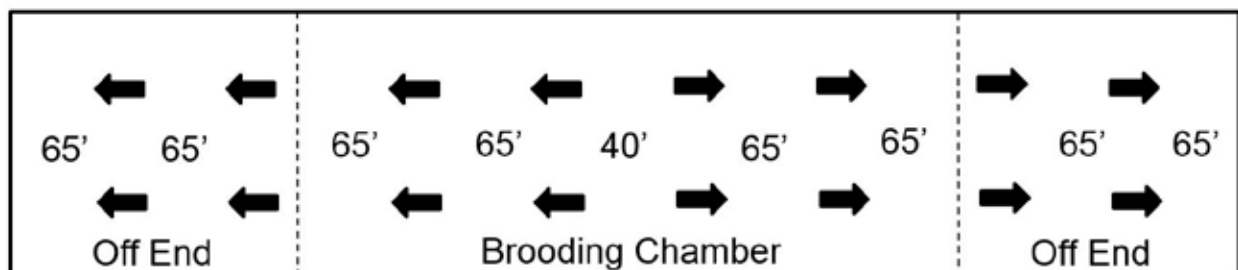
40x500 - 50x500 Dropped Ceiling House - Basket Fans



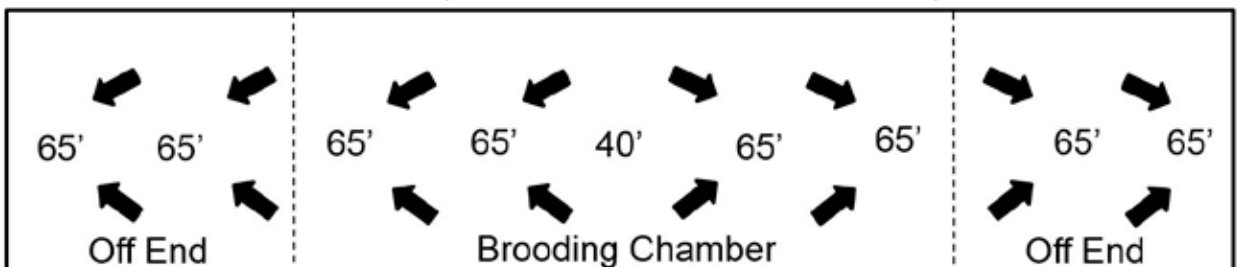
54x600 - 66x600 Dropped Ceiling House - Basket Fans (racetrack arrangement acceptable)



54x600 - 66x600 Dropped Ceiling House - Basket Fans - Center Brood



Alternate 66x600 Dropped Ceiling House - Basket Fans pointed 45 degrees toward middle



of the house on 50- to 70-foot spacing. The second choice is to use an orifice type fan or panel type fan that is more powerful, but more expensive. Since they are more powerful, it is recommended that they be installed on a speed control. The exact location of recirculating fans take priority after lighting, heating, and other equipment is installed. Some suggested layouts are shown on page 3.

When and how should recirculating fans be operated?


Recirculation fans are recommended to be used at least during preheat and brooding. This is when their use provides the most benefit to the chickens and producer. Once the birds are generating enough body heat and cause exhaust fans to operate continuously at night, the recirculation fans can be turned off. The simplest way to operate them is to turn them on at the start of preheat and let them run continuously until there is no need for them. They can be operated to come on by a thermostat or timer and some prefer to operate the recirculation fans only between minimum ventilation cycles operated by the controller. This allows minimum ventilation air to be preheated and mixed adequately with the stratified heat before it reaches the litter and chicks. This may be necessary in cold weather. There can be several acceptable ways to use recirculation fans so find what works best for your operation. The goal is to achieve and maintain temperature uniformity at floor level.

Recirculation fan air should never be directed onto the chicks, but should be pointed slightly to the ceiling in dropped ceiling houses and upward in high ceiling houses. Some basket fans may need to be securely fastened so they do not point down when they are turned on.


Growers with 66-foot wide houses have some unique problems to deal with when it comes to winter ventilation. The width of these houses often makes conventional ideas of ventilation and airflow used in older style houses less effective. This fact makes innovation a necessity and trial and error is often where that starts. Fans in wide houses can be turned 45 degrees toward the middle of the house. This causes fans to “wipe” the peak of the ceilings, more effectively mixing the hot air found near the center peak. If you are not currently satisfied with your existing fan setup, we recommend trying one existing house in this arrangement to see if it helps improve litter and growing conditions before making the change in every house. This method may not be for every grower or every house, but it might help some growers maintain drier sidewalls.

Bottom Line


One of the most effective tools to improve in-house conditions to improve flock performance and save fuel, especially in an older house, is the use of recirculation fans. The payback for the typical system is less than 1 year in an older house (with potential fuel cost savings of 25% or more) and only 3-4 years in a modern house (with potential fuel cost savings of 5-10%). If you are experiencing high fuel bills and wet floors and seem to have trouble keeping up during winter growouts, a recirculation fan system might help. Contact your poultry company representative for alternate fan designs, layouts and additional methods of operation that might work best for your specific operation and location.

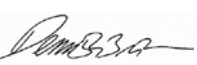



Our mission: To improve the bottom line profitability of the live production sector of the US poultry industry by providing timely applied research and education, resulting in increased efficiencies in housing, equipment, energy, and environmental control.





The *Poultry Engineering, Economics and Management Newsletter* provides up-to-date information on topics of interest to poultry production personnel, focusing on most effective and efficient uses of modern technology and equipment, with a special emphasis on economic implications. The Newsletter is published as needed to address issues of concern to the industry. Contact: Jess Campbell, National Poultry Technology Center, 226 Corley Bldg., Auburn University, AL 36849-5626, (334) 844-3546, fax (334) 844-3548, jesscamp@aces.edu. The NPTC team:


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