The *Poultry Engineering, Economics & Management*
NEWSLETTER

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

National Poultry Technology Center, Auburn University,
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Get Ready for Winter! The Five-Step Program

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Fall is here and winter won't be far behind. This time of year every poultryman begins to think about keeping birds over the winter. With the highest fuel costs on record and high feed costs, the economic outlook for the poultry industry is not good this year. We get lots of calls and inquiries looking for the magic bullet that will reduce heating costs. The fact is that there is no one single thing we can do to minimize fuel cost. In hard times, often doing the best with the resources we have at hand is our best management philosophy. In today's energy economy when you wisely spend money on energy reduction practices it usually is a very good investment and pays back in less than two years.

There are five relatively inexpensive fuel-saving steps we tell folks to look at when they ask where they should focus their time and resources to reduce energy consumption and keep bird performance up. These steps are not new and not particularly high-tech. They are the basics. Remember that doing a good job in keeping costs down in poultry production is similar doing a good job coaching a football team. Successful programs usually start with a good understanding and application of the basic principles. Here is our list of basic steps you need to take (if you have not already) to tackle your runaway energy costs. (To get the details, go to www.poultryhouse.com to pull up the newsletters referenced at the end of this newsletter.)

Step 1. Tighten the house – Stop air leaks

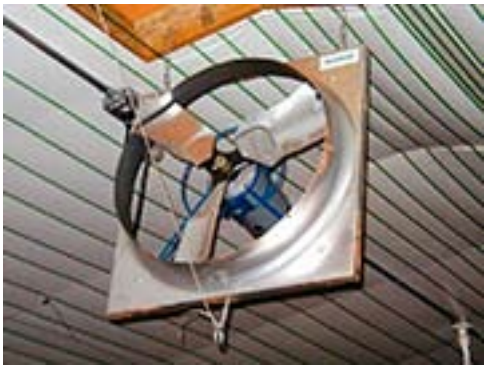
Air that bypasses the ventilation air inlets and comes in through cracks, holes, etc. spoils environmental control of any poultry house. A house that cannot achieve a 0.12 - 0.15 inches of water column during a house tightness test must burn unnecessary energy and fuel to maintain the target environment for the bird. Common voids that allow air infiltration into the building envelope are: loose sidewalls; loose tunnel inlet curtains; voids between carpenter joints; voids between lumber walls and concrete footings; cracks around end wall doors; cracks around access doors; sidewall or ceiling vent inlets that hang loose; damaged fan shutters; holes rusted in outside wall metal; and holes in the dropped ceiling material. Maintaining a tight building envelope around the birds is of utmost importance. Making serious adjustments tightening the building envelope of a house that tests below 0.09 inches of water column can save 25% on heating fuel costs.

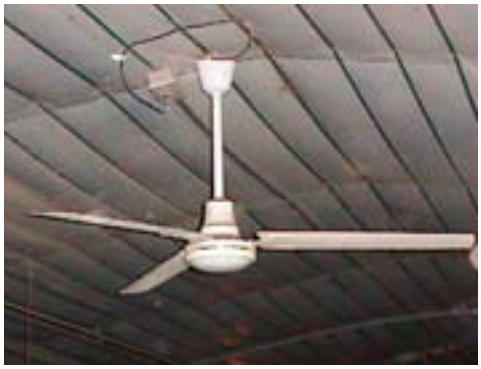
Smoke does not lie. One of the best tools for diagnosing a poultry house for tightness is to test with smoke. Place the house under 0.10 inches of static pressure and smoke the exterior. Incoming smoke shows where air leaks will occur.

Just because a house is new – like the one in this photo – does not mean it is tight. Air infiltration in loose poultry houses causes ventilation systems to run overtime, which costs growers lots of money.

Step 2. Stir the air

There have been so many good newsletters written about using stir fans to cut fuel costs in heated poultry buildings that it is hard to understand why folks don't seem to get the message and so many houses in the poultry belt don't have them. Stir fans can be used on new or old poultry farms to produce a sizeable fuel and production benefit for the grower.





Stir fans can significantly cut fuel use and improve bird performance in both old and new houses. Many variations exist. Axial fans are most recommended for low ceiling houses. Paddle fans are used successfully in high ceiling houses. Newer houses can typically get around 10% in fuel savings; older houses may see as much as 25% savings.

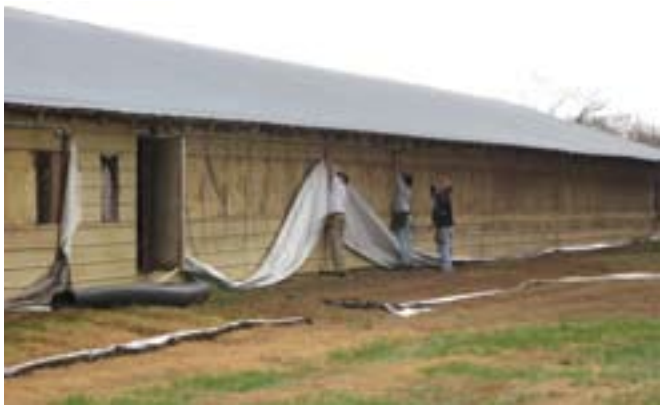
In non-engineering terms here are the basic facts about stir fans: Without stirring, air stratifies; that means hot air rises and cold air falls, so most of the warm air will concentrate in the top center of the house. We are basically heating the poultry house from the top down. Good ventilation management in a tight house, with vent doors throwing the outside cool air to the top of the house certainly helps reduce stratification. However, especially in older houses and even in new houses there is more stratification and need for stirring air than the vents can accomplish. This is especially true during minimum ventilation when air flow is at the lowest. Aggressive stirring of the air reduces stratification, promotes uniformity, makes for a drier house and causes the brooders and heating devices to run less.

How much do stirring fans help? Study after study after study shows stir fans in newer houses can save about 10% on fuel in newer houses. Older houses can see as much as 25% reduction in fuel costs. The taller the house the more benefit to using stir fans. If you have a house with no air inlets (curtain crack ventilation) or very poor air inlet air profiles, the stir fan is the best single band-aid you can place on your house.

We like to see folks using one-third to one-fourth horsepower axial fans (such as shown in the photo above) in smooth ceiling houses. These fans should be slightly tilted up to wash the heat off the ceiling. There are many different ways to run stir fans. Some would recommend them be run continuously, others would alternate them with the opening and closing of the vent doors. There may not be one correct answer to that question but it should be decided on a house to house basis. In high ceiling houses the paddle fan is the stirring device of choice because of the baffles that have been installed.

Step 3. Wall up and insulate

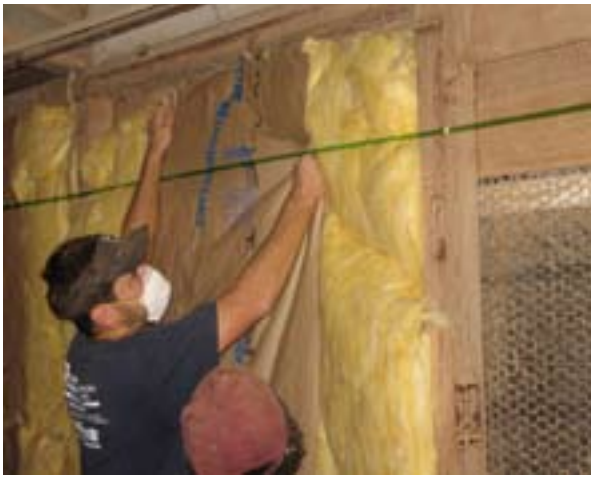
People that are serious about saving money on fuel convert their buildings to solid sidewall. Using solid walled buildings drastically cuts down on the amount of heat lost through conduction. Insulation is installed in or on the surfaces of the building to prevent the transfer of energy through the surfaces of the building. There are several methods that can be used to achieve a true solid sidewall that is air-tight and well insulated. Insulation value is measured in (conductive) R-values. The higher the R-value the better the insulation is at preventing heat transfer through the material. Typical (conductive) R-values of materials in poultry buildings are as follows: Curtain material = R-1; 2-inch dimensional lumber = R-2.5; 1-inch board insulation = R-5; 3.5-inch fiberglass batt = R-11; 6-inch blown cellulose = R-19; 1-inch spray foam = R-5; and bubble wrap = R-1. The first few points in R-value will yield the quickest paybacks.



A good rule of thumb is that when you increase the R-value of a material from R-1 to R-2.0 you essentially cut the heat lost through that material by 50%. When you go from R-1 to R-8 you cut the heat lost by 85%. New

Serious energy savings can be realized by replacing curtain walls with insulation. Sometimes, as shown in this photo, curtains are put back up on the outside and nailed in place until money for tin is in the budget.

construction specifications for poultry buildings commonly call for R-11 or R-19 sidewalls and R-19 to R-21 ceiling insulation. A grower that does a good job tightening and insulating the entire building envelope and goes from a loose, R-1 curtain sided house to an well tightened R-11 sidewall and R-19 ceiling could see a 50% reduction in fuel costs.



There are many ways to insulate sidewalls. One of the best methods is to add a 3-inch fiberglass batt between existing posts, as shown in this photo. Wall R-value increases from R-1 to R-11, drastically reducing the amount of heat lost through sidewalls.

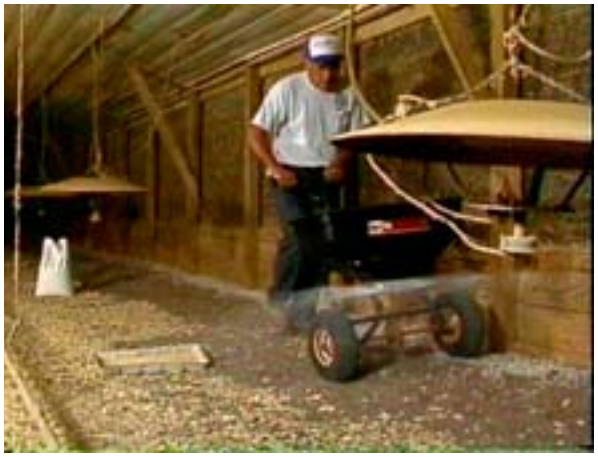
Step 4. Treat the litter

If you have been around the poultry business very long you certainly know how bad high ammonia concentrations are for birds, and especially for chicks. Ammonia concentrations above 50 ppm are often seen in broiler houses and the typical excuse for this is that fuel costs are too high and the grower cannot afford to ventilate because of gas costs. The fact is, to do a good job raising poultry our upper limit for ammonia concentration should be 25 parts per million. Most folks don't realize that the loss in bird performance actually costs more than the value of the gas, but that is another item that is hard to get across to the man who is paying the gas bill.

Years ago when propane was cheap, if we had high ammonia, we ventilated to improve air quality. Today we are growing birds on built up litter (manure that generates ammonia) and fuel is very expensive. It is difficult to ventilate enough to get good air quality with respect to ammonia.

Chemical litter treatments, when applied at the correct rate and timing, inhibit ammonia by stopping its formation until the chemical is depleted. Chemical litter treatments allow us to ventilate at significantly lower ventilation rates, thus concentrating only on moisture removal and not worrying about ammonia. There is a high pay back to properly using a litter treatment, but still some folks don't seem to get it.

Here are the facts about the value of a litter treatment on a typical house with built up litter: A house with no litter treatment, 30% minimum ventilation rate, 90 seconds on 210 seconds off. House with litter treatment, built up litter, ventilation rate 30 seconds on, 270 seconds off. Depending on the difference in temperature between outside and inside it is very easy to calculate the value of the gas saved. In a typical 40 ft x 500 ft house with a 40 ft x 250 ft brood chamber the cost to treat the brood chamber with a typical litter amendment is $200.



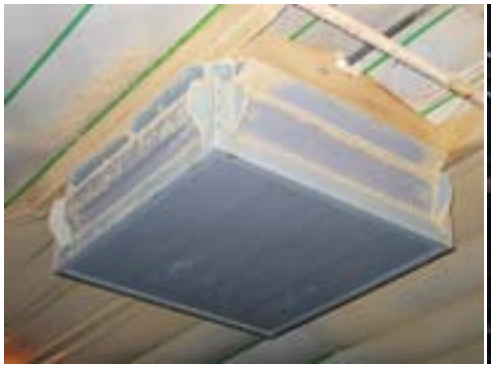
The economics of litter treatments are pretty simple. Without a litter treatment, the ventilation rate is controlled by ammonia level. With litter treatments, we need to ventilate only to manage moisture. Lower ventilation rates mean less cold air being brought into the house, thus lower fuel use.

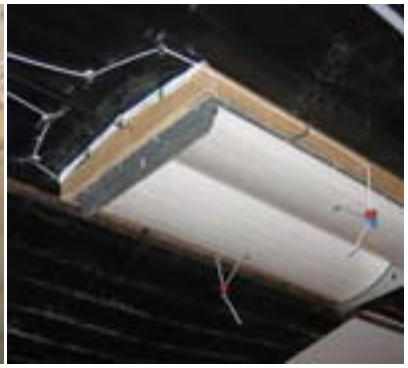
The value of the reduced ventilation rate depends on the inside-outside temperature differential, but typically ranges from $400 to $600 for the brood period in cold weather.

It is an absolute no brainer to use the litter treatment for fuel savings. In addition, litter treatments provide improved conditions that contribute to better bird health in other ways; the value of these benefits is not included in the above figures.

Step 5. Install solar attic inlets

Test results have documented that approximately 20% fuel savings can result from installing solar heated attic inlets. Poultry house roofs and attics in dropped-ceiling houses are excellent solar heat collectors, which can provide preheated incoming air for house pre-placement heating, brooding, and minimum ventilation. One-year paybacks have been documented using these inlets. Solar attic inlets also provide significant additional benefits: reduced in-house relative humidity, improved litter conditions, increased ventilation rates, and improved bird performance. Properly managed attic air inlets will continue to yield payback to growers with reduced fuel costs as long as the sun shines. Note that these inlets should only be installed in houses that can achieve a static pressure of 0.10 inches of water column during a house tightness test. They will be ineffective in a loose house. Growers





Using attic inlets to provide pre-heated bird chamber air can save as much of 20% of yearly gas costs. Photos show a gravity-type attic inlet (at left) and a controller-actuated inlet (at right). Houses must be tight and attic inlets managed properly to avoid allowing moist, warm in-house air to get into the attic.

should also be cautioned that if these inlets are misused and allow warm moist in-house air to enter the attic of the house in cold wintertime conditions, then harm may be done to the metal, ceiling insulation, and structural trusses resulting in severe damage to the structural integrity of the house.

To get with the program, go to www.poultryhouse.com

We are still about two months from cold weather in most of the poultry belt, so there is time to take the steps needed to manage winter fuel costs. Below is a list of the most significant winter ventilation and fuel reduction newsletters we have done, available free at poultryhouse.com.

#54 – July 2008 – Attic Inlet Technology

#53 – May 2008 – Economics of Converting to Natural Gas

#52 – March 2008 – Energy Auditing Your Own Poultry House

#46 – March 2007 – Controlling Sidewall Energy Losses

#44 – November 2006 - Winter Maintenance: Setting Priorities

#43 – September 2006 – Poultry House Energy Retrofits for Fuel & Cost Savings

#34 – March 2005 – Problems With Blown-in Insulation in Dropped Ceiling Houses

#13 – September 2001 – Paddle and Recirculating Fans – A Progress Report

#12 – July 2001 – Solid Sidewalls for Broiler Houses?

#11– May 2001 – Where Insulation Counts Most for Fuel Savings

 # 9 – January 2001– Renovating or Retrofitting Older Broiler Houses

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