

# *The Poultry Engineering, Economics & Management* **NEWSLETTER**

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

Auburn University, in cooperation with the U.S. Poultry & Egg and Alabama Poultry & Egg Associations  
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## **Energy Auditing Your Own Poultry House**

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Every poultry grower knows that the costs of propane and electricity are increasing steeply. The question is, what can a grower do to keep energy costs from eating away all farm profit? Fortunately, there are some answers to this question. When energy prices are rising, growers have three good alternatives to reduce costs:

First, we need to do all we can to be sure that we are buying our gas at the lowest possible price.

Second, we need to do all we can to reduce the amount of energy needed to operate our houses; that is, take steps to improve energy efficiency and reduce consumption.

Third, we should consider whether alternative fuel heating systems or alternative sources of energy could reduce utility bills without sacrificing bird comfort.

Following is a 9-point Self-Assist Energy Audit Checklist to help you make sure you are doing all you can to reduce your energy costs and maintain profitability.

### **1. Buying Gas**

Have you looked into alternative methods of buying propane as a way of controlling cost? There are four main methods of buying gas: group contracting, pre-payment, bulk purchasing, & buying as needed.

Group purchasing permits a group of growers to negotiate a contract price, generally under more favorable pricing terms, by "booking" a large quantity of propane well in advance of cold weather. These cooperative booking arrangements have been very successful in reducing propane expense in several geographical areas.

Pre-payment is simply borrowing under simple loan terms to pre-pay for a specific quantity of gas over the next several months. Typically, this may secure a much lower gas price, with the only additional costs being an interest charge of 2-3 cents per gallon.

Bulk purchasing in advance of need can also secure a lower price. However, installing large tanks imposes a high initial investment cost. Other drawbacks include the risks entailed in physically taking possession of large quantities of gas, having to pay for it when delivery is made, complex permitting regulations in some areas, and new Homeland Security on-site inspection and reporting requirements.

Buying gas as needed on the open market places the grower at the mercy of the market, and in a climate of continually rising prices, usually ends up costing the grower more than the other methods.

**If there was just one single practice that could be applied to an older poultry house to save money it would be the installation of stirring fans. Depending on the age and tightness of the older house where they are installed, gas consumption might be reduced by as much as 25%. In addition there are many production and performance benefits associated with the addition of stirring fans.**



## **2. House Tightening**

Is your house air-leaky? If you run approximately 20,000 CFM of air in a house with all inlets, doors and windows completely closed and you read the static pressure and you are in the single digits, your house is costing you lots of money through unwanted heat loss through the cracks. Tightening means creating a tightly sealed building envelope (sidewalls, endwalls, & ceiling). This ensures that fresh, outside air will enter the house only through intended inlets, not through cracks or other unintended openings. Air leaks in hot weather cause fans to have to run longer, and in cold weather the additional cold air leaking into the house means more propane has to be burned. Tightening houses has been shown to reduce energy bills by as much as 25%.

Tightening a house usually is not a very expensive operation. Tightening can be no more than using foam to seal cracks, plastic to cover fans, plastic to cover tunnel inlets, etc. On curtain houses, installing flaps and boots, and sealing the curtain bottom with a lumber strip are recommended. Ensure that curtains and strings are tight, especially in cold weather. Also, several types of tunnel inlet doors now on the market both seal and insulate the tunnel inlet. Tunnel curtain inlets have been shown to be the second most energy inefficient area of a poultry house, second only to whole house curtains, which makes the new inlet doors an item to be considered for retrofitting.

## **3. Insulation and Solid Walls**

Does your house need insulation? An uninsulated lumber-walled curtain sided house might have an aggregate R value of 2 to 2.5. Adding batts or spray foam to increase this R value to 7 or 8 will cut heat loss through those surfaces by 75% and is one of the best investments a grower can make. We are often told by growers that they can't afford to invest in insulation and tightening. The fact is that they can't afford not to. And it does not take big bucks. We don't need R values of 28 in poultry house walls; we get the biggest payback bang for our bucks just getting our walls up to R7 or R8.

Growers with open truss ceilings should replace damaged board insulation and seal the ridge cap. Attic spaces above drop ceilings should be examined at least once a year for shifting and settling of blown insulation. Batts can be placed over the ceiling peak for the entire length of the house and then the ceiling can be re-blown for uniform coverage. Sidewalls above and below curtains can have insulation added, either batts, blown cellulose, or closed-cell polyurethane foam. However, it is preferable to retrofit curtain houses to solid wall houses. Solid wall cavities may be retrofitted with batts or cellulose and covered with a vapor barrier and either lumber, hard plastic, or flexible poly (tri-ply) with bands, or by spraying the wall surface and curtain opening with closed-cell foam and providing a physical barrier on the lower two feet of the wall to prevent bird and equipment damage. Replacing tunnel inlet curtains with new insulating doors should also be considered (see 2. House Tightening above).

## **4. Ventilation Management**

Is your ventilation management on target from minimum ventilation through full tunnel? Many growers don't realize that good ventilation management is one of the prime keys to achieving maximum fuel efficiency – especially in cool weather. Matching the correct number of inlets to the number of fans running, adjusting inlet openings for good air velocity, and getting the right amount of runtime on the minimum ventilation timer are the three basic principles of fuel conservation when ventilating in cold weather.

For example, all perimeter air inlets should not be open when running just two 36-inch fans or a single 48-inch fan. Sidewall inlets need to be opened 1½ to 2 inches for best air velocity. Ceiling inlets should be opened about 1 inch for best air velocity. Minimum ventilation should be run on a 5-minute timer, with the number of fans and on-off time intervals adjusted according to bird age. All the adjustments need to be pretty much on the mark in order to get moisture out of the house and to keep birds comfortable without having to burn more propane than needed.

## **5. Stirring the Air**

Does your house have properly selected and operated stir fans? Stir fans prevent temperature stratification and help achieve more uniform temperature distribution end-to-end, side-to-side, and floor-to-ceiling. They help prevent hot spots and cold spots, and promote drier litter, especially in the brood area. The mixing of in-house air brings drier air in contact with bedding, which results in more moisture removal per minute of fan run time. This allows growers to reduce fan run time with no effect on litter quality, thus saving on gas use. Stirring fans are beneficial in all poultry houses, but benefits are especially dramatic in houses heated by forced air furnaces since these houses are being heated from the top down, with the floor being the last place to be warmed by the furnace heat.

## **6. Litter Management and Litter Amendments**

Are you following proper litter management steps, including using litter amendments to reduce ammonia? Having too much ammonia coming out of litter not only harms birds, it requires using more fan run-time to remove the ammonia – which means you will have to burn more propane to restore lost house heat. Proper storage of litter, de-caking between flocks, and being watchful to prevent water spills or leaks are all important to prevent ammonia

## **The Next Step – Where to Go for the Key Energy-Saving Information You Need**

Your master key is our Auburn University Poultry Ventilation & Housing website: [www.poultryhouse.com](http://www.poultryhouse.com). There you will find our guidebooks and DVD or VHS videos with valuable tips on cost-efficient summer and winter ventilation management, house construction and retrofitting, equipment choices, and more, plus all the newsletters listed below:

### **1. Buying Gas**

Newsletter 31, Getting the Most from Your Gas Supply and Piping System, September 2004  
Newsletter 29, Alternatives to High Propane Prices, May 2004

### **2. Tightening Houses**

Newsletter 44, Winter Maintenance: Setting Priorities, November 2006

### **3. Insulation and Solid Walls**

Newsletter 46, Controlling Sidewall Energy Losses, March 2007  
Newsletter 43, Poultry House Energy Retrofits for Fuel and Cost Savings, September 2006  
Newsletter 12, Solid Sidewalls for Broiler Houses, July 2001  
Newsletter 11, Where Insulation Counts Most for Fuel Savings, May 2001

### **4. Ventilation Management**

Newsletter 39, Cold Weather Inlet Management: A Common Sense Approach, January 2006  
Newsletter 34, Problems with Blown-In Insulation in Dropped-Ceiling Houses, March 2005  
Newsletter 15, Cardinal Rules for Wintertime Broiler House Ventilation, January 2002  
Newsletter 4, What is the Most Important Part of Your Poultry House Ventilation System, March 2000

### **5. Stirring the Air**

Newsletter 13, Paddle and Recirculating Fans - A Progress Report, September 2001

### **6. Litter and Litter Amendments**

Newsletter 19, Ammonia: Can Cause Serious Losses Even When You Can't Smell It, September 2002

### **7. Heater Efficiency and Gas Piping**

Newsletter 31, Getting the Most from Your Gas Supply and Piping Systems, September 2004

### **8. Fan and Electrical Efficiency**

Newsletter 30, Fan Belts, Pulleys, Shutters, Cool Pads and Profits, July 2004  
Newsletter 51, Evaluating Costs of Tunnel Ventilation Fans, January 2008

### **9. Alternative Energy and Fuel Sources**

Newsletter 33, Oil-Fired Heat Shows Cost-Cutting Potential, January 2005

problems. Using a litter amendment to hold down ammonia production is also highly recommended. Studies have shown that houses that do not use litter amendments have fan run times higher than those houses with litter treatments, and litter amendments are now widely adopted by growers. The economics are pretty simple. We want to protect our birds and base our ventilation rates on proper moisture removal from the house, not on the need to remove ammonia.

### **7. Heater Efficiency and Gas Piping**

Does your management routine include regularly checking and maintaining heating equipment and gas plumbing? If not, you may be wasting thousands of dollars. Heating equipment that operates under too high or low gas pressures will not operate properly or efficiently. Every gas plumbing system should be designed and maintained to meet the heating equipment manufacturer's requirements for pressure and volume. All flexible hoses that supply heating equipment must be marked for use with LP or gas. Air or water hoses are not approved for use with gas and often fail prematurely. Orifices, pilots, and igniters must be kept clean and in good operating condition. Insufficient plumbing, ill adjusted regulators, and leaking gas fittings or hoses will waste a lot of gas as well as risk devastating fires. Regularly inspecting and maintaining heating system equipment and plumbing is extremely important.

## 8. Fan and Electrical Efficiency

Is your house using electricity as efficiently as possible? Typically, about 75% of the electrical energy in a tunnel house is used by the fans and about 25% by the lights and other loads. Keeping ventilation fan electricity consumption to a minimum requires doing proper fan maintenance and cleaning of shutters on a routine basis. Dirty shutters and slipping belts can reduce fan air flow up to 30%. If fan retrofit is in order or for new houses, choosing the right fans can save thousands of dollars in electric costs. The key point is to purchase fans that have higher cfm/watt efficiency ratings. This can pay off over time even if the fans have much higher initial cost. To hold down lighting costs, consider replacing incandescent light bulbs with dimmable 5-watt cold cathode fluorescents. In a 500-foot house with 50 bulbs, the amp load is reduced from 25 amps on 60 watt bulbs to 2 amps with 5 watt cold cathode bulbs, saving around \$250 per house per flock, depending upon electrical charge per kilowatt hour and the lighting program followed.

## 9. Alternative Energy and Fuel Sources

Have you considered alternative fuels? In some locations growers are saving money by using outside furnaces to burn wood chips, corn, coal, used motor oil or hay to heat their poultry houses. Existing heating systems are still needed for back up and supplement. And in some case a lot more labor is required by the grower. Alternative fuel technology will be of most value when it is applied to houses that have been modified and managed using the basic principles covered in this newsletter.

Another option is install attic inlets to capture the free solar heat that is produced in the attic of a broiler house during the day. These solar inlets may be either gravity type or controller actuated. Gas savings will depend on sunshine, weather and management, but conservative estimates are in the 10% range. A particular advantage of having attic inlets is being able to bring no-cost warm air into the house between flocks to dry out litter before the next flock arrives. Costs of installing attic inlets will range from \$1200 to \$4000 per house, depending on number and type of system.

## The Bottom Line

Each of the nine items discussed in this newsletter offers an opportunity for cost savings. There are many older houses that still need basic energy retrofitting to make them more efficient; but even in relatively new houses growers who use this checklist will usually find one or more parts of the house or their management routines that can be improved to save energy. Our studies have shown that money spent wisely on energy conservation pays back very quickly.



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