

POULTRY SCIENCE AND TECHNOLOGY **GUIDE**

from North Carolina State University at Raleigh / Extension Poultry Science

OPPORTUNITIES FOR ENERGY CONSERVATION

The major expansion of the efficient poultry industry occurred when energy was cheap and abundant. We substituted energy using technology to replace a shrinking supply of human labor that was ever increasing in cost. While the cost of energy is still relatively less than human labor, present and future energy supplies and costs make it prudent for us to re-examine our use of fossil energy.

Some have estimated that fossil fuel energy and energy generated from fossil fuel will increase in cost fivefold by the end of this century. Any energy conservation techniques started today will make even more economical sense in the future.

In many cases, energy used in production of poultry can be reduced from 20 to 50 percent, resulting in substantial dollar savings.

Tips for Saving Energy

I. Brooding

Brooding accounts for over 70 percent of the non-feed energy used in growing poultry. Therefore, greatest savings opportunities are in this area.

A. Brood in part of the house the first 3 weeks during winter months.

1. Use middle half or one end of the house for the first 3 weeks, then give birds access to entire house so feeder space will be adequate and litter will not cake. (Some people brood in one-half of the house for the first 3 weeks, then allow access to three-fourths of the house for 2 weeks and then allow birds access to entire floor area with satisfactory results.)
2. Drop curtains from ceiling to floor. Double curtains are much better than single curtains when properly installed.
3. Place twice normal number of birds per brooder.
4. Place full number of feeders and waterers in brooding area.

B. Brooder Management and Operation

1. Start with and maintain *dry* litter. Keep water systems repaired and prevent leakage and spills.
2. Brood maximum chicks per hover. Cluster 3 to 4 brooders; encircle with 1 solid brooder guard.
3. Locate brooders near the center of the house to hold down heat loss through sidewalls and to avoid drafts.
4. Brood at lowest temperature feasible. 86 to 88° F. is acceptable much of the time. Lower temperature 2 to 3 degrees every 3 days. Use chick behavior as measure of their comfort.

5. Use minimum ventilation—.1 to .2 cfm per bird during first part of brooding period is sufficient.
6. Start layer replacements in top cage where room temperature is highest.

C. Brooder Maintenance (For detailed maintenance information, see Poultry Science and Technology Guide No. 15).

1. Check brooder thermostats for accuracy.
2. Eliminate all gas and air leaks in fuel lines. Use soap and water to check for leaks.
3. Maintain gas line pressure at a specified pressure of an 11-inch column of water.
4. Adjust pilot lights to specifications. Turn off pilot lights when brooder is not needed—perhaps as many as 50 percent during 4th week when not needed, then the remainder.
5. Keep burner orifice clean. Follow manufacturer's recommended cleaning procedures.

D. Winterize House

1. Stop air leaks—plug cracks with caulking compound or roofing cement; use plastic for larger areas (walls, etc.).
2. When curtains need replacing, check on the availability of translucent insulating curtains.
3. Insulate adequately. Use vapor barrier on warm side of insulation. Ceiling R-value of 12-18. Ends and walls R-value of 6-7. \$1 worth of insulation now probably will return \$12 in the next 20 years. Savings per house—about \$235. Repair insulation (torn spots, etc.).

II. Lighting

Lighting represents only 7 percent of energy costs, but it can be reduced by 50 percent.

For details on lights for layers, please refer to Poultry Science and Technology Guide No. 16, "Lighting Systems for Layers." (Revised).

1. Broilers—Consider cycling feeders every 1 hour, 15 minutes on and 45 minutes off. Use 1 or 2 periods of light and feeding at night rather than all night light. McDaniel and other researchers at Alabama got essentially equal results from 15 minutes of light followed by 90 minutes of darkness, after 3 days, for the entire broiler growing season when compared to continuous light.
2. Use electric lights only when daylight is below .5 foot candles at bird level. A light sensing device is suitable for this purpose.

III. Ventilation

A. When buying fans consider:

1. Air volume (cfm) per watt. Could be as much as 100 percent difference in total annual cost (fixed and operating). Use energy efficient motors on all fans.
2. Static pressure of system.
3. Intended location—blow with prevailing wind.
4. Ease of cleaning fan blades and shutters.
5. Guards on motor and fan.
6. Ventilate to remove moisture and maintain air quality, but *do not overventilate*. Let house temperature rise in winter. Generally, use large, low-speed fans. Keep fan shutters and guards *clean* for maximum efficiency.

B. Ventilation

1. Consider installing a manually operated variable speed controller on existing fans to regulate air flow.
2. Clean brush, weeds, and other obstructions away from fans and open-sided buildings that might interfere with mechanical or natural ventilation.
3. Housing placed too close together may prevent or reduce natural ventilation. Provide a minimum of 50 feet between houses for fire safety purposes as well.

IV. Egg Processing

1. Operate all cleaning and packing equipment at full capacity. Minimize short runs.
2. Maintain egg wash water at 105 to 120° F.
3. Turn off all equipment during rest breaks.
4. Maintain refrigeration at highest temperature to preserve quality (55 to 60° F. for short term storage). Keep relative humidity above 70 percent.
5. Plug air leaks around refrigerators as well as outside air leaks.
6. Minimize traffic in and out of coolers.
7. Insulate cooler room (8 inches of fiberglass or equivalent).
8. Turn off lights when they are not needed.
9. Keep air filters and condensers on refrigeration equipment clean.
10. Use fluorescent lighting.
11. Keep all machinery properly adjusted, especially the egg washer and packer.
12. Use heat from refrigeration compressors to heat water and/or for space heating.
13. Plan egg pickup for most energy efficient route.
14. Insulate all hot water pipes.

V. General

1. Match tractor and truck size with job.
2. Keep engines tuned.
3. Avoid unnecessary engine idling.
4. Start and stop gradually.
5. Drive at steady speeds.
6. Deliver full loads.
7. Observe speed limits.
8. Good truck maintenance program.
9. Consider electric or propane engine preheaters (diesels especially) in winter.

Lowering Electrical Demand and Use

1. Wire all fans, feeders, and other motors to start in delayed sequence.
2. Keep all moving machinery parts well-lubricated.
3. Keep belts at proper tension.
4. Keep all electric motors clean.
5. Use properly sized and energy efficient motors when replacing motors.
6. Flush houses during non-peak hours of electricity use.
7. Run feeders only 3 to 4 times daily.
8. Keep manure handling equipment in good repair; clean after each use.
9. Consider solar water heaters.
10. Solar space heating may be practical.

For detailed "Energy Conservation Plan for Feed Manufacturers," write to the American Feed Manufacturers' Association, Inc., 1701 North Fort Myer Drive, Arlington, Virginia 22209.

BTU Conversion Factors¹

| | | British Thermal Units (BTU's)* |
|---------------------------------|-------------|-----------------------------------|
| Gasoline (regular) | 6.12 lb/gal | 120,000-124,000 BTU/gal |
| Diesel fuel (no. 2) | 7.07 lb/gal | 140,000 BTU/gal |
| Propane | 4.25 lb/gal | 92,000 BTU/gal |
| Natural gas | | 1,067.5 BTU/gal |
| Natural gas | | 100,000 BTU/therm |
| Cubic foot of natural gas | | 1,000 BTU |
| Fuel oil (no. 2) | 7.20 lb/gal | 138,500 BTU/gal |
| Ton of coal | | 25,000,000 BTU |
| Wood | | |
| Hickory (air dry ²) | | 32,000,000 BTU/cord |
| Red oak | | 29,000,000 BTU/cord |
| White oak | | 31,000,000 BTU/cord |
| Soft maple | | 25,000,000 BTU/cord |

* In practice, BTU's per unit may vary slightly.

¹ *A Guide to Energy Savings for the Poultry Producer*, U.S. Department of Agriculture, June 1977; *Energy Use and Conservation in the Poultry and Egg Industry*, U.S. Department of Agriculture, October 1976.

² Paper No. SER 81-001, American Society of Agricultural Engineers, February 1981.

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