Energy Conservation in Broiler Housing

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How to Identify a Meth Lab

Examples of Energy Conservation Technologies
- Enclosing curtain-sided houses
- Adding insulation (ceiling or sides)
- Circulation fans
- Attic inlets
- Tunnel Doors
- Fluorescent lights

How Much Savings are we Seeing?
- Virtually impossible to compare one year with the next
  - Management Changes
  - Weather Changes
- Best comparison is to convert some houses on the same farm
**Totally enclosed house**

- 30 – 50% fuel savings
- Improved air quality
- Improved bird performance

**Curtain leakage**

**A number of methods of enclosing curtain-sided houses**
Additional Insulation

- Always a benefit
- Benefit drops the more you add
- Ceiling
  - 3” to 6” insulation – 13% savings
  - 6” to 9” insulation – 7% savings
- Walls
  - Curtain to ¾” insulation – 29% savings
  - ¾” to 3.5” insulation – 15% savings

Significant summertime benefits to totally enclosing housing

Circulation fan systems

- Reduce temperature stratification
- Promote uniform temperatures throughout the house during cold weather.

Hot curtains radiating heat the birds

Stratification
Stratification

- How much warmer the air is at the ceiling depends on a number of factors:
  - Ceiling height: The higher the ceiling, the greater the amount of stratification.
  - Type of heating system used: The hotter the air produced, the greater the stratification.
  - House tightness: A loose ridge reduces stratification; a loose side wall increases stratification.
  - Inlet operation: The better the inlets work, the more they are used...the lower the level of stratification.
A circulation fan system can help to reduce temperature stratification...

By mixing the warm air near the ceiling with the cooler air near the floor.

**Benefits**

1) Reduced fuel usage
   - Recovering heat collecting near the ceiling can reduce fuel usage from 10 to 30%
   - In some instances will increase fuel usage.

**Temperature stratification**

(no circulation fans)

**Temperature stratification**

(with circulation fans)

**Fuel usage?**
Benefits

1) Reduced fuel usage
2) Improved litter/floor air temperatures
3) Promote litter drying
   - Not only is the air next to the ceiling warmer...but it is drier.
   - It takes air movement to dry litter.

Benefits

1) Reduced fuel usage
2) Improved litter/floor air temperatures
3) Promote litter drying
4) Reduced condensation problems
5) Reduced preheat time
6) Creates more uniform house conditions
   - End to end, side to side

Circulation fan system objectives:

1) Mix the air from floor to ceiling
2) Mix air from end to end
3) Mix the air from side wall to side wall
4) Needs to be done continuously
5) Minimal air movement at floor level

18” low volume circulation fans

- Lower volume:
  - Less drafts
  - Continuous operation
    - Easier to install
  - Better suited for houses with lower ceilings
- Lower power usage:
  - Lower operating costs
Circulation fan options:
- 18” high volume circulation fans (1/3hp)
- Better suited for houses with higher ceilings
- Better suited for houses with “rougher” ceilings

Tall/rough ceilings

Attic inlets

The attic space is an unused solar collector
- Can we harness this heated air to:
  - improve air quality
  - improve litter quality
  - reduce heating costs?

18” 1/15 hp circulation fans - control -
- Tend to produce little air movement at floor level therefore can be operated continuously
- Can be turned off when second stage cooling fans start to run.
- OR can be left on.

Counter-weighted ceiling inlet
- Been used in hog and commercial layer houses for decades.
Counter-weighted ceiling inlet

Locking inlets closed during hot weather

Research project

- Three test farms
  - Two farms with 50' X 560' houses
    - One on each farm
  - One farm with 40' X 500' house
  - All houses are totally enclosed

50' X 560' house

- 16 inlets @ 1,800 cfm per inlet (max)
- 28,000 cfm, with leakage is sufficient to operate four 36'' fans.
- Installed evenly spaced down the center of the house (near center)
- 40' X 500' house - 12 attic inlets

Attic inlets with circulation fans in 50' wide house

Counter-weighted ceiling inlet - test results -
Fuel usage
- Approximately 10% - 20% less, but this was not the most important effect...

Increased ventilation rates

Less drafty conditions

Drier litter – Attic inlet house

Conventional inlets
General Observations:
- Attic inlets did not significantly reduce attic temperature.
- Houses must be tight to be effective, best if the house is totally enclosed.
  - 0.13" pressure or better with one 48" fan
  - Less affected by wind

Tunnel Doors:
- Roughly $4,000 to $6,000/house
- Typically save 5-7% on gas
- Slow payback on energy savings
- Must consider other advantages

Tunnel Doors:
- Improve R-value and leakage at tunnel inlets
- Better Control of inlet air
- Almost impossible to keep this end of house warm without these

Fluorescent Lighting
- Non-Dimmable
- Dimmable

Fluorescent Lighting – Lessons Learned
- Limit dimming to 40% or more if possible
- 8-watt cold cathode is probably most dependable dimmable
- Good quality sockets
- Dimmers?
- Combination of small dimmable and large non-dimmable is ideal
Fluorescent Lighting
- 2L Adaptor
- 2nd circuit

LED Lighting
- Future of Lighting
- Much to be learned

Marginal Energy Saving Technologies
- Replacing old fans with new high-efficiency fans
  - Often results in no energy savings or even higher cost, but moving more air
  - Hard to justify as an energy saver
  - High cost for small return
  - If fans need replacing, you are really looking at the diff. between low and high efficiency fan - A no brainer

Technologies that do not qualify
- Installing evaporative cooling pads
  - Good investment, but not energy saving
- Adding exhaust fans
- Structural repairs
- Upgrading a Computer Control System

Marginal Energy Saving Technologies
- Replacing Thermostats and Timers with a Computer Control System
  - Good Investment Generally, but
  - Very high price
  - Uncertain return (depends on how the house was managed before conversion)

The Audits - What is needed?
- Narrative Describing Existing Farm
- Current Energy Use and Price
- Current Technologies
- Proposed Changes
- Cost of Proposed Changes
- Estimate of expected savings
- Narrative supporting estimate
Questions?
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