Evaluating a Poultry Farm’s Energy Use

Gary Van Wicklen
Extension Poultry Engineer
Dept. of Bioresources Engineering
University of Delaware
Georgetown, DE

Points of My Talk

#1: Alternative energy – is it practical?

#2: House Tightness = Step #1

#3: Thermal Insulation

#4: Energy Efficient Equipment

#5: Gas Leaks

Delmarva’s Rising Energy Costs

Rising Delmarva Electric Rates

• The industry’s key issue??
• There is no “silver” bullet solution!

Wind Energy ??

Delmarva’s wind capacity is rated “poor” away from the coast!

• Look at mean wind speeds for January, February, March
  • Georgetown: 7.7, 7.8, 7.7 mph
  • Ocean City: 8.7, 9.0, 9.5 mph
  • Central Illinois: 13.8, 13.9, 13.8 mph
  • Home of largest wind farm east of the Mississippi: 240 large turbines, each rated at 1.65 megawatts!

Solar Energy ??

• Solar PV technology works!!
• UD-Allens Project: no problems for nearly 18 months!
• Payback for a large system is between 4 and 5 years, BUT…

• A grower must ……
  – Be a Delmarva Power customer to receive the highest Green Energy payment.
  – Receive a USDA Energy Grant
  – Be able to take advantage of Federal Solar Tax Credit.
  – Hope that renewable energy credits remain at $0.20/kWh
  – Then finance $150,000!

• I’m all for PV systems being a solution, but I have to acknowledge the financial challenges.

• Need to lower present cost of $8/watt.
So, What’s the Solution?

- First action should be to tighten the house envelope! (But that’s a boring answer!)
- New wide housing uses about half the propane and electricity of older houses.

House Tightness: It’s the First Step

- You all likely know how to test tightness: Close house tight, operate 2 – 36” fans …
- Look at static pressure: at least a 0.13” w.c.
- A tight house will lower electric and propane consumption.
- A tighter house will require less investment in a PV system.

Visualizing House Leakage

- Insect Fogger: burning baby oil.
- Cost: $60 to $80

This Summer ……
I’m Receiving Grower Calls

- Once those huge electric bills arrived, growers contemplated large investments in solar and/or wind.
- Instead of investing $150,000 in solar/wind, perhaps invest $250 per house to improve tightness.
Evaluating a Poultry Farm’s Energy Use

Making a Case for Tight Housing!

• Consider a “loose” house.
• Brooding: Need an extra 36” fan to achieve correct the static pressure.
• If the “extra” fan doesn’t run poor air distribution and mixing will cause significant problems.
• What does operating that extra side wall fan cost??

Daily Gallons Propane Used
Inside Temperature = 90 F
“Extra” Side Wall Fan ~ 8000 cfm

<table>
<thead>
<tr>
<th>Min Vent Schedule</th>
<th>20°F</th>
<th>30°F</th>
<th>40°F</th>
<th>50°F</th>
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<tbody>
<tr>
<td>30s/5 min</td>
<td>16.2</td>
<td>13.9</td>
<td>11.6</td>
<td>9.3</td>
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<tr>
<td>60s/5 min</td>
<td>32.4</td>
<td>27.8</td>
<td>23.2</td>
<td>18.6</td>
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<tr>
<td>90s/5 min</td>
<td>48.6</td>
<td>41.7</td>
<td>34.8</td>
<td>27.9</td>
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</tbody>
</table>

Thermal Insulation

• Attic Insulation
  – Feasible to blow in additional insulation.
  – Temperature stratification causes warmest air to rise to ceiling surface.
• How much is too much??
• Balance: Cost of Fuel vs. Cost of Insulation

Inspect the Attic

• Ceiling insulation: ~ 5-1/2 inches. Even with top of lower truss chord.
• Are there bare spots?

Let’s look at a 40 x 500 ft house, in the 200 ft long brood chamber during the coldest day in January 2007 with day-old chicks.

We’ll assume some R-values ....
  Side wall: 12
  Brood curtain: 1
  Ceiling: vary from 6 to 50

Minimum vent: 2 – 36” fans, 16,000 cfm
  30 seconds out of 5 minutes

Indoor Temperature: 92 F
Off Brood Temperature: 60 F
### Evaluating a Poultry Farm's Energy Use

#### Adding Insulation …. Is More Better?

<table>
<thead>
<tr>
<th>Ceiling</th>
<th>Heat Loss per day</th>
<th>propanes</th>
<th>percent decrease</th>
<th>cost at propane</th>
<th>cost at propane</th>
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<tbody>
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</tbody>
</table>

#### Adding Insulation …. How Much?

### Energy Efficient Equipment

**Light Bulbs**

- Install energy efficient light bulbs.
  - Cold cathode bulbs (5 W): 27% decrease in total annual electric use.

- Not everyone is sold on cold cathode light.
  - New dimmable compact fluorescents: 23 W bulbs – 1600 lumens (100 W incandescent)
Will New Tunnel Fans Help Cut Electric Costs?

• Let’s look at the example house again.
• Suppose we had some 48-inch diameter, belt drive, slant wall fans that are 15 yrs old.
• These fans had the capacities shown below when tested “new” in a wind tunnel:

<table>
<thead>
<tr>
<th>SP</th>
<th>CFM</th>
<th>CFM/Watt</th>
<th>Watts</th>
</tr>
</thead>
<tbody>
<tr>
<td>.05</td>
<td>18,300</td>
<td>17.3</td>
<td>1070</td>
</tr>
<tr>
<td>.10</td>
<td>17,400</td>
<td>16.1</td>
<td>1080</td>
</tr>
</tbody>
</table>

vs. the old fans (when NEW)

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<td>17,400</td>
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<td>1080</td>
</tr>
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</table>

Suppose some new 52-inch diameter, belt drive, cone fans, 1.5 hp motor, are considered that were tested in a wind tunnel with the following characteristics measured ….

<table>
<thead>
<tr>
<th>SP</th>
<th>CFM</th>
<th>CFM/Watt</th>
<th>Watts</th>
</tr>
</thead>
<tbody>
<tr>
<td>.05</td>
<td>26,200</td>
<td>24.0</td>
<td>1092</td>
</tr>
<tr>
<td>.10</td>
<td>24,400</td>
<td>21.0</td>
<td>1162</td>
</tr>
</tbody>
</table>

• Suppose we replace 8 “old” fans with 6 new fans.
• Assume each fan operates 2500 hrs per year.
• Old fans cost …..
  8 fans x 2500 hrs x 1.08 kW = 21,600 kWh
  $0.15/kWh x 21,600 kWh = $3240
• New fans cost …..
  6 fans x 2500 hrs x 1.16 kW = 17,400 kWh
  $0.15/kWh x 17,400 kWh = $2610
• Save $630 per year.

Gas Leaks?

We checked a grower’s gas lines from the tank to the house, then throughout the house … no leaks.

Just before leaving the farm we spraying some leak detector fluid on the connections on top of the tank ….. severe leaks at three places!

• Any Questions?

Gary Van Wicklen
Carvel Research & Education Center
Georgetown, DE

302-856-2585 x576
gvw@udel.edu