


## Energy Efficient Houses



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

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Energy Efficient Houses

## Why Are We Worried About Energy??

Consider .....

- Regional Residential Electric Cost:
  - Athens, GA: 7 cents per kwh
  - Seaford, DE: 15 – 18 cents per kwh
- Rising Delmarva Electric Rates
  - DE Electric Co-op: 7 cents per kwh (for now)
  - Delmarva Power: 65% increase (15-18 cents per kwh)
  - Choptank Electric: 35% increase

UNIVERSITY OF DELAWARE **Delmarva's Rising Energy Costs**

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The majority of electricity is used by:

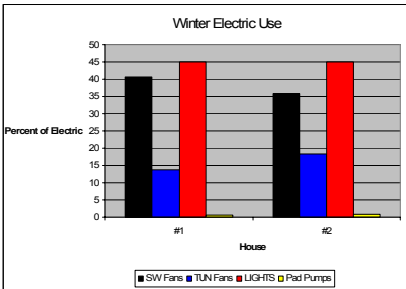
- tunnel fans during hot weather, and,
- by lights during cold weather.

LP gas is the largest component of energy consumption during cold weather.

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### Winter Electric Use

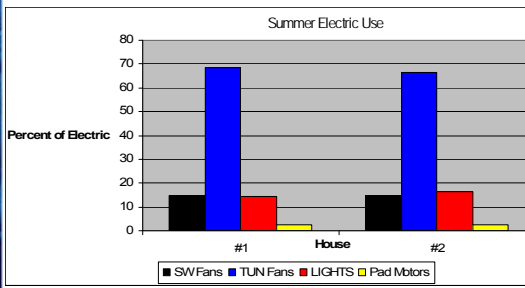


House	SW Fans	TUN Fans	LIGHTS	Pad Pumps
#1	40%	15%	45%	0%
#2	35%	18%	45%	0%

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### Summer Electric Use



House	SW Fans	TUN Fans	LIGHTS	Pad Mbtors
#1	15%	70%	15%	0%
#2	15%	68%	15%	0%

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- Where do houses transfer heat?
  - Curtains (R ~ 1.00)
  - Concrete Foundation (R ~ 2, for 8")
  - Air leakage (sill, doors, holes, vent boxes, etc.)
  - Excessive ventilation.
  - Lack of ceiling insulation.
- Remember that tight, well-insulated houses conserve energy in summer heat as well as winter.

UNIVERSITY OF DELAWARE **Tight, Well-Insulated Houses Conserve Energy**

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- New Poultry Housing Construction Features Support Energy Efficiency:

- Wider housing.
- Solid, insulated sidewalls.
- Radiant tube heaters.
- Low wattage light bulbs.
- Low horsepower recirc fans.



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### Characteristics of New Housing

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- New Poultry House Construction: What Else Should We Include??

- Tunnel Boards: Insulated boards covering the cooling pad.



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### What Else Can We Do?

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- New Poultry House Construction: What Else Should We Include??

- Choose tunnel fans with a high VER (ventilation efficiency ratio) that provide a high air flow rate per watt of input.



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### What Else Can We Do?

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- New Poultry House Construction: What Else Should We Include??

- Use end doors that really seal tight.



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### What Else Can We Do?

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- New Poultry House Construction: What Else Should We Include??

- Additional thermal insulation in ceiling if energy prices increase.
- Take precaution against ceiling insulation “moving” in attic from wind; use batts instead of loose fill product.



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### What Else Can We Do?

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- New Poultry House Construction: What Else Should We Include??

- Use recirc pad systems instead of spray on pad systems to reduce the wall surface exposed by pads.



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### What Else Can We Do?

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- Recently constructed wider housing uses less energy than earlier construction.
- Newer housing typically has less curtain and more insulation in sidewalls and ceiling.
- Component shrinkage and settling occurs over the years to reduce house tightness.



### New Poultry Housing Uses Less Energy

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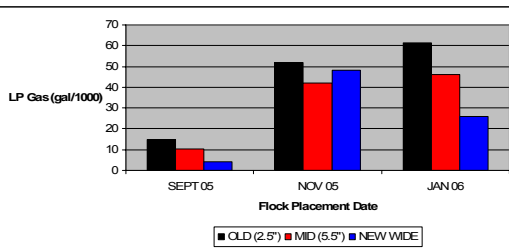
- Let's Compare Energy Use by Houses on 3 Farms to See the Value of New Housing and Thermal Insulation. (all flocks 49-52 days)

- 1. Older Houses (3) ■: '70s style, 40 x 400, curtain sided, tunnel, radiant brooders, recirc pads, *ceiling insulation matted to 2 – 2.5"*
- 2. Mid Level Houses (2) ■: ~ 6-7 years old, 46 ft. wide, north wall solid – south curtain, tunnel, radiant brooders, recirc pads, *ceiling insulation 5.5-6"*
- 3. New Wide Houses (3) ■: online Jan 2005, 60x 500, solid sidewall, tunnel, radiant tubes, recirc pads, *ceiling insulation ~6"*



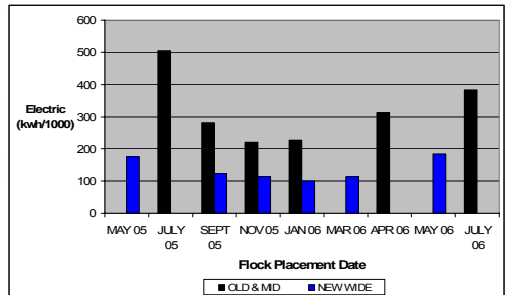
### Thermal Insulation Comparison

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### LP Gas Use (gals/1000)

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### Electric Use (kwh/1000)

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- Improve the older house?
  - Growers typically don't want to invest (much) in older houses that are already or almost paid off.
- Are there simple upgrades that aren't terribly expensive?
  - Sealing the sill.
  - Reworking the end doors.
  - Restoring ceiling insulation.
  - Basic house maintenance.



### What Can We Do With Older Houses?

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- Fall, 2004
  - Used foam weather stripping and spray foam to seal the sill plate/foundation crack.
  - Improved seal on end doors.
  - Covered pad opening with polyethylene.
  - Spent about \$250 in materials to tighten the house.
  - Raised tightness test static pressure from 0.05" to 0.11".



### Tightening Older Houses: Project Houses

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**Sealing the Sill/Foundation Crack**  
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**Using Spray Foam to Seal the Sill**  
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**Sealing the End Door**  
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- Fall, 2005
  - Used two small tanks of spray foam (\$335/tank) to seal the sill plate/foundation crack for both total lengths of sidewall (1000 ft.).
  - Foam was same “expandable” product as in the small cans.
  - Several other leakage problems, but sill was the worst.
  - Began with tightness test static pressure between 0.03” and 0.05”.

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**Tightening Older Houses: Project Houses**  
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**Sill/Foundation Needs Sealing**  
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**Filling Void With Expandable Foam**  
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### Typical House Problems

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- Even if all your tunnel fans are the same “exact” model .... They don’t all perform the same, especially over time.

- Using a FANS unit (in place fan air flow testing device), the flow rate of a fan can be measured with 1% accuracy. The voltage and current drawn by the fan motor can also be easily measured.

- Staging the most efficient tunnel fans first saved 3-5% on energy consumed in a UKY study.

### Using Most Efficient Tunnel Fans

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FANS Unit Testing Tunnel Fan

FANS Unit Calibrated in Wind Tunnel

### FANS Testing Unit

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- Products to Avoid .....

- “Space Age” or “Nanotechnology” paints and/or coatings. They don’t have the real R-value to significantly reduce heat transfer.

- Bubble pack “insulation”. This product has no real R-value, but its cost is as high as a comparably sized sheet of foam insulation.

### Products to Avoid

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- What’s in the future .....

- Alternative energy systems: photovoltaic (PV) systems to generate electricity from solar radiation.

- PV system cost = \$7/watt, but ...

- With Green Energy program (pays for half!) and tax credits, payback for a 65 kw system may be 4 years.

- Let OPEC keep their oil!

### The Future?

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- Any Questions?

Gary Van Wicklen

Carvel Research & Education Center

Georgetown, DE

302-856-2585 x576

gvw@udel.edu

### Questions?

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