Delmarva Broiler Lighting Conference
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Dr. Jon Moyle  University of Maryland
Jenny Rhodes  University of Maryland
Dr. Gene Simpson  Auburn University NPTC
Broiler Lighting

Large Savings Potential!

Show me the $$
Energy Breakdown on a Delmarva Broiler Farm
2008

Figure 2 - Electricity Use Breakdown

- Tunnel Ventilation: 62%
- Lighting: 32%
- Side Wall Ventilation: 4%
- Circulation Fans: 0%
- Miscellaneous: 2%
Same Farm
2014

- Poultry Ventilation: 80%
- Air Heating / Building Env., Miscellaneous: 2%
- Poultry House Lighting: 6%
- General Lighting: 5%
- Other Motors and Pumps: 7%
Bulb Shapes

Incandescents Getting Scarce

A19 LED – Classic
“Thomas Edison” Shaped

PAR XX LED (XX/8” Wide)

HPS With Reflector

Spiral CFL

CCFL Cold Cathode

Hybrid LED

Slide courtesy of Gene Simpson
Evaluating Light (Bulbs)

Evaluate the light produced

Intensity expressed as foot candles
Uniformity Coefficient Variation (C.V.)
Cost Lumens/watt
Color

Evaluate the bulb

Will it tolerate the environment
Heat dissipation
Dim ability
Maintenance
Failure Rate & Warrantee
This LED didn’t make the cut!
Evaluating Light
Light Intensity

Floor Intensity Greatly Affected By Height & Bulb Design
Lumen: Standard Unit Of Light Output
1 Footcandle (fc) = Lumens Covering 1 Square Foot
1 Lux = Lumens Covering 1 Square Meter
1 fc Equals 10.76 Lux (Ex: 3.00 fc = 32.2 Lux) (1fc ~ 10 Lux)

Light Uniformity

Goal: Wall To Wall, End To End Uniform Light Coverage
• No Shadowy/Shaded Areas
• Achieve With Various Bulb Sizes & Layouts

Courtesy of Gene Simpson
New LEDs - More Heat Loss & Lower Wattage
6 Watt vs. 8 Watt A19 With Same Lumen Output (~525-530)

Lower Temp Increases Bulb Life & Reduces Depreciation

<table>
<thead>
<tr>
<th>MEASUREMENTS</th>
<th>°F</th>
<th>°C</th>
</tr>
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<tbody>
<tr>
<td>Spot 1</td>
<td>139</td>
<td>59.9</td>
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<td>Spot 2</td>
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<td>Area 1 Max.</td>
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<td>Area 1 Min.</td>
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<td>Area 1 Avg.</td>
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<td>Area 1 Avg.</td>
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Courtesy of Gene Simpson
Cleaning Lights - Not Rocket Science

Spray Off Between Flocks. 1 Part Window Cleaner Or Ammonia With 10 Parts Water & Jet Stream.

5 Flocks
35% Brighter

2 Flocks
16% Brighter

Courtesy of Gene Simpson
Easy Washing - Before & After

“Before” Bulbs Were Fully Blown Off Between Flocks

- 5 Flocks
- 35% Brighter
- 3+ Years
- ??% Brighter

- 2 Flocks
- 16% Brighter
- 2 Flocks
- 4-5° Cooler

Courtesy of Gene Simpson
# LED Ownership Cost & Simple Cash Flow

<table>
<thead>
<tr>
<th>House</th>
<th>Bulb</th>
<th>Retail</th>
<th>Warranty</th>
<th>Cost/Bulb/Yr</th>
<th>$Retail/50</th>
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Courtesy of Gene Simpson
## Grid Uniformity Index

*25 Spot Grid, 5’ OC*

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<tr>
<th>Brand</th>
<th>Bulb Type</th>
<th>Watts</th>
<th>*Kelvin</th>
<th>Warr Yrs</th>
<th>Retail Cost</th>
<th>Cost / Warr Year</th>
<th>Mean fc @ Feed Line - Full Intens</th>
<th>Low fc @ Full</th>
<th>High fc @ Full</th>
<th>Mean fc In Grid</th>
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<td>8.80</td>
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Don’t Pay Mercedes Price For Chevy Performance

Courtesy of Gene Simpson
Lumen Depreciation

All Lights Depreciate, But At Very Different Rates!
Two Sources Of Lumen Depreciation:
1) Physical Deterioration Over Time – Can’t Control
2) Accumulation Of Dust, Dirt & Debris – Can Control

Observed Physical Depreciation In Commercial Houses:
CCFL ~ 20-25%/Yr ; CFLs ~ 15-18%/Yr; LEDs ~ 4-8%/Yr
Even After Blowing Off, Depreciation From Debris Can Reduce Intensity Another 10-20% In One Flock.

CCFL/CFL Disposal
CCFLs & CFLs Contain Mercury.
Clean Up Around Broken Bulbs, Including Litter.
Double Bag & Recycling Center–Comply With Regs
LEDs – No Mercury – No Disposal Regs

Courtesy of Gene Simpson
Economics ROI $

Milford Farm
Paired Housing (Separate meters on Light circuits)
Installed 96- 8 watt A-19 LED verses 60 watt incandescences
Grower paying $.12 per KwH
Results
No bird performance loss (paired chicks)
93-95% energy savings
$1700 per house $17.70 savings per bulb
Bulb Retails for $16
11 month payback
Brood Lighting

Use Supplemental lighting to achieve
3-5 FC
Oversized CFLs 55-65 watt or
Reflectors with
23watt CFL
Better light distribution to middles
And sidewalls
Dust Magnet
Burn hot

55 watt CFLs
$100/Hse cheaper to operate per year
Bulbs stay cleaner
Reflectors do not need to be replaced

23 watt CFL w/ Reflector
Color Rendering
What Is the Kelvin Scale and Which Bulb Value Should I Choose?

• Kelvin is a unit of measurement used to describe the hue of a specific light source
• This is not necessarily related to the heat output of the light source but rather the color of the light output
Four treatments consisted of 3 LED light bulbs (2700k, Warm [LED-1], 3500k, [LED-2,], 5000k, Cool[LED-3]).

The BW and BW gain, live weight and carcass weights of birds reared under LED-2 were significantly (P ≤ 0.05) higher in comparison to birds reared under ICD.

However, FI, FCR, and mortality were not affected by treatments. There was no effect of treatments on fat, breast, and tender weights and yields.

It was concluded that neutral LED with 3500k is a better potential light source in comparison to ICD on production performance, but equal when compared to other LED light sources examined in this study.
Energy Audits
How Energy Audits can Help the Poultry Industry

A Small Sample -

- **Area**
  - 50 mi. from Salisbury, MD
- **Operation**
  - Broiler
- **Count**
  - 22 Farms in MD, DE, VA
Energy Cost per 1,000 lb. Produced

Electricity and Propane Costs per 1,000 lb. Produced

Why so high?

Why so low?

Electricity | Propane

EnSave
EnSave’s energy audits identify energy savings between 10% to 35%
Recommendations

1. Get an Energy Audit
2. Make an informed decision about a Light Bulb
   Grow circuit
   Choose an affordable LED bulb ($12-18 Range)  
   480-520 lumen range (6-8 watts)
   Use a CFL in Brood Chamber to meet integrator specs for chicks
Bulbs being tested on Delmarva

Overdrive 8 watt A-19 LED
Overdrive 6 watt A-19 LED
Litetronics 8 watt A-19 CCFL
Utilitech Pro 7 watt A-19 LED
Litetronics 7 watt A-19 LED
Life Lamp 6 watt A-19 LED
IBA 9.9 watt A-19 LED
Nex Gen 8 watt PAR LED
Energy Smart 11 watt A-19 LED