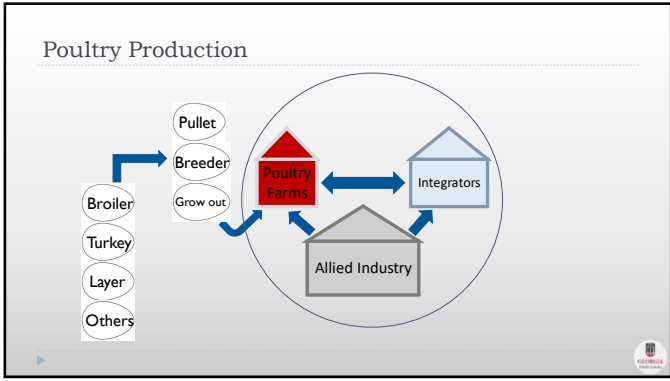
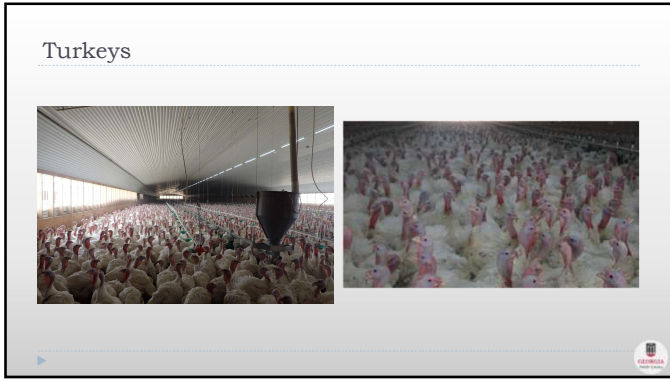


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2



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4



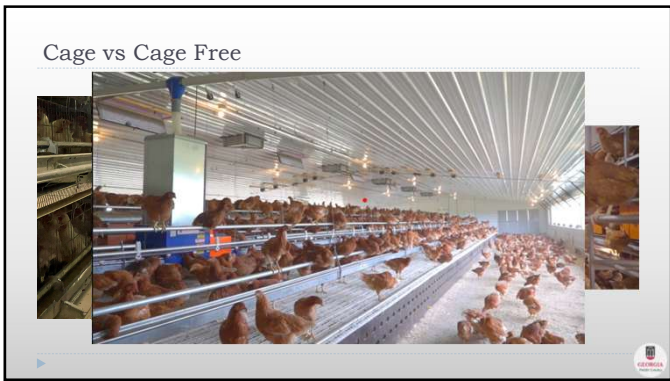
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6



7



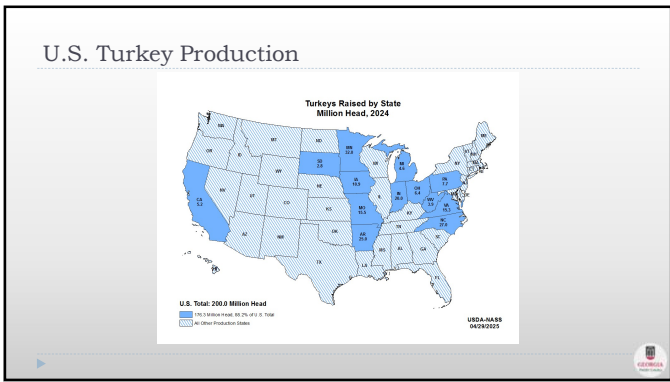
8

### Top 5 Turkey States 2024

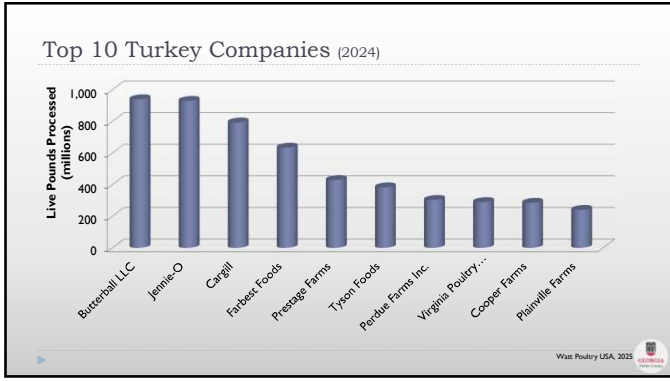
Rank	State	Head*	Pounds**
1	NC	27,000	1,020,600
2	MN	32,000	918,400
3	IN	20,000	848,000
4	AR	25,000	512,500
5	IA	10,900	504,670

\* 1,000 Head  
\*\* 1,000 Pounds

9



10



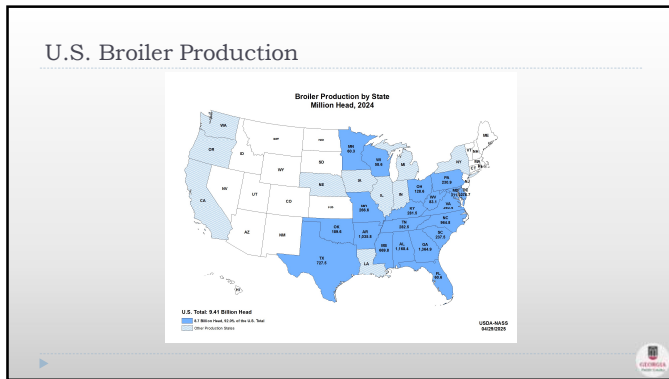
11

### Top 6 Broiler States 2024

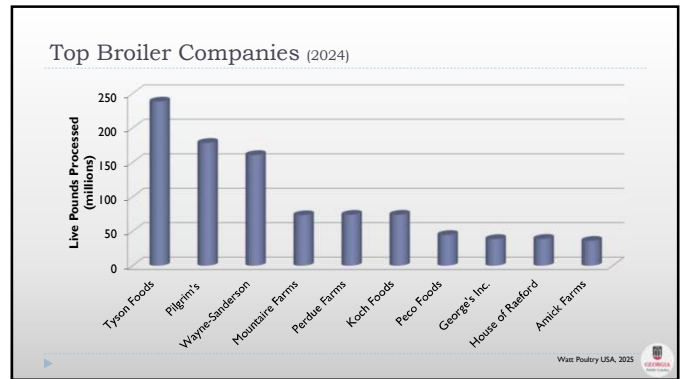
Rank	State	Head *	lb **
1	GA	1,364,900	8,189,400
2	NC	964,800	8,104,300
3	AR	1,035,800	7,561,300
4	AL	1,168,400	6,426,200
5	TX	727,500	5,019,800
6	MS	669,800	4,487,700

\* 1,000 Head  
\*\* 1,000 Pounds

12



13



14

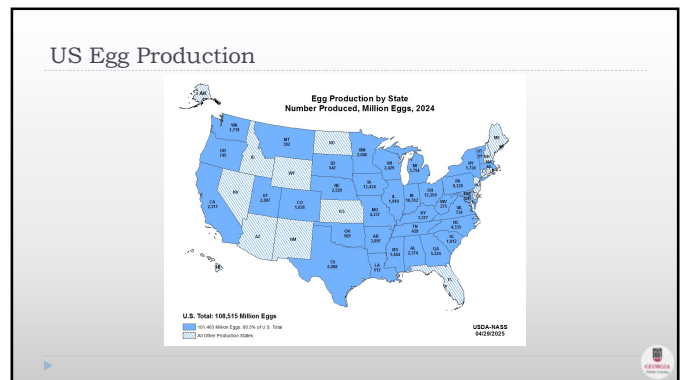
### Top ten states in table egg production

Ranked by hens

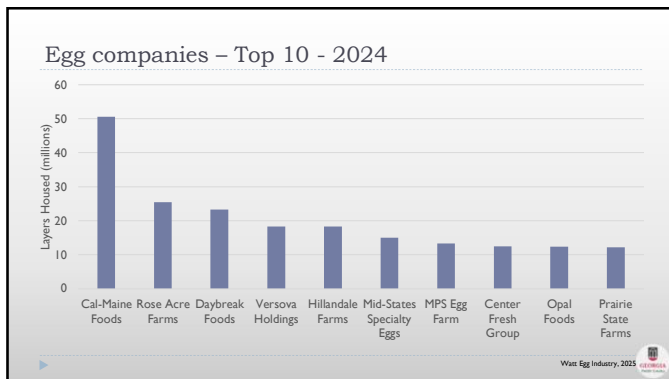
Rank	2021	2022	2023	2024
1	IA	IA	IA	IA
2	IN	OH	IN	OH
3	OH	IN	OH	IN
4	PA	PA	PA	PA
5	MI	MI	MI	TX
6	CA	CA	CA	GA
7	MN	MN	GA	NC
8	GA	GA	MN	MO
9	NE	NE	MO	AR
10	MO	MO	NC	MI

USDA-NASS 84090219

15



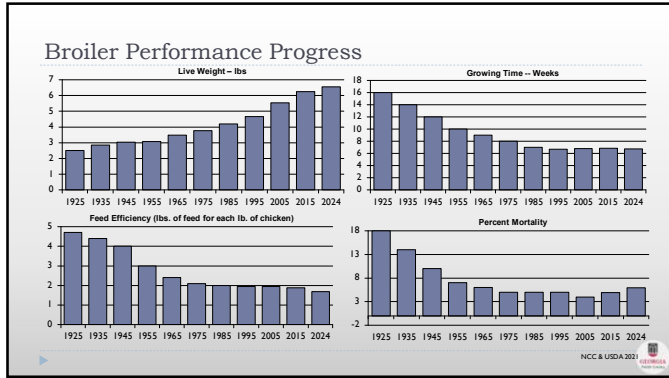
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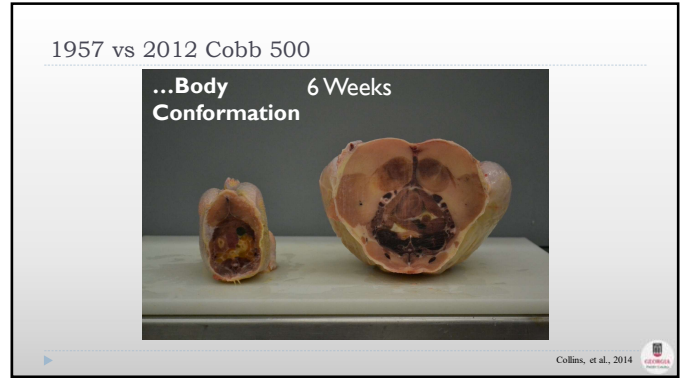
17

- ### Poultry Science Departments
- ▶ University of Georgia (Athens, GA)
  - ▶ North Carolina State University (Raleigh, NC)
  - ▶ Auburn University (Auburn, AL)
  - ▶ Mississippi State University (Starkville, MS)
  - ▶ University of Arkansas (Fayetteville, AR)
  - ▶ Texas A & M University (College Station, TX)
- 
- USDA-NASS 84090219

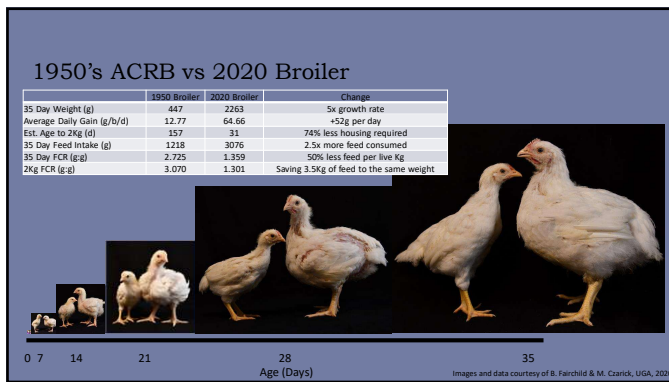
18



19



20



21

### The modern broiler

- More sensitive to environment
- Smaller margin of error
  - Performance not hardiness
- Management is the biggest challenge that it has ever been

1957 vs 2013  
Collins et al, 2015

22

### What is the key to a healthy flock?

- Chick quality
- Proper house preparation
- Optimal environment
  - Temperature
  - Moisture control
  - Air quality
- Feed formulation
- Good feeder management
- Good drinker management
  - Test water quality (minerals & bacteria)
- Good bird management
- Bird density even throughout house
- Growth rate
- Biosecurity
- Vaccine program
- Integrated pest management

23

### What is the key to a healthy flock?

- Chick quality
- Proper house preparation
- House tightness
- Optimal environment
  - Optimal temperature
  - Moisture control
  - Air quality
- Feed formulation
- Feeder management
- Light management
- Litter management
- Drinker management
  - Test water quality (minerals & bacteria)
- Bird density even throughout house
- Biosecurity
- Vaccine program
- Integrated pest management

24



### Follow the drinker manufacturer guidelines

**BROILERS**

**Management Procedures.**

**Nipple Height Adjustments.**

**Water Column Products.**

31

### Poultry drinking water bulletin

**UGA extension**

**Poultry Drinking Water Primer**

Water is a critical nutrient that maximizes attention and a problem when. Not only should producers make an effort to provide water in adequate quantity they should also know what is in the water that will be being drunk by the water lines to be used in cooperative cooling systems and consumed by the birds.

**Water Sources:**  
Water is used for bird consumption, including air temperature (including evaporative cooling) and for egg laying, growth and body maintenance. Birds consume approximately 1/2 to 1/3 liter to reach water based on a weight basis. Water is a critical nutrient to bird production and welfare. From a production perspective, water consumed by the birds is another resource (temperature, oxygen, and dissolved oxygen) to the birds, body temperature regulation and dilution of acids and toxins.

32

### Poultry basic needs

- ▶ Feed
- ▶ Water
  - ▶ Height
  - ▶ Line pressure
  - ▶ Quality
    - ▶ Minerals
    - ▶ pH
    - ▶ Hardness
    - ▶ Microbial

Contaminant, Characteristic or Mineral	Maximum Acceptable Levels
Bacteria	
Total Heterotrophic Bacteria	100 CFU/100 ml
Coliform Bacteria	50 CFU/100 ml
pH	6.8
Hardness	110
Calcium	500 ppm
Chloride	250 ppm
Copper	0.6 ppm
Iron*	0.3 ppm
Magnesium	125 ppm
Manganese**	0.05 ppm
Nitrate***	25 ppm
Phosphorus	0.1 ppm
Potassium	500 ppm
Sodium	50 ppm
Sulfate	250 ppm

33

### Poultry basic needs

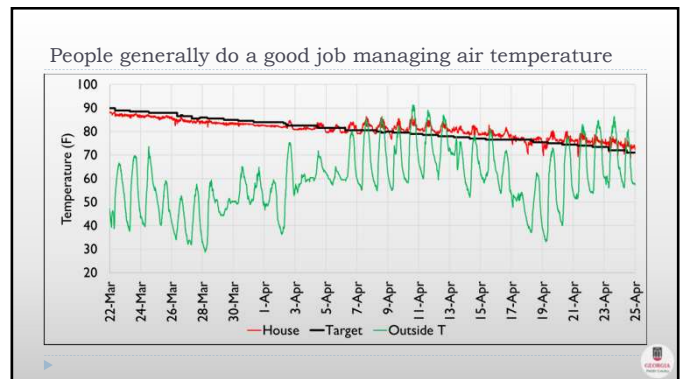
- ▶ Feed
- ▶ Water
- ▶ Temperature

34

### Newly hatched chicks

- ▶ Unable to regulate body temperature
- ▶ Maternal antibodies
- ▶ Residual yolk
- ▶ Require water and feed to stimulate upregulation of intestinal enzymes to digest carbohydrate based feed
- ▶ Many body systems are still developing
  - ▶ Thermoregulation
  - ▶ Immune
  - ▶ Digestive
  - ▶ Skeletal
- ▶ More susceptible to
  - ▶ Cold air and floors
  - ▶ Ammonia

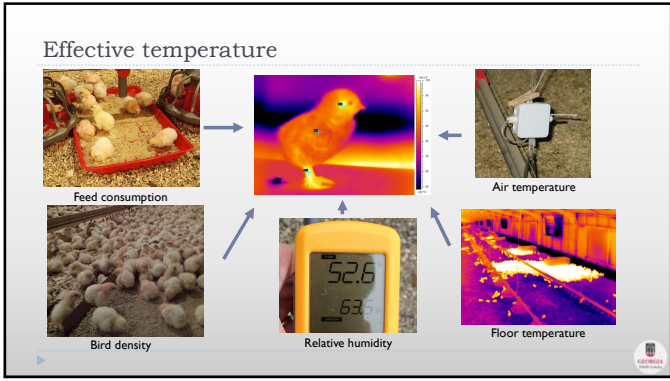
35



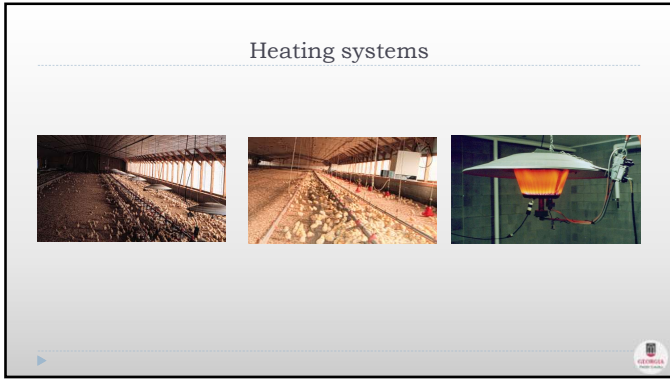
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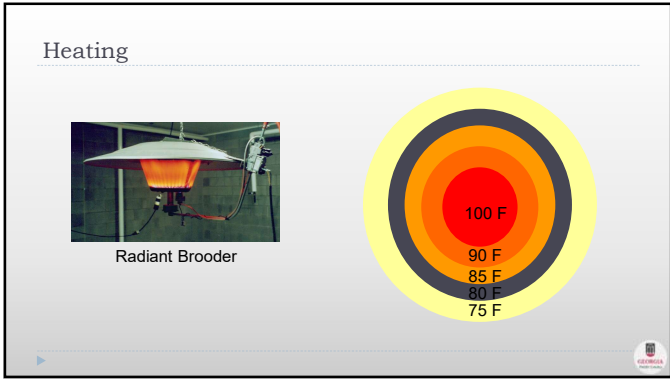
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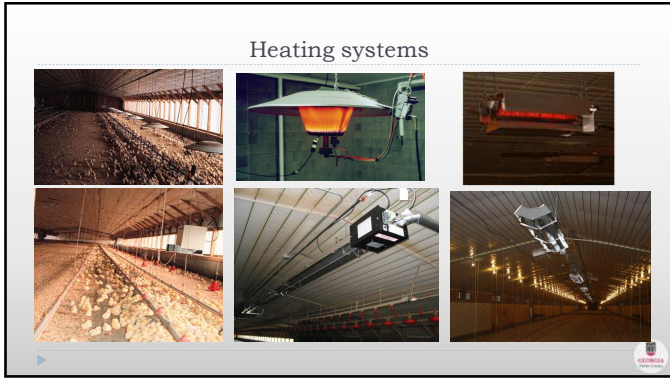
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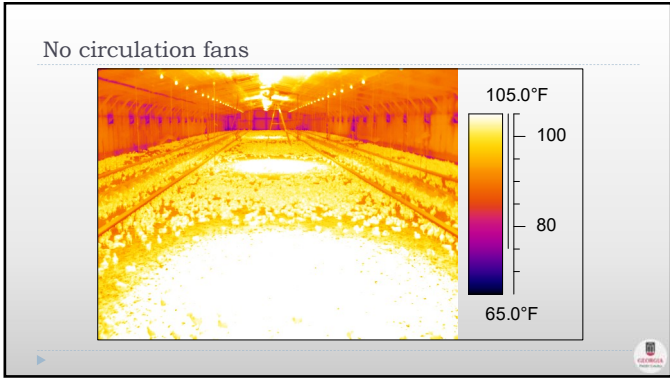
39



40



41



42

### Circulation fans help re-distribute heat

43

### Space Ray Big Foot Radiant Brooder

44

### 40' Radiant Tube Heaters (54' x 600' broiler house)

45

### Poultry basic needs

- ▶ Feed
- ▶ Water
- ▶ Temperature
- ▶ Air quality
  - ▶ Relative humidity management
  - ▶ Carbon dioxide
  - ▶ Carbon monoxide
  - ▶ Dust
  - ▶ Ammonia

46

### Poult's oxygen requirements (one-week-old)

- ▶ 0.01 cul
- ▶ Air is 21% oxygen
  - ▶ Fresh air
- ▶ Barn with poor ventilation
  - ▶ Fresh air
  - ▶ Or
  - ▶ Or

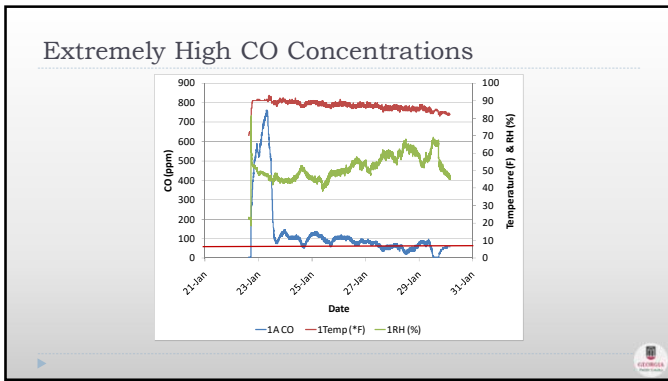
47

### Carbon Monoxide (CO)

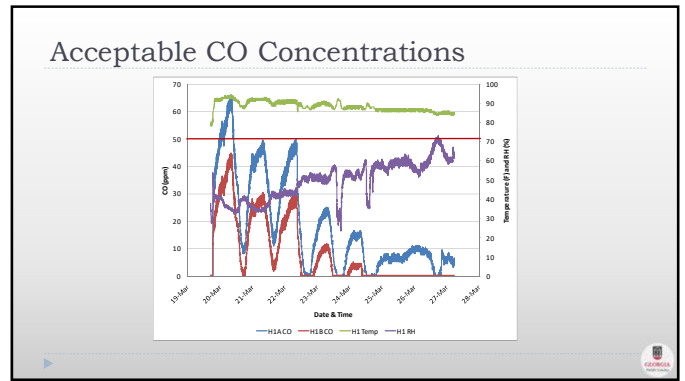
- ▶ Field study
- ▶ Workers wore CO detectors
  - ▶ 1994-1998 - 25 people affected by CO concentrations greater than 50ppm
  - ▶ Chickens were less affected
    - ▶ One incident resulted in ~3,500 dead birds around the radiant heaters
- ▶ Conclusions of the study
  - ▶ Accidents occurred in new tight buildings during coldest months of the year
  - ▶ Poor maintenance of heating equipment biggest factor

▶ (Breurec et al, 1999)

48



49



50

### CO<sub>2</sub> Research

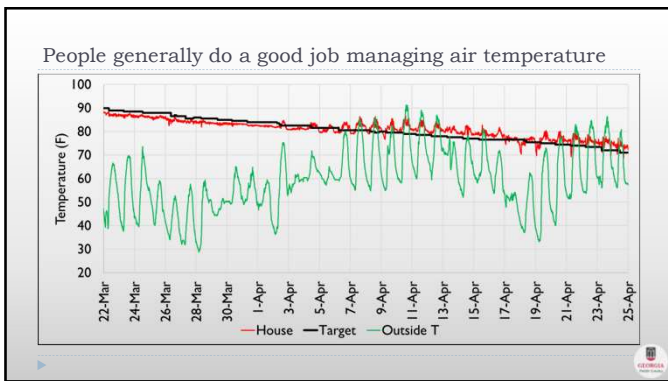
- ▶ 2008, Olanrewaja, Dozier, Purswell, Branton, Miles, Lott, and Thaxton
  - ▶ 3,000 ppm, 6,000 ppm, 9,000 ppm from 0 to 14 days
    - ▶ Performance, blood chemistry and heart condition
  - ▶ Increasing from "0" ppm to 3,000, 6,000 or 9,000 ppm did not affect blood chemistry
  - ▶ Increasing from "0" ppm to 3,000, 6,000, or 9,000 ppm did not affect 28 and 49 body weight gain or feed conversion
  - ▶ Increasing from "0" ppm to 9,000 ppm did affect mortality most likely due to pulmonary hypertension syndrome (changes in heart).

51

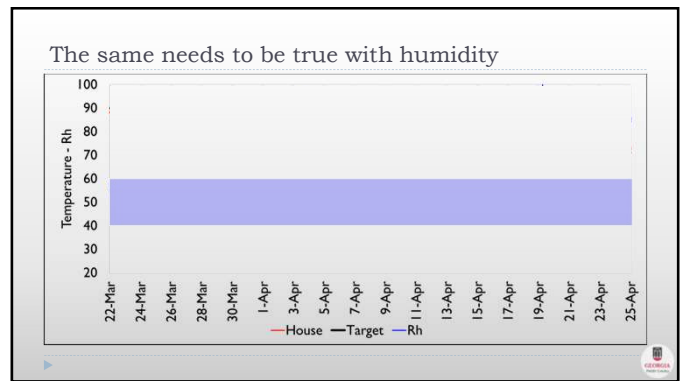
### Moisture management

- ▶ We should simply monitor relative humidity

52




53



54

When it comes to ventilating poultry houses during cold weather...

- ▶ Our primary objective when it comes to air quality is to manage house moisture levels



- ▶ In fact, 95% of the time house moisture levels are what determines how much we need to ventilate during cold weather.

55

If we don't remove the water the birds are adding to a house each day, over time we will get wet litter...

- ▶ Which will lead to excessive ammonia, respiratory issues, damage paws, etc.



56

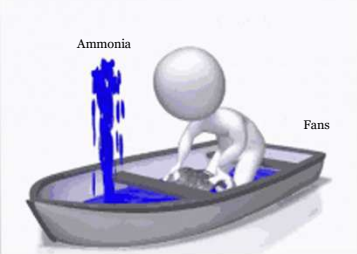
In general, we really shouldn't be ventilating to control ammonia



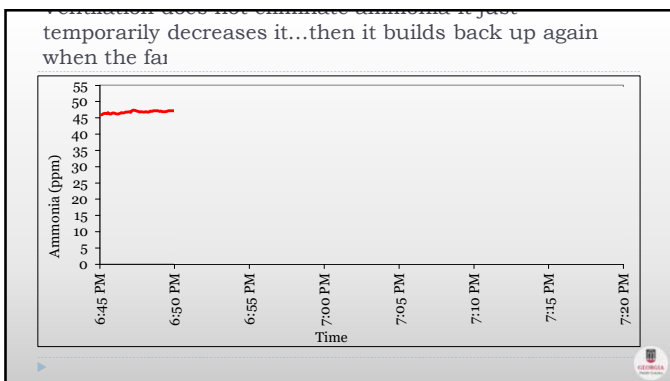
- ▶ If we are...we have already lost the battle

57

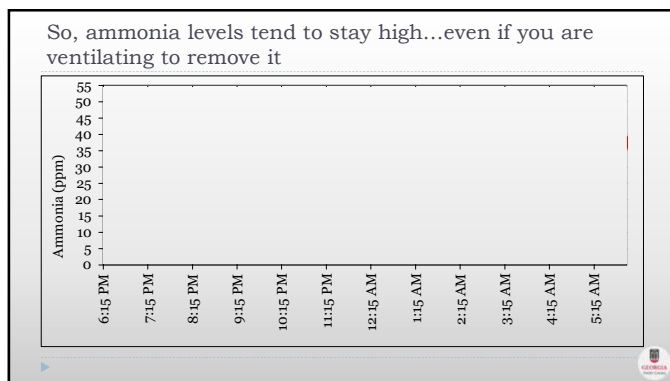
This is because once you have ammonia... it is very difficult to get rid of



58




59



60

Moisture is required to generate/create ammonia

Uric Acid



Therefore, the best way to control ammonia production is to control moisture

61

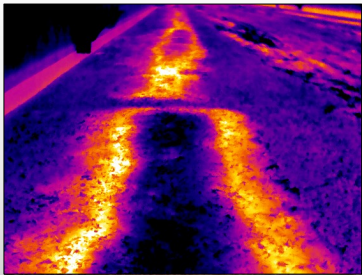
The key to controlling ammonia is to control the generation of ammonia...

- Which can be accomplished by controlling litter moisture



62

Most of the moisture is near the drinkers... which means most of the ammonia is being generated near the drinkers



63

Ammonia generation vs. House location

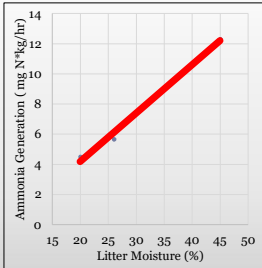
- Miles, Brooks, McLaughlin, and Rowe (USDA – Mississippi State).
  - 100 samples per house:
    - Side walls
    - Feeders
    - Drinkers
  - Measured ammonia generation rate, litter moisture and litter pH



64


Findings:

- Litter moisture:
  - Near feeders (20%)
  - Near side wall (26%)
  - Near drinkers (45%)
- Ammonia generation rate (brood area):
  - Near feeders (4.5 mg N<sup>3</sup>/kg of litter/hr.)
  - Near side wall (5.7 mg N<sup>3</sup>/kg of litter/hr.)
  - Near drinkers (12.3 mg N<sup>3</sup>/kg of litter/hr.)



65

Findings:




- If you could reduce ammonia generation rate near the water lines to that near the feed lines or side wall by lowering litter moisture
- Ammonia levels could be reduced by roughly 40% to 80%

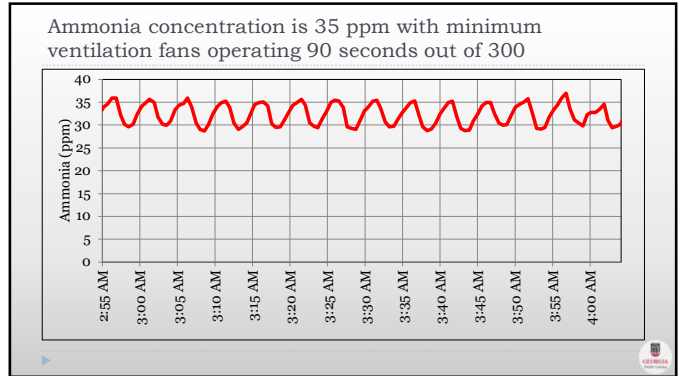
66

How do you determine a minimum ventilation rate to control ammonia once you have it?

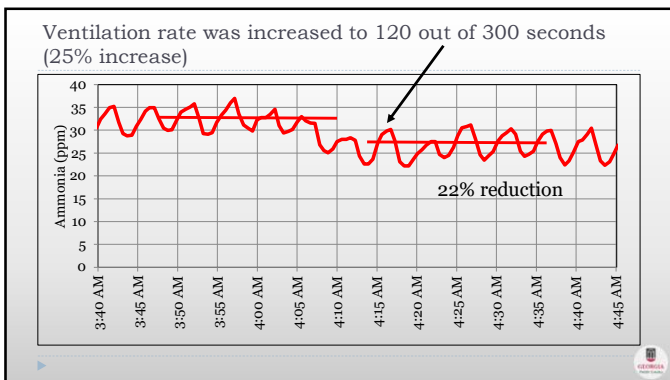
- It depends on the current level and how much you need to reduce it.
- Ammonia concentration is roughly proportional to ventilation rate
- If you want to cut ammonia concentration in half, you need to double your current minimum ventilation rate
  - 80 ppm to 40 ppm...double min vent rate
  - 40 ppm to 20 ppm...double min vent rate
  - 20 ppm to 10 ppm...double min vent rate
- For example...



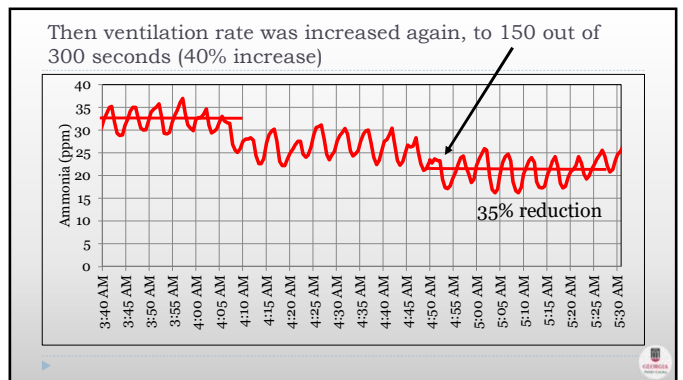
67



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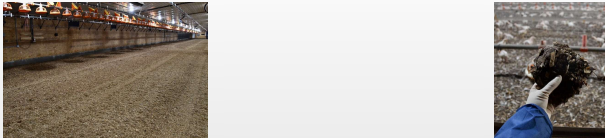
It is important to keep in mind...

- Since roughly 80% of a house's heating cost is associated with ventilation/leakage...
- doubling minimum ventilation rates can easily result in a 50% or more increase in heating costs.



71

To control ammonia...



- Between flocks...we typically need to dry the litter.
- Prior to bird placement we need to add a litter amendment
  - How much depends on how you managed the litter between flocks
- Once the birds are placed, we need to make sure our litter remains relatively dry by ventilating to remove the moisture the birds are adding each day

72

Step #1 in removing the moisture the birds are adding to the house each day...

- To do so we need to determine minimum ventilation rates based primarily on bird water consumption




For example...

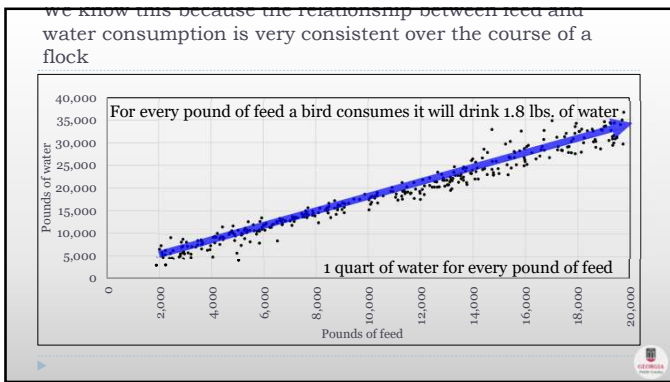
73

A 21-day-old broiler...

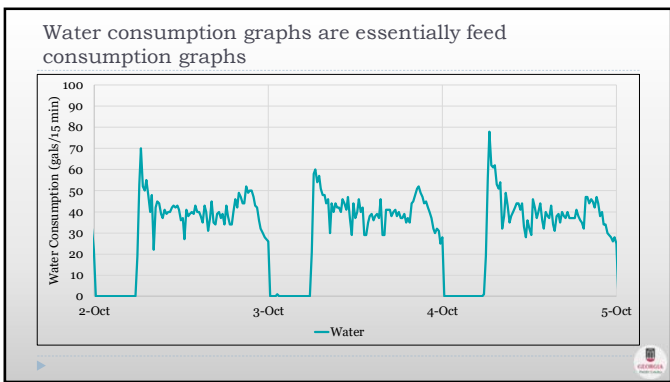
- will consume approximately 1/4 of a pound of feed each day...
- and will drink 1/2 of a pound or 8 oz of water...



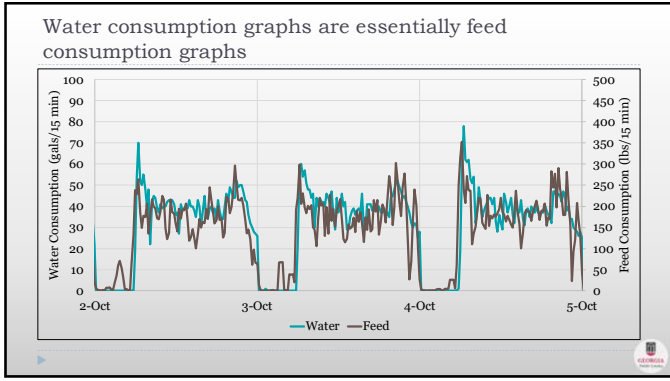
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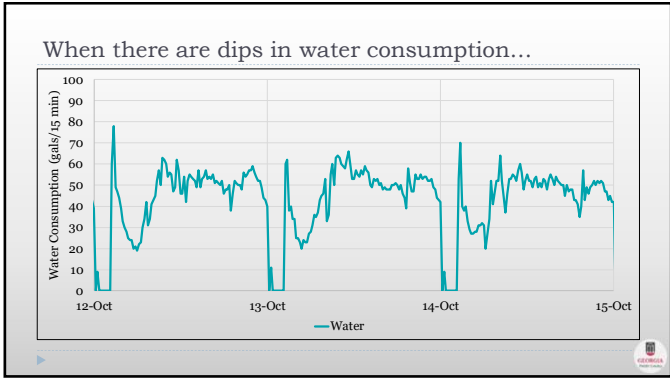
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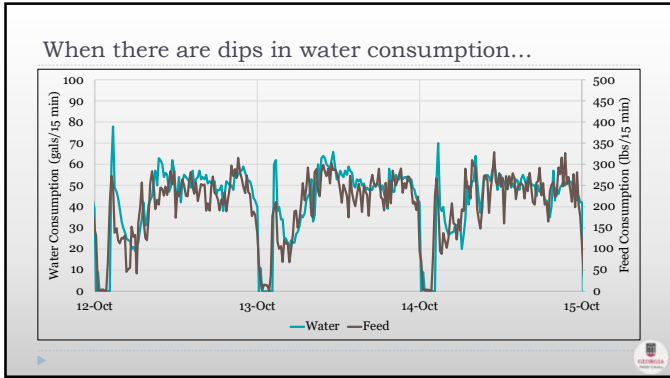
76



77




78



79


### A 21-day-old broiler...

- ▶ will consume approximately 1/4 of a pound of feed each day...
- ▶ and will drink 8 oz of water...
- ▶ and will retain roughly 20% of the water consumed (1.6 oz)...
  - ▶ tissues, organs, blood, etc.
- ▶ Therefore, each bird will add 6.4 oz of water to the house over the course of the day (8 oz - 1.6 oz = 6.4 oz)
- ▶ But...



80

### Interesting fact...




- ▶ The digestion of feed actually creates water...
- ▶ In fact, digesting 1/4 pound of feed will produce 1.6 oz of water

81

### So, a 21-day-old broiler...


- ▶ will drink 8 oz of water...
- ▶ will retain 1.6 oz of water...
  - ▶ tissues, organs, blood, etc.
- ▶ will create 1.6 oz of water by digesting a 1/4 pound of feed...
- ▶ Therefore, each bird will drink 8 oz of water then add 8 oz of water to the house over the course of the day.



82

### The fact is for any given bird age...

- ▶ the best measure of the amount of water the birds are adding to a house each day...
- ▶ is a water meter.



83

### Now to control house litter moisture...


- ▶ we simply need to ventilate a house each day based on the amount of water the birds are adding to the house.



- ▶ In short, whatever the birds are drinking each day...
- ▶ We need to remove from the house each day...

84

How do we determine how much we need to ventilate to remove the water the birds are adding to a house each day?



- Under "typical" wintertime conditions...
- a rough rule of thumb is...
- we need to exchange approximately 14,000 cubic feet of air to remove each gallon of water added to the house.

85



We bring in 14,000 cubic feet of



86


So, if a water meter indicates that 500 gallons flowed into a house on a given day...

- We would need to remove 500 gallons
- To do so we would need to exchange...
  - Air exchange rate = 500 gallons X 14,000 ft<sup>3</sup>/gals = 7,000,000 ft<sup>3</sup> per day
- Or in terms of cubic feet of air per minute...
  - 7,000,000 ft<sup>3</sup>/day / 24 hours / 60 minutes = 4,860 cfm

87

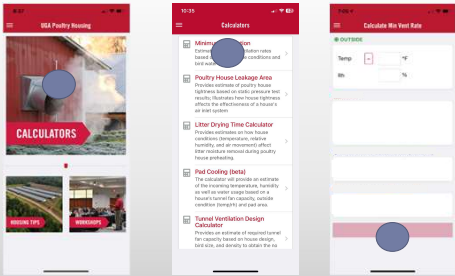
What if conditions are not "typical"



- How do minimum ventilation rates vary with inside/outside conditions?

88

To help answer this question we developed Poultry411 minimum ventilation calculator App



89


Example:

- Broiler house with fourteen-day-old birds



90


Inside conditions = 80°F, RH = 50%



- ▶ Outside it is 40°F, Rh = 50%
- ▶ Daily water consumption = 1,200 gallons
- ▶ Three 36" exhaust fans (10,000 cfm) will be used for minimum ventilation

91

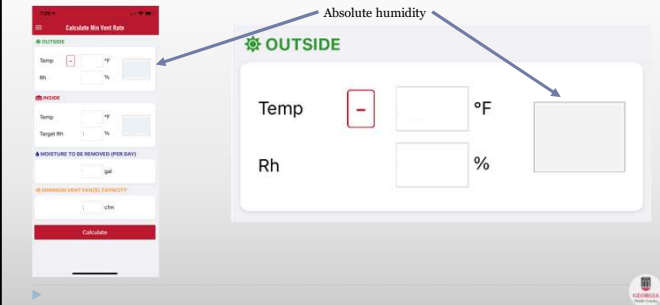
Outside (40°F, 50%)



92

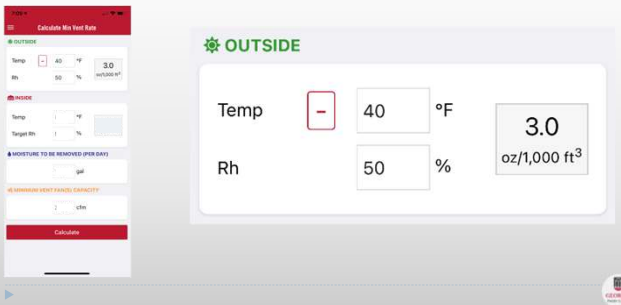
Outside (40°F, 50%)

Absolute humidity



93

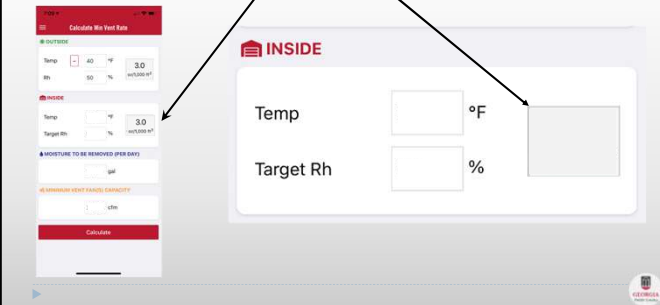
Outside (40°F, 50%)



94

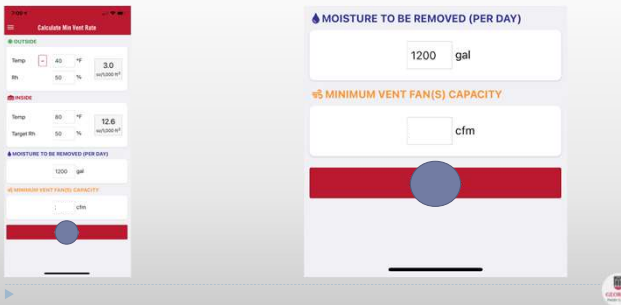
Outside (40°F, 50%) Inside (80°F, 50%)

Absolute humidity?



95

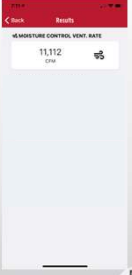
Outside (40°F, 50%) Inside (80°F, 50%)  
1,200 gallons to be removed with three 10,000 ft³/min fans



96

Minimum ventilation rate = 11,112 ft<sup>3</sup>/min

- ▶ Rule of thumb vent. Rate = 1,200 gals X 14,000 ft<sup>3</sup>/min
- ▶ = 16,800,000 ft<sup>3</sup>/day
- ▶ = 11,670 ft<sup>3</sup>/min



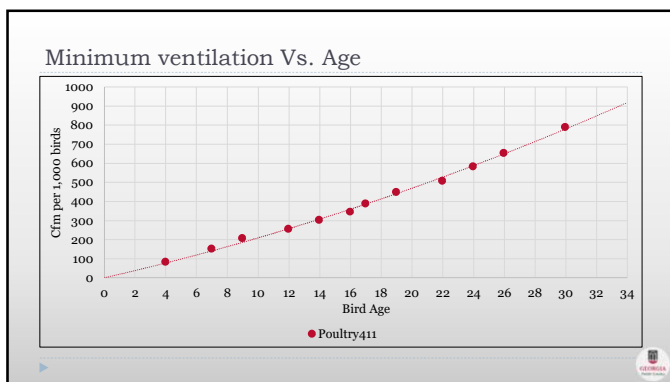
97

The app could be used to provide a minimum ventilation rate chart for a typical flock...

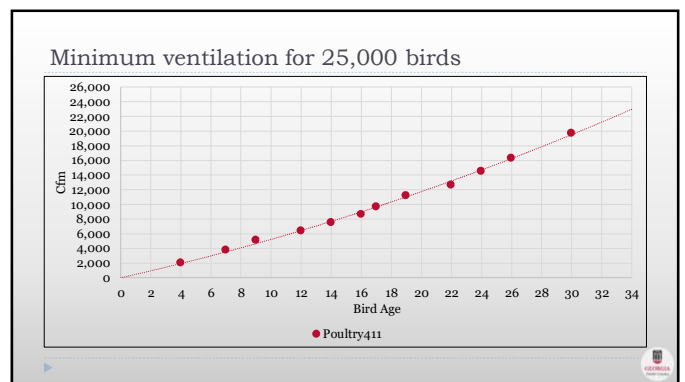
- ▶ All you need to know is for each bird age (weekly/daily):
  - ▶ Typical water usage (i.e. 20,000 birds)
  - ▶ Average outside temperature and RH
  - ▶ Inside temperature and Target RH (50%)



98




99



100

Poultry basic needs

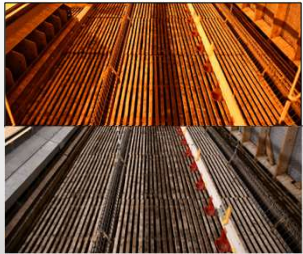
- ▶ Feed
- ▶ Water
- ▶ Temperature
- ▶ Air quality
- ▶ Light
  - ▶ Photoperiod
  - ▶ Scotoperiod
  - ▶ Intensity
  - ▶ Spectrum



101

Features of Light

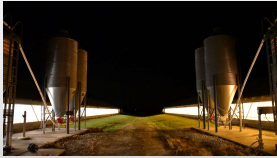
- ▶ Broiler Production:
  - ▶ Photoperiod (duration)
    - ▶ Photoperiod/Dark period hours
  - ▶ Intensity ( brightness)
    - ▶ 1 foot candle = 10.76 lux
  - ▶ Wavelength (color)
    - ▶ nm
    - ▶ Color temperature
  - ▶ Light source
    - ▶ Incandescent, CFL, CCFL, HPS, LED, etc..
    - ▶ Spectrum – Kelvin, Light color temperatures



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### Physiological Responses (photoperiod)

- ▶ **Reproduction (seasonal breeders)**
  - ▶ Red light (longer wavelengths penetrate extra retinal receptors)
- ▶ **Decreased plasma corticoids**
- ▶ **Pineal gland**
  - ▶ Melatonin
    - Cardiopulmonary
    - Reproductive
    - Excretory
    - Thermoregulatory
    - Behavioral
    - Immunomodulatory
    - Neuroendocrine



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### Photoperiod influence on feed conversion

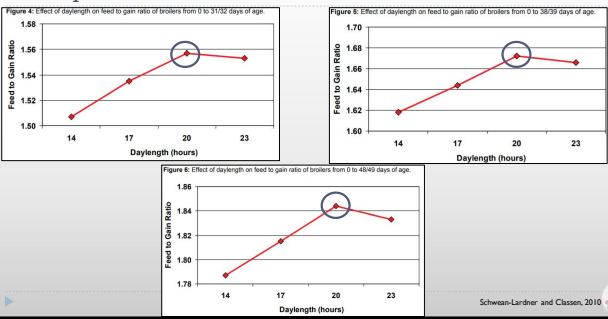


Figure 4: Effect of daylength on feed to gain ratio of broilers from 0 to 31-102 days of age.

Figure 5: Effect of daylength on feed to gain ratio of broilers from 0 to 38-29 days of age.

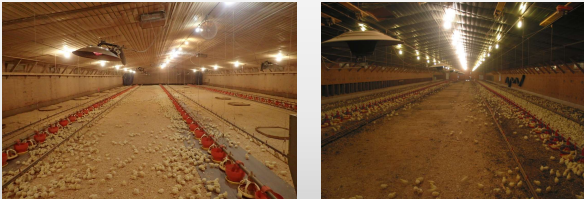
Figure 6: Effect of daylength on feed to gain ratio of broilers from 0 to 48-69 days of age.

Schwann-Lardner and Classon, 2010

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### Uniformity


- ▶ Less than a 20% difference throughout the house
- ▶ More important for brooding



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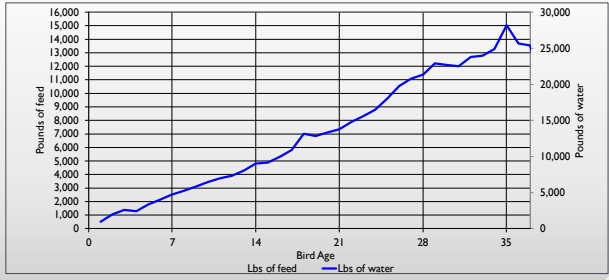
### Monitoring lighting in poultry houses

- ▶ Use water meters
- ▶ Preferable at least 2
  - ▶ Front of house
  - ▶ Back of house
- ▶ More research needed on the use of 4 or more water meters per house



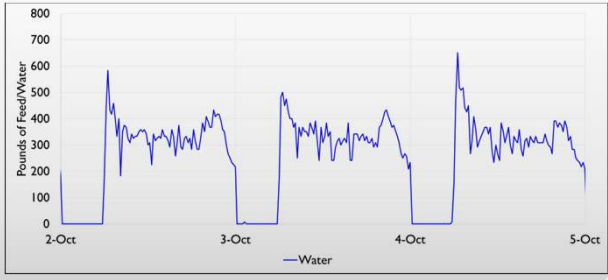
106

### Monitoring daily water consumption is important

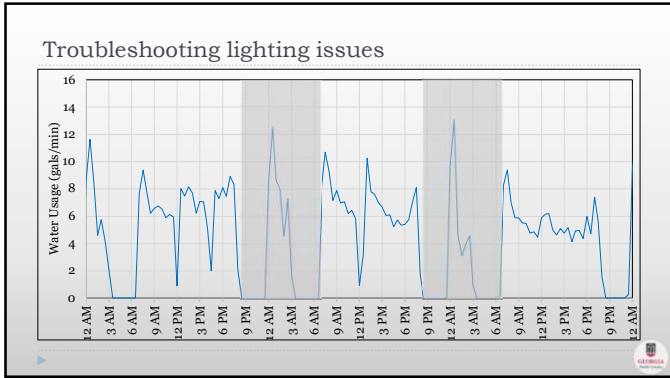


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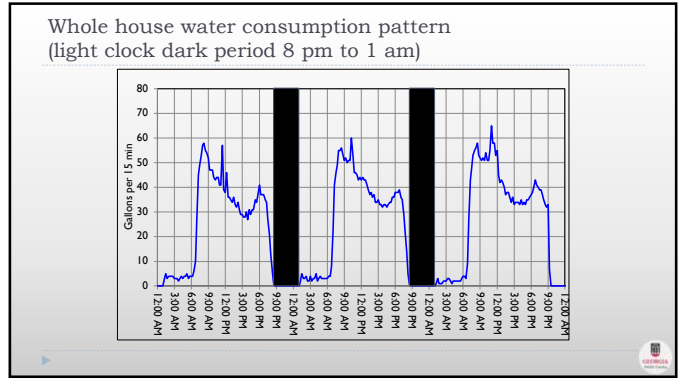
### 15 minute water consumption illustrates how birds drink over the course of the day



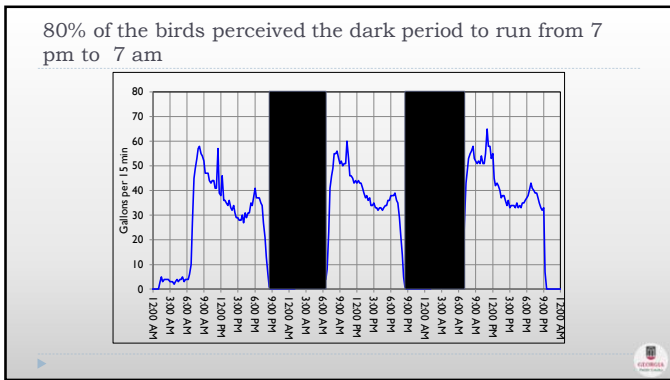
108



109



110



111



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### Sunrise was at 7:09 am

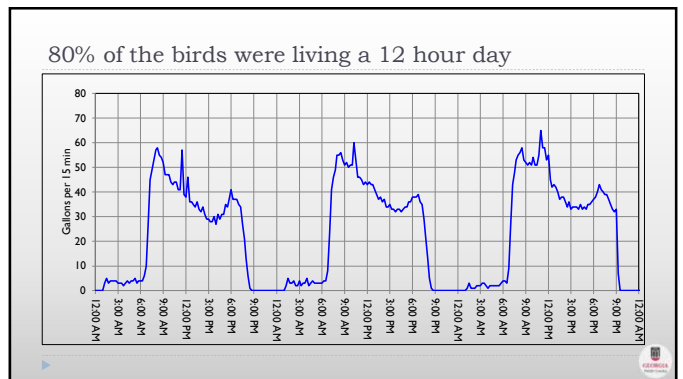
Sunrise and sunset Atlanta

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**Friday, August 29, 2014**

- Morning astronomical twilight: 05:42
- Morning nautical twilight: 06:14
- Morning civil twilight: 06:44
- Sunrise: 07:09**
- Transit: 13:36
- Sunset: 20:06
- Evening civil twilight: 20:32
- Evening nautical twilight: 21:02
- Evening astronomical twilight: 21:33

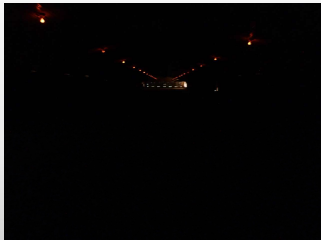
113



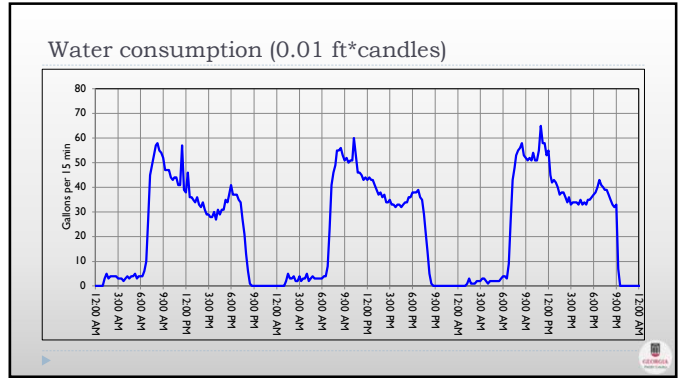
114

### Lighting program

- Light intensity was running approximately 0.01 ft\*candles



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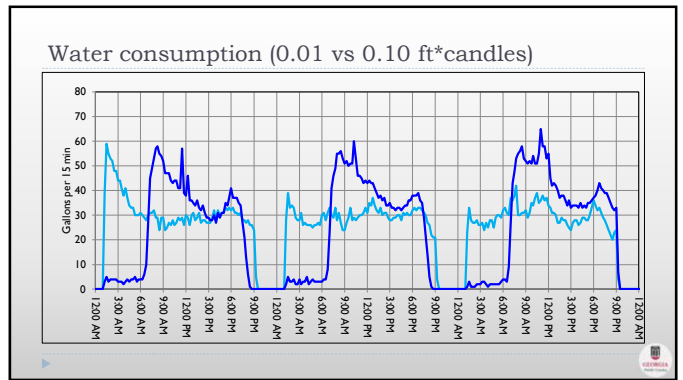


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### Light in the house was increased to 0.10 ft\*candles in adjacent house



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### Evaluating the effect of daylength (24, 20, and 18 hours) during brooding on broiler performance and physiological responses to light environment

Garret G. Ashabansner, Michael Czurik III, Brian D. Fairchild

University of Georgia, Poultry Science Department, Georgia, USA 30602

**ARTICLE INFO**      **SUMMARY**


**Keywords:** Brooding broiler chicks under continuous or near-continuous light is common in poultry research and commercial broiler production. Despite its prevalence, there is a notable lack of research to support its use. The current research investigated the impact of natural daylight (24, 20, and 18 hours) during brooding on broiler performance and physiological responses in the light environment. Broiler performance and physiological responses were recorded in four experiments consisting of one trial. Broiler birds reared under continuous light during brooding initially exhibited higher body weights during the first week of  $<math>P</math>. Following the introduction of the dark period for the control group on day 7, the treatment birds exhibited no dark period during brooding overtook the control group in body weights. From Days 28-42, no differences in performance were observed between the control and treatment groups. No significant differences were found in feed conversion between treatment and control groups during any experiment. Concentration and depressive duration were consistently modulated by either lighting program. The introduction of a dark period during brooding led to higher broiler and eggshell retention in incubators levels in the treatment birds, persisting up to 26 days of age. Feed intake remained in commercial parity across broiler treatment. Our research findings, with no significant differences observed in performance or mortality were unexpected to control and treatment broilers. This research illustrates that providing broiler chicks with a dark period from day of placement does not have detrimental effects on end-of-day performance.$

**Description of the problem** and 14 between chicks exposed to 20 hours of light and 4 hours of dark (20L:4D) versus 23 hours of light and one hour of dark (23L:1D) (12:00-1:00-2022). Higher plasma melatonin was observed during the lighting and end of the dark period in chicks reared under 20L:4D compared to 23L:1D.

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### Why are chicks given 24 hours of light during brooding?

- It is assumed that chicks will eat more feed and get chicks off to a good start but is this true?



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### Studies conducted

- ▶ **Study 1**
  - ▶ 3 trials comparing 24L versus 20L:4D during brooding
  - ▶ 14 days
- ▶ **Study 2**
  - ▶ 2 trials comparing 24L versus 18L:6D during brooding
  - ▶ 21 days
- ▶ **Study 3**
  - ▶ 2 trials comparing 24L versus 18L:6D during brooding
  - ▶ 42 days
- ▶ **Study 4**
  - ▶ Commercial field trials comparing 24L versus 18L:6D during brooding
  - ▶ 49 days

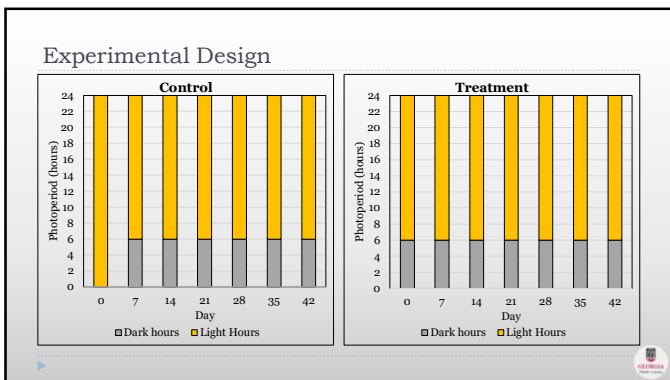
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### Objectives:

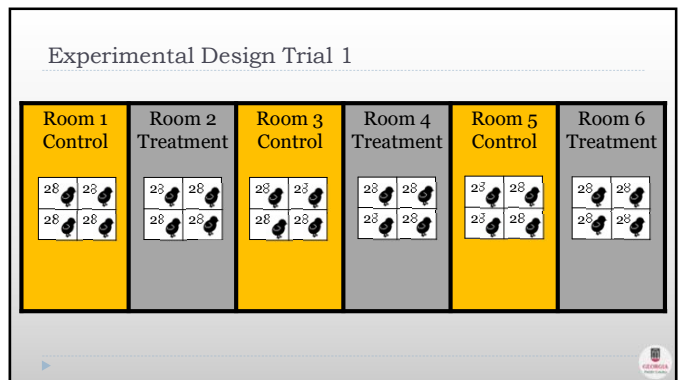
- ▶ Determine the impact of giving chicks a 6-hour dark period during the first week of age on broilers reared to 42 days



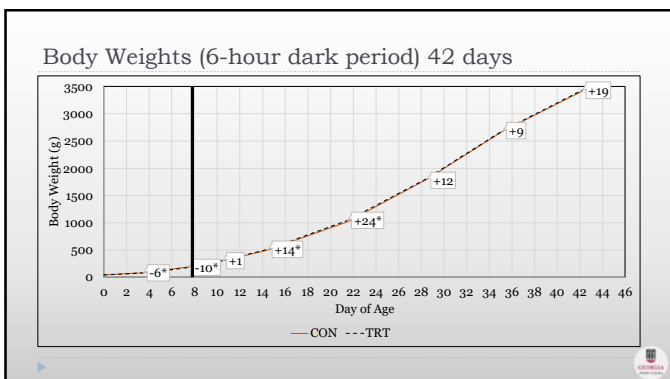
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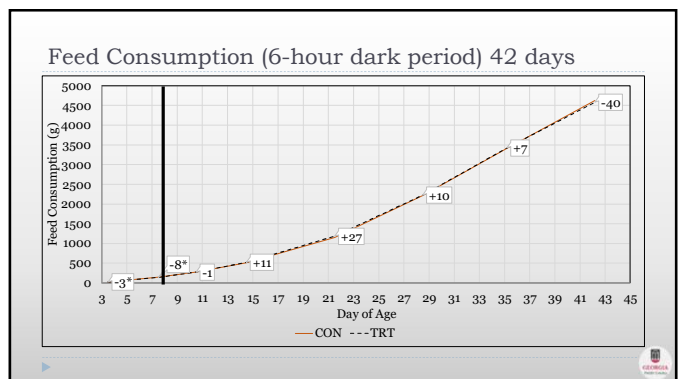
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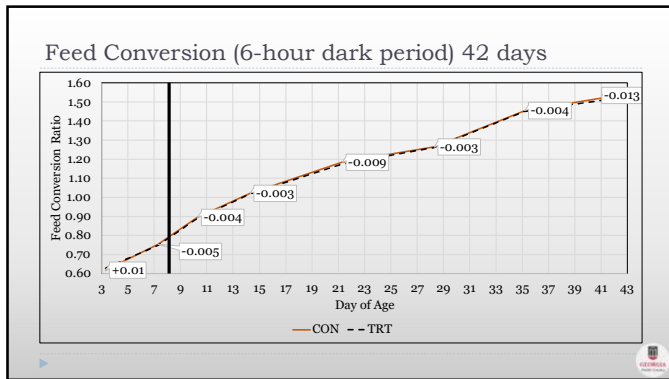
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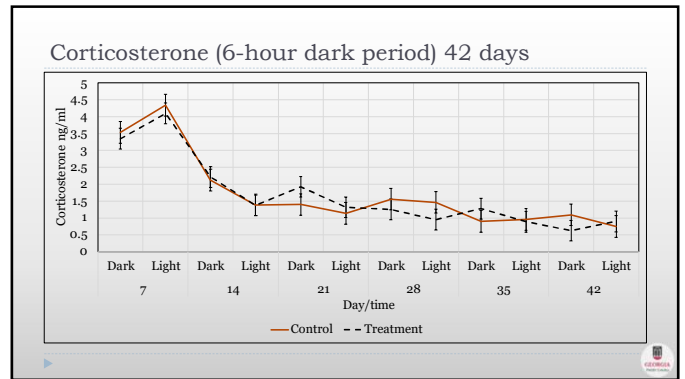
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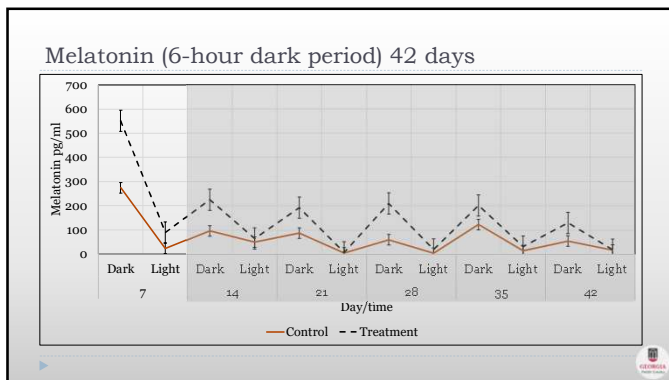
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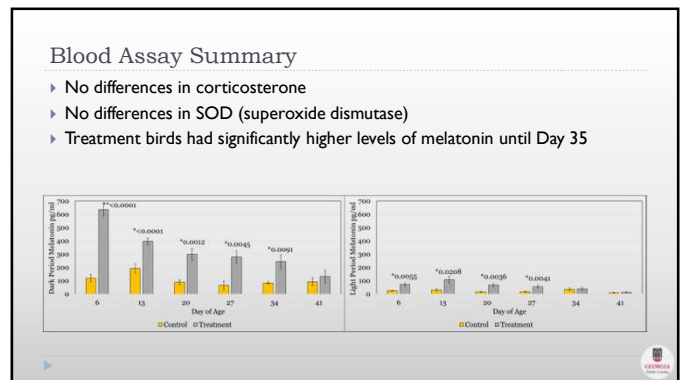
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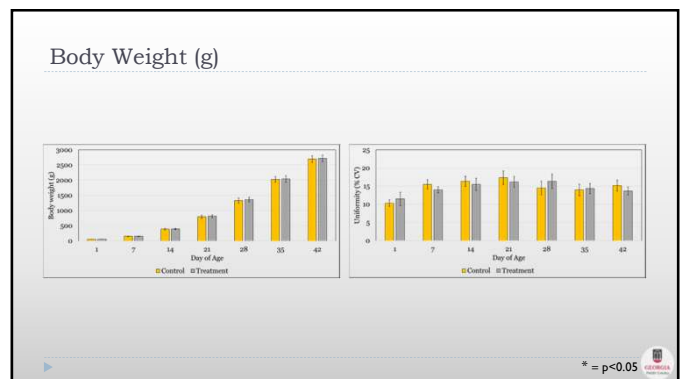


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### Broiler Farm Trials

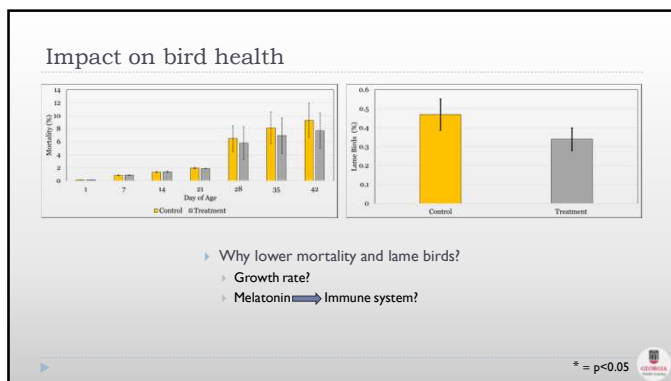
- ▶ 24L versus 18L:6D during brooding
- ▶ Separated by house
- ▶ Collect data on:
  - ▶ Weekly body weights
  - ▶ Water usage patterns
  - ▶ Mortality
  - ▶ Leg culls
  - ▶ Grower feedback

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\* = p<0.05



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### Brooding dark period summary:

- ▶ Providing chicks a dark period during brooding does not affect bird mortality, weight, feed consumption, and FCR by the end of the flock
- ▶ Can be done on virtually every farm

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### Poultry basic needs

- ▶ Feed
- ▶ Water
- ▶ Temperature
- ▶ Air quality
- ▶ Light
- ▶ Protection from disease
  - ▶ Confined housing
  - ▶ Biosecurity
  - ▶ Vaccination

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### Steps to successful brooding

- ▶ Floor temperature of 90-95°F (32-35°C)
- ▶ Rh between 40-60%
- ▶ Good air quality
  - ▶ NH<sub>3</sub> ≤ 25-35 ppm
  - ▶ CO<sub>2</sub> ≤ 5,000 ppm
  - ▶ CO ≤ 50 ppm
- ▶ Feed availability
- ▶ Water availability
- ▶ Light (30 lux (3 ftc) or more)
- ▶ Conduct house tightness checks and perform maintenance as needed
- ▶ Focus on basics

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### How do you know if you have it right?

- ▶ You measure it
  - ▶ Feed consumption
  - ▶ Mortality
  - ▶ Data loggers
    - ▶ Temperature
    - ▶ Relative humidity
    - ▶ Light

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### How do you know if you have it right?

- ▶ You measure it
- ▶ A combination of observing
  - ▶ Water consumption
  - ▶ Mortality
  - ▶ The birds
  - ▶ Bird activity

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Plastic pads will fit into existing six-inch paper pad systems

- ▶ Similar design velocity,
  - ▶ 350-375 ft/min
- ▶ Similar static pressure
  - ▶ 0.05" – 0.06"

140

Primary differences:

- ▶ Made of plastic,
- ▶ Two feet wide,
- ▶ Flutes are larger,

141

Primary differences:

- ▶ Made of plastic,
- ▶ Two feet wide,
- ▶ Flutes are larger,
- ▶ Instead of angled flutes, have "U-shaped" or "V-shaped" flutes

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We have been conducting studies on plastic pads for over 10 years  
 ...most recent study started 3 years ago

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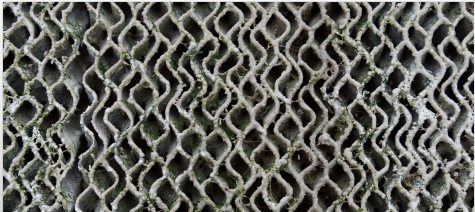
Objectives:

- 1) Compare pad cooling/humidity of plastic vs. paper
  - ▶ High flow water distribution system (Barku)
  - ▶ Conventional "low flow" water distribution systems (Reeves)

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Objectives:

- 2) Explore ways to minimize mineral build-up on pads
- 3) Explore ways of removing mineral build-up from pads



145


On the study farm the pads were essentially turned into stone in about six years.



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Six house farm – Study conducted in four of the houses

- ▶ New Paper Pad – Old Reeves System (conventional flow)
- ▶ Barku Plastic Pad – Barku System (high water flow)
- ▶ Barku Plastic Pad – Old Reeves System (conventional flow)
- ▶ Big Dutchman Plastic – Old Reeves System (conventional flow)




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Barku maximum water circulation

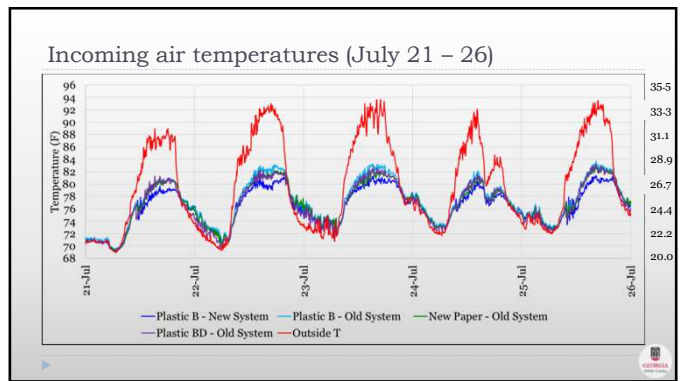


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Reeves – Maximum water circulation



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### Cooling comparison (last ten days of the flock)

Location	Temperature (C)	RH(%)
Outside	29	74.8

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### Differences between plastic and paper pads:

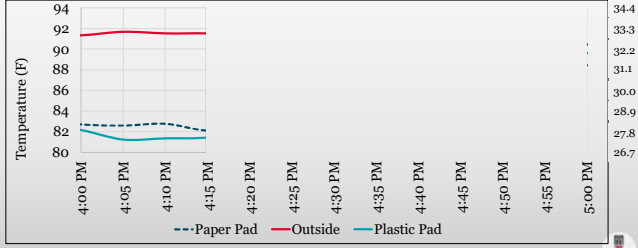
- ▶ Plastic pads are much more difficult to fully wet
  - ▶ Most existing systems are not capable of putting enough water on plastic pads



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### Differences between plastic and paper pads:

- ▶ Plastic pads dry out faster than paper pads




Time	Paper Pad (F)	Outside (F)	Plastic Pad (F)
4:00 PM	82.5	92.0	80.0
4:05 PM	83.0	92.0	80.0
4:10 PM	83.5	92.0	80.0
4:15 PM	83.0	92.0	80.0
4:20 PM	82.5	92.0	80.0
4:25 PM	82.5	92.0	80.0
4:30 PM	82.5	92.0	80.0
4:35 PM	82.5	92.0	80.0
4:40 PM	82.5	92.0	80.0
4:45 PM	82.5	92.0	80.0
4:50 PM	82.5	92.0	80.0
4:55 PM	82.5	92.0	80.0
5:00 PM	82.5	92.0	80.0

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### Differences between plastic and paper pads:

- ▶ Plastic pads are more likely to carry water into pad rooms
  - ▶ Must have pad rooms to obtain maximum cooling



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### Differences between plastic and paper pads:

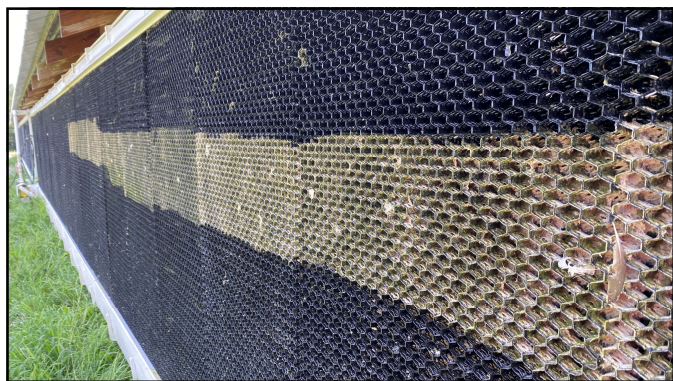
- ▶ Plastic pad are much easier to clean than paper pads



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Differences between plastic and paper pads:

- ▶ Plastic pad cost twice as much

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Conclusions:

- ▶ If you have good water quality, it is probably best to stick with paper pads.
- ▶ You might have to replace your circulation system to obtain maximum cooling from plastic pads.
- ▶ The use of interval timers may be problematic.
- ▶ Plastic pads tend to be "messy"
  - ▶ If you reduce water flow over the pads, cooling will decrease significantly

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Management for healthy flocks

- ▶ Temperature
- ▶ Relative humidity < 60%
- ▶ Optimize air quality
  - ▶ Ammonia < 35 ppm
  - ▶ CO2 < 5,000 ppm
  - ▶ CO < 50 ppm
- ▶ Unlimited access to feed
- ▶ Manage water system
  - ▶ Unlimited access
  - ▶ Line height
  - ▶ Water pressure
- ▶ Keep birds evenly distributed
  - ▶ Use migration fences
  - ▶ At least one fence every 100 ft (30 m)
- ▶ Light
- ▶ Biosecurity
- ▶ Effective integrated pest management program

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**Department of Poultry Science**  
 College of Agricultural & Environmental Sciences  
**UNIVERSITY OF GEORGIA**

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