Brooding

- Put simply, chicks have 5 basic requirements for their comfort zone:
  1. Feed
  2. Lights
  3. Air / Temperature
  4. Water
  5. Space
Ammonia Production - Air/Temp.
Effects of Ammonia

Effects of Increased Ammonia Levels on Bird Body Weight at 7 Weeks, 2002

- 20 PPM (continuous for 6 weeks)
  - pulmonary edema, congestion, and hemorrhage²
  - increased susceptibility to respiratory disease due to ciliastasis²
  - reduced weights (9 points less at 49 days)⁴

- 40 PPM
  - distillation and decreased clearance of E. coli from lungs and airsacs³

- 25-50 PPM
  - reduced body weights (0.50 lbs. Less at 49 days), feed efficiency and increased airsacculitis in birds exposed to IBV³⁴
  - Corneal edema and ulceration ⁴

- 50-100 PPM
  - keratoconjunctivitis, deep corneal ulceration, and blindness³⁴
  - poor weight distribution⁴

⁴ D. Miles and B. Lott, publication pending, UDA-ABS and Mississippi State University, 2002.
Preparing the House

- Remove all caked material between flocks
- Maintain house temp. above 70F allows ammonia to volatilize
- Ventilate ammonia out of the house
Crusting-Decaking

- When? - Immediately following bird movement
- How? - Set cruster blade no deeper than 2-5”
- Where? - Remove all cake
- Why? - Reduction of ammonia approx. 40% and reduce bacterial challenge
Litter Amendment-Why and Types

- High Fuel Prices
- Extremely cold weather
- Short layout periods
- Wet litter conditions
- Prolonged litter reuse
- Persistent disease challenges

- Chemical Acids- Lower litter pH
- Microbial- Competitive exclusion
- Plant Extract-Enzymes
- Absorbents- Molecular Sieve
Litter Amendment - Benefits

• Decrease litter pH
• Decrease house Ammonia
• Decrease fuel usage
• Improvements in bird performance
• Reduced pathogenic bacterial populations
• Lower beetle populations
Litter Depth

- Absolute minimum of 4 inches.
- Prefer 6 – 8 inches.
- Built up litter programs require cake removal and most likely a litter amendment.
- Critical to dry houses and good paw quality.
MINIMUM VENTILATION

- Provide good air quality without chilling birds.
- Remove moisture from the house to maintain good litter quality.
- Timer driven with a thermostat override for warmer conditions.
Moisture = Enemy

Birds Generate Heat and Moisture

20,000 4-pound birds

2-3 heaters (360,000-480,000 BTUs per hour)

1,000 gallons of water per day
Moisture

• A broiler chick excretes about 0.06 ounces (2ml) of water per hour in the first week and 0.11 ounces (3.5ml) per hour the second week.

• 20,000 2 week chicks = 18.5 gallons/hour or 444 gallons/day
Ventilation

- Warm air rises
- Cool air falls
- As air temperature increases, relative humidity decreases
- Every 20 degree increase in temp. reduces rH by ½-
- Warmer air = drier air

Aviagen™
Air Flow

Proper minimum ventilation airflow warms up and dries out cold, wet outside air.

Ventilation airflow can then absorb moisture from litter and carry it out of the house.

Airflow into house: No

Airflow out of house: Yes
Belts and Shutters

Worn

Proper Fit

Dirty

Dirty
Proper Ventilation

1. Controlling air flow into the house.
2. Seal all house air leaks.
3. Set fan timer for proper minimum ventilation rate for age of birds.
4. Recycle heat.
Controlling Air Flow
Ceiling Inlet
Ceiling inlet with frame
Ceiling inlet with frame
PROPER AIR INLET OPENINGS FOR BEST AIRFLOW AND MIXING

SIDEWALL INLET SHOULD OPEN ABOUT 1\(\frac{1}{2}\)" – 2"

CEILING INLET SHOULD OPEN ABOUT 1" – 1\(\frac{1}{2}\)"
MATCH AIR INLETS TO FANS FOR CORRECT STATIC PRESSURE

TYPICAL: OPEN 15 INLETS FOR EACH FAN (20,000 CFM)

BROOD CHAMBER

15 INLETS OPERATING USING ONE FAN
Two Types of Air> House

- **Inlet Air- Needed**
  - Required to maintain proper air quality
  - Moves hot air off the ceiling

- **Leakage air- Causes Problems**
  - Fuel Usage
  - Drafts
  - Caking
  - Temp uniformity problems
Seal Air Leaks

- Shutters
- Sidewalls
- End Doors
- Brood Curtains
Sidewall Curtains

- #1 source of heat loss- minimum R-value and high leakage
- 30%-50% of heating cost is due to the sidewall curtain
CURTAINS NOT NAILED TO KNEEWALL AND WITHOUT FLAPS ALLOW AIR LEAKS THAT ROB FROM NEEDED INLET AIRFLOW – RESULT: WET LITTER AND CHILLED BIRDS
UNSEALED SILL OR TOP PLATES ALLOW OUTSIDE AIR TO BE PULLED INTO THE HOUSE, CAUSING SLICK LITTER AND CHILLED BIRDS
Setting Fan Timers
Test Static Pressure

• Close all inlets, curtains, and doors.
• Make sure shutters are clean and belts are tight.
• One 48” fan or two 36” fans should pull between 0.12 (old house) to 0.15” (new house).
MINIMUM VENTILATION – CFM PER BIRD

- 0.10 CFM  1 WEEK
- 0.25 CFM  2 WEEKS
- 0.35 CFM  3 WEEKS
- 0.50 CFM  4 WEEKS
- 0.65 CFM  5 WEEKS
- 0.70 CFM  6 WEEKS
- 0.80 CFM  7 WEEKS
- 0.90 CFM  8 WEEKS
MINIMUM VENTILATION

- DETERMINING TOTAL VENTILATION RATE NEEDED
  - If we have 20,000 birds 2 weeks of age, and we need .25 cfm per bird
  - $0.25 \text{ cfm} \times 20,000 = 5,000 \text{ total cfm needed}$
MINIMUM VENTILATION

• DETERMINING FAN ON/OFF DUTY CYCLE NEEDED
  – Fan duty cycle = cfm’s needed ÷ fan cfm’s
  – If we use a 20,000 cfm fan
  – 5,000 cfm ÷ 20,000 fan cfm = ¼ or .25% on/off cycle
MINIMUM VENTILATION

• DETERMINING TIMER SETTING NEEDED
  – Timer ON setting = Fan duty cycle X timer minutes
  – If we use a 5 minute timer and fan duty cycle is ¼ or 25%:
    – ¼ or 25% X 5 minutes = 75 seconds on
  – Timer setting is 75 seconds on
Recycle the Heat
• Define Zone of Comfort

• Place Feed and Water

• Chicks cannot regulate their own body temps until 12-14 days of age
Recycle the Heat
Recycle the Heat

Paddle Fan Layout

8 paddle fans hung under ceiling along centerline of house

5 paddle fans in brood chamber

not to scale

Stirring Fan Layout

Six 18-inch recirculating fans hung under ceiling along centerline of house

not to scale
Brooders

- Clean Brooders/Sensors - dust and dander
- Check Electrical Parts
- Inspect-Brooders, Heaters, Gas Hoses
- Test Gas Pressure
- Brooder Height/Sensor Placement
Winter Ventilation for Broilers

1. Purpose of winter ventilation
- Ventilation for some minimum amount of time is required no matter what the outside weather is to:
  - maintain good air quality
  - remove excess moisture
- Minimum ventilation is recommended during cool/winter weather.

2. Minimum ventilation rates
- Recommended minimum ventilation rates for winter ventilation are:

<table>
<thead>
<tr>
<th>Bird age (days)</th>
<th>Cubic meters/hour/bird (Cubic feet/hour/bird)</th>
<th>Total cubic meters/hour (Total cubic feet/hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-7</td>
<td>0.16 (5.19)</td>
<td>3,200 (11,756)</td>
</tr>
<tr>
<td>8-14</td>
<td>0.42 (14.85)</td>
<td>6,400 (23,512)</td>
</tr>
<tr>
<td>15-21</td>
<td>0.59 (20.64)</td>
<td>11,800 (42,436)</td>
</tr>
<tr>
<td>22-28</td>
<td>0.64 (22.54)</td>
<td>15,800 (55,036)</td>
</tr>
<tr>
<td>29-35</td>
<td>0.93 (32.34)</td>
<td>16,000 (55,776)</td>
</tr>
<tr>
<td>36-42</td>
<td>1.16 (41.46)</td>
<td>23,000 (81,504)</td>
</tr>
<tr>
<td>43-49</td>
<td>1.35 (47.24)</td>
<td>27,000 (95,544)</td>
</tr>
<tr>
<td>50-60</td>
<td>1.52 (53.06)</td>
<td>30,400 (108,784)</td>
</tr>
</tbody>
</table>

3. Achieve good airflow and volume
- If incoming air flow speed and volume is too low:
  - cold air will drop directly on to the birds/litter
  - litter will become wet and birds may get chilled

4. Ensure house is tightly sealed
- Ventilation only works effectively if the house is adequately sealed.
- This ensures the speed at which air enters the house is controlled.
- Avoid air leaks.

5. Uniform air inlet openings
- Open air inlets must be evenly distributed through the house and be opened equally.
  - This will create uniform:
    - volume of air flow
    - speed of air flow
    - direction of air flow
    - distribution of air flow
- At lower ventilation rates close some inlets to force the same volume of air through fewer inlets.

6. Monitor and evaluate regularly
- Monitor house pressure & air speed:
  - pressure should be 30-40 Pa (0.12-0.16 inches of water column) depending on house width
  - air speed around 4 m/s (800 ft/min) measured at air inlet
- Use smoke tests to confirm if air flow direction and inlet settings are correct.
- Monitor bird behavior and litter quality.
- Complete regular evaluation of:
  - air quality
  - relative humidity
  - signs of condensation
  - dust levels

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Library photographs for teaching purposes.
7 Day Weights vs. % Crop Fill

Daily Gain (lb/d) vs. % Crop Fill

Gain (lb/d) vs. % Crop Fill

Weight (g) vs. % Crop Fill
Don’t forget the turn out end!

- Preheat-floor temp.
- Waterlines flushed-airlocks? Nipples triggered?
- Light bulbs-dirty? All working?
- Feeder-level? Pans set properly?
Thank You!!!