TENNESSE VENTILATION
PRESENTATION
WHY VENTILATE?
TO CONTROL:

OXYGEN
CO₂
CO
MOISTURE
DUST
AMMONIA
TEMPERATURE / HEAT
AGENDA

BASIC VENTILATION SYSTEMS AND SETUPS
NATURAL VENTILATION
FAN-POWERED VENTILATION
“Curtain ventilation”
Allows outside breezes and inside convection currents to flow right amount of air into and through house
Ideal when temperature outside is close to temperature birds need
Exchange rates depend largely on outside winds
NATURAL VENTILATION

Works best when outside temperature is $\geq 10-15^\circ$F ($5.6-8.4^\circ$C) colder than target temperature

Problem in cold weather

• with small curtain openings, heavy outside air comes in at low speeds and drops immediately to floor
• chills birds and cause moisture condensation - creating wet litter
NATURAL VENTILATION

Curtain machines operated on thermostats at bird level are essential during cooler weather.
Circulation or stirring fans controlled with timers help mix incoming cold and in-house warm air.
NATURAL VENTILATION

On warm to hot days with little wind, circulation fans needed to get wind chill cooling of air moving over birds. Foggers or misters used with circulation fans add second level of cooling capability.
Curtain ventilation requires constant management
Natural Ventilated House
POWER VENTILATION

Two types
Positive pressure
• Pushes outside air into house
Negative pressure
• Fans pull air out of house
  – Creates a partial vacuum
  – Outside air is pulled into house through cracks or inlets
POWER VENTILATE HOUSING TO DEPLETION

CROSS VENTILATE IN COOL WEATHER.

Pumps on at 82 F 28 C & all fans on.
Control pad moisture with timer
Control algae growth
Maintain distribution pipe
NEGATIVE PRESSURE VENTILATION

Three major setup configurations

Minimum ventilation
• Used for cooler weather and/or smaller birds

Tunnel ventilation
• Used for warmer weather and/or larger birds

Transitional ventilation
• Used for “in-between” conditions
Negative Pressure Power Ventilated House

Negative-pressure and transitional fan ventilation

TEMPERATURE

AGE (DAYS)

F
95
90
85
80
75
70
65
60
C
35.0
32.2
29.4
26.7
23.9
21.1
18.3
15.5
MINIMUM VENTILATION

Provides fresh air to exhaust excess moisture and harmful gasses during cold weather or when birds are small.

Timer driven

• 5 minute timers ideal

Minimum vent fans should be equipped with a thermostat which overrides timers as birds grow and/or weather warms.
Ventilation, Ventilation, Ventilation

• A broiler chick excretes about 2ml of water per hour in the first week and 3.5ml per hour the second week

  – 20,000 2 week chicks = 70 liters/hour
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
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DETERMINING TOTAL VENTILATION RATE NEEDED

• If we have 20,000 birds 2 weeks of age, and we need .25 cfm per bird
• 0.25 cfm x 20,000 = 5,000 total cfm needed
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
DETERMINING TIMER SETTING NEEDED

- Timer ON setting = Fan duty cycle \( \times \) timer minutes
- If we use a 5 minute timer and fan duty cycle is \( \frac{1}{4} \) or 25%:
  - \( \frac{1}{4} \) or 25\% \( \times \) 5 minutes = 75 seconds on
  - Timer setting is 75 seconds on
You must create proper partial vacuum so air comes in with sufficient speed through all inlets. Inlets should be distributed evenly along entire length of house.

Static pressure should be ran at .10 in to .12 in (2.0 to 2.5 mm) of water with sidewall vents open 2 - 3 in wide (5.1 - 7.6 cm), ceiling vents 1 inch wide (2.5 cm).

- Allows air to come into house with enough volume and speed to mix with warm in-house air above the flock.
- Incoming air doesn’t drop directly onto chicks.
  - No chilling.
House must be tight to properly power ventilate

Try to achieve a static pressure of .15 inches (3.8 mm) with everything closed with two 10,000 cfm fans or equivalent
HOUSE TIGHTNESS

A house that will pull .20 inches (3.8 mm) has less than 10 square feet (3 m) of leakage.

One the other hand a house that only pulls .02 inches (.39 mm) has 45 square feet (14 m) of leakage.
TYPICAL DOOR circa 1990--2004
Side Wall Vents
VENT DOORS
Inlets Control Mixing

Negative pressure ventilation using adjustable inlets
DETERMINING NUMBER OF VENT DOORS

Depending on house tightness each vent door will pull 700 CFM’s per square foot.
It will take 5 to 7 (2 sq. ft.) (.61 sq. meters) vent doors per 10,000 cfm fan you want to run.
MINIMUM VENTILATION

Curtain cracks and fixed board inlets more likely to allow too-wide openings and dump cool in-coming air onto birds

When using curtain cracks or fixed board inlets:

• Stirring fans recommended
• Static pressure decreased to .03 - .05 in (0.8 - 1.3 mm)
Reuse the Heat
Typical Paddle Fan Layout

40' x 500' Broiler House

8 paddle fans hung under ceiling along centerline of house

25ft 50ft 50ft 50ft 50ft 25ft 50ft 75ft 75ft 50ft

5 paddle fans in brood chamber

not to scale
Typical Stirring Fan Layout

40' x 500' Broiler House

| 80ft | 80ft | 10ft | 10ft | 80ft | 80ft |

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

not to scale
STOP UP HOLES
Fan belts - worn
Fan belts – proper fit

Belt Tightness
Dirty Shutters
TRANSITIONAL VENTILATION

Begins when higher than minimum air exchange rate is required

- outside air should not contact birds directly

To be successful, requires sidewall inlets linked to a static pressure controller so heat can be removed without lowering curtains or switching to tunnel ventilation
TRANSITIONAL VENTILATION

Rule of thumb

- transitional ventilation may be used when outside temperature is +/- 10°F (5.5°C) of target house temperature
TYPICAL TUNNEL INLET 1990-2012
TUNNEL COOLING

Keeps birds comfortable in warm to hot weather and where large birds are being grown by using cooling effect of high-velocity airflow

Provides maximum air exchange and creates a wind chill cooling effect

In full tunnel mode operation, you should produce a complete house air exchange in under 1 min

Velocity of a minimum 650 ft/min needed for most effective wind-chill cooling
Tunnel ventilate only when cooling birds is the goal

- tunneling when air temperature is not high enough, or birds are too young, can chill birds and hurt performance
TUNNEL COOLING

To successfully tunnel cool birds what is the most important thing you must understand
Wind chill and the effect it has on birds from placement to kill
Turn on the right number of fans for cooling needs

- effective temperature must be estimated
- wind chill is greater with cooler air, and less with warmer air; greater for smaller birds, less with larger birds
Wind Chill Effect

- Easy rule of thumb
  - 4 week and younger birds- 2.5 F per 20,000 CFM fan
  - 4 week and older birds- 1.5 F per 20,000 CFM fan
TUNNEL COOLING

Watch the birds, not just the thermometer, to see how much cooling is needed

- the temperature the birds experience is not the same as the thermometer reading
- birds sitting down usually indicates too much air movement
- birds panting, lifting wings and not eating usually indicates birds are too warm
Don’t run fewer than four or five of the installed tunnel fans if you intend to be tunnel ventilating

- running less than 40% of fan capacity can result in a rise of house air temperature of 10°F (5.5°C) or more from inlet end to fan end
Monitor and maintain adequate airflow

- Keep tunnel inlets fully open
- Partly closing tunnel inlets does not increase air velocity, it reduces needed airflow
- Keep fans and shutters clean and belts tight
- Close all doors and seal all leaks or other openings, so all incoming air enters through tunnel inlets only
TUNNEL COOLING
KEEP EQUIPMENT IN WORKING ORDER
Cool Cell Management

Never operate pads below 80 degrees (26.5 C)
Do not operate pads when humidity is above 80%
Never operate pads until all fans are running on older birds
PAD MANAGEMENT

Keep pads as clean as possible

- Dirty pads restrict air flow thus reduces air speed

Use algaeicides regularly to prevent algae buildup

Watch for mineral buildup
Migration fences are a necessary evil
Must be in place by at least three weeks of age
Spacing of migration fences
Type of migration fences
  • Pipe
  • Shelving material
Density and bird performance

Weight and feed conversion decrease approximately 2% for every 0.10 square foot decrease in floor space per bird.
Density and bird performance

0.8 ft²/bird
- 5.77 lbs
- 1.88 feed conversion

0.90 ft²/bird
- 5.88 lbs
- 1.85 feed conversion

1.0 ft²/bird
- 5.99 lbs
- 1.83 feed conversion
Density and bird performance

If the birds in a house migrate….

- birds in rear will weigh .23 kg more than those near pad
- average weight will decrease by .15 kg or more.
- condemnations will be higher
Density and bird performance

Does not take into account increased heat stress!
RULES FOR COOL WEATHER VENTILATION

Seal all house air leaks
  • a non-air tight house cannot be properly ventilated

Insulate before you ventilate
  • proper growing conditions cannot be maintained in cold weather

Set the fan timer for correct minimum ventilation rate
RULES FOR COOL WEATHER VENTILATION

Increase fan timer settings each week from day one through catch (minimum ventilation rate)
Bring cool outside air into the house high above the birds, with enough velocity to mix with warm inside air
If wet litter and/or ammonia becomes a problem, increase the minimum ventilation rate
RULES FOR COOL WEATHER VENTILATION

If increased minimum ventilation rates don’t solve wet litter problem, add heat

If house gets too dry and dusty, reduce the minimum ventilation rate

If a house gets too warm, check the thermostat settings, not the timer settings
Review

Replace existing 10 minute timers with 5 minute timers
Maintains house tightness
• Seal end doors
• Seal ridge caps
• Seal bottoms of sidewalls

Fan maintenance
• Belts tight
• Shutters clean
POULTRY NEWSLETTER
BOOKS & TAPES
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