Mechanical Ventilation of Barns

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What are we controlling?

- Dust
- Ammonia
- Carbon Dioxide
- Moisture or Relative Humidity
  - 55 – 75% Rh inside
  - Good litter quality and healthy paws
- Excess Heat

System Design

- Minimum Ventilation
  - Calculate
  - Fans
  - Inlets
  - Static Pressure
- Maximum Ventilation
  - Tunnel Ventilation
  - Air Exchange
  - Cooling
  - Inlets / Light traps
- Controllers

Minimum Ventilation

- Bring in air to remove ammonia, CO_2 and moisture.
- Smaller fans for minimum ventilation.
  - The longer a fan runs, the more consistent the flow of air and therefore the interior environment.
- ¼ to 1 cfm per bird depending on age, outside temp, body weight, etc.
    - Ex. 200 chicks only need 50 cfm.

Minimum Ventilation

- Fans
- Bess Labratories
  - http://bess.illinois.edu/search.asp
- Criteria
  - Output at 0.1 inwc will match needed cfm
    - Can use larger fans run on a vfd, triac, or timer
  - Select fans with an Air Flow Ratio higher than .75
    - Output at 0.05 inwc / output at 0.20 inwc = AFR

Stir Fans

- Small fans don’t generate much pressure
- Stir fans help to break up stratification by mixing the air in rooms more uniformly.

Save money by preventing heat at ceiling and can be pointed towards bigger birds to help cool.

Inlets

- Inlets (ft^2) are matched with the fans (cfm) intended to run them.
  - Most inlet ratings are at a 0.125 or 0.15 inwc
- Jet throw
  - Incoming air travels approximately 2 ft for every .01” of Static Pressure
- Allowing air to warm will increase its ability to hold water.
  - 68* F holds 15 grams/ kg of air, 86* F holds 28 g/kg

Inlets

- Correct opening for volume of air
  - Too open and air falls to the floor instead of following ceiling.
- Soffit openings
  - Use bird wire versus commercial soffit covering
  - 400 cfm per sq ft of soffit opening

How do they all relate?

- Static pressure is the difference in pressure between the outside and the inside. (think sucking through a straw)
- We control incoming air by restricting the opening which generates static pressure.
- Inlets are proportional to fan output. Not enough inlet? Restricted air! Higher SP!


Spot 87.8 °F
FLIR
107
84.1

Maximum Ventilation

- Tunnel Ventilation
  - Takes advantage of wind chill factor
  - Calculated between 300 and 500 fpm (cfm/sqft)

- Air Exchange
  - One complete air exchange every two minutes

*At least 5 cfm per bird as a rule at 0.05 inwc

Cooling

- Misters/ Foggers
  - Slowest form of cooling and adds humidity to room
- Sprinklers
  - Only used on big birds for a short period adds the most moisture to the room
- Cool Cells
  - Most efficient way to cool but also the most expensive.

Inlets and Light Traps

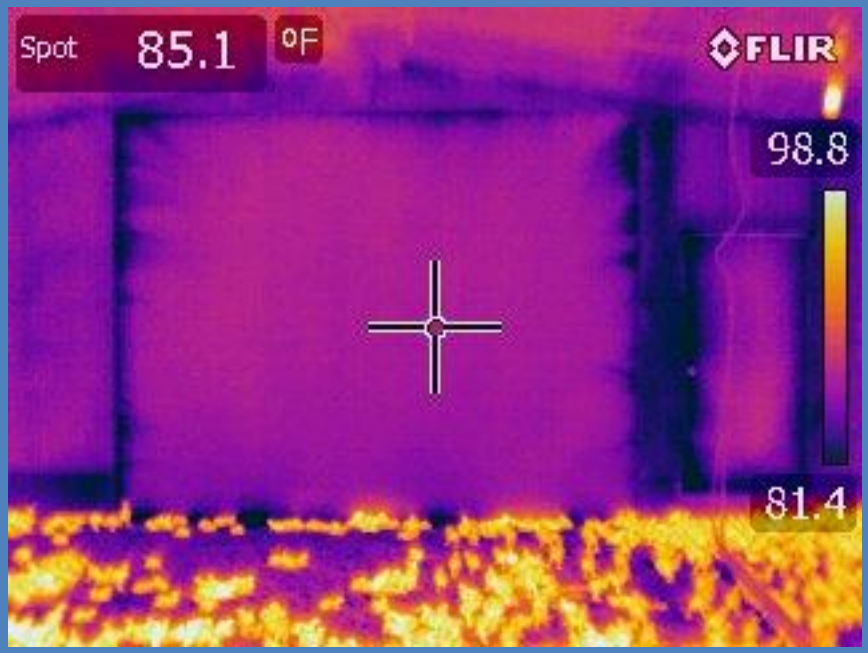
- Inlets
  - Match maximum ventilation output at a 0.05 inwc
  - Tunnel inlets figured at 500 fpm (cfm/sqft)
- Light Traps
  - Restrict air!
  - If using light traps more fans are needed to make up for the added pressure. (0.15 inwc)

Controllers

- Very simple to very complex
- Choose a controller that is simple to use and cost effective to purchase and replace.
- Be sure your equipment provider helps you to understand how the system works and has replacement parts on hand.
- Single stage thermostats are a necessary back-up.

UNINTENTIONAL INLETS


Spot 81.0 °F
FLIR
96.5
80.8


Spot 85.1 °F
FLIR
98.8
81.4


Spot 86.0 °F
FLIR
101
83.2


Spot 93.6 °F
FLIR
95.8
88.2

Questions?