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**SowBridge**

**Breeding Herd Education Series**

**2011-12**

**Timely, relevant & convenient learning**

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**Today's Objectives**

- Better understand terminology used in setting controllers
- Increase confidence in adjusting controller settings
- Improve capability to enhance pig environment and performance

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**Controllers**

- Single-stage thermostats
- Multi-stage
  - 2 variable-speed legs
  - 1-10+ stages
    - Single-speed fans
    - Heaters
    - Tunnel fans
    - Sprinklers
    - Cool cells
    - Curtains
    - Actuated inlets
Establishing Selection Criteria for a Controller

- Temperature tolerance
- Complexity of ventilation
  - Natural to Mechanical?
- Number of stages
  - Plus heating and cooling?
- Multi-room/building applications
- Peripheral devices for ‘remote’ monitoring/control

Controller Settings

- Room temperature: Probes temp.
- Set point temperature
- Stage 1: Variable
  - Minimum speed
  - Bandwidth
  - Humidity Control (No)
- Stage 2: Variable
  - Offset
  - Bandwidth
  - Minimum speed

Note: You have to know the motor curve of variable speed fans if available

Controller Settings Cont.

- Cooling stages
  - Wall fans
  - Tunnel fans
- Sprinkler settings/Cool cells
- Heater settings
- Alarms
- Actuated inlets

Room Temperature

Shows the air temperature around the sensor in the room or an average reading for multiple sensors.

- Airstream properly identifies this reading as “Probe T”.

- Accurate reflection of temperature in the room? …Pig space?

Setting Controllers

- Sensor location ↔ target
  - Is temperature representative of pig space?
- Stage differentials
  - Set-point + differentials
  - Reset only one temperature
- Heater
  - Offset
  - Differential

Less-Than-Ideal Sensor Locations

Probe on ceiling
Set-Point Temperature

- Target temperature for controller
- NOT the average room temperature
- Other settings often are based on set-point temperature

Variable-Speed Fans & Multiple Single-Speed Fans

Variable Speed Fan Rules

- #1 50% speed does not equal 50% cfm
- #2 50% voltage does not equal 50% cfm/rpm
- #3 Every motor reacts to voltage differently
- #4 Minimum speed should never be under 50% rpm
- #5 Almost every controller controls VS fans by changing voltage (Valco is exception)

Temperature Differential

- Temperature deviation allowed before activation or de-activation of a stage

Control Settings for Variable-Speed Fans

- Minimum speed (%)
  - Know the motor curve?
- Bandwidth
  - Temperature difference between minimum and maximum speed (ramp length)

50% voltage does not equal 50% cfm

BESS Labs
Choosing a Minimum Speed

Depends on minimum ventilation rate desired and fan specifications

- Bigger pigs → higher setting (CURVE)
- Fan motors should not be operated at slow speeds, but the minimum setting varies
  - Ex. 65% for one vs. 40% for another
  - See motor manufacturer’s recommendations for lowest minimum speed setting
- Motor selection can affect setting
  - Noticed change since swapping out motors?

Minimum speed

- Most fan motors are TEAO (totally enclosed air over)
- With Thevco controllers, never go under 40% minimum speed when motor curve is correct
- With Ventra/Ventium, never go under 24% minimum speed
- Minimum speed impacts response to static pressure
  - If choice is 1 fan at 80% or 2 fans at 40%, always go with 1 fan at higher speed

Airstream Expert

Motor Curves Laboratory Conditions

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Motor curve recommendations for various fans from Airstream, Aerotech, Acme controllers

Where to set Motor Curves on Airstream or Aerotech
No motor curve or other adjustment
Linear voltage change

30% 69v
40% 92v
50% 115v
60% 138v
70% 161v
80% 184v
90% 207v
100% 230v

Bandwidth
Sets the temperature increment over which fan output should vary.

\[ \Delta T = T_{\text{upper}} - T_{\text{lower}} \]

Stage 1 Max. output: \( T \geq T_{\text{set}} + \frac{1}{2} \text{Bandwidth} \)

Choosing a Bandwidth
Depends on tempering desired
- Bigger pigs \( \rightarrow \) less tempering needed
- Cold weather \( \rightarrow \) more tempering
  - Stages 1 & 2: Use 2°F as starting point
  - Stages 3+: Use 1-2°F as starting point
Cooling Stages

Common Applications
- Next fan stage comes on
- Curtains begin to drop
- Supplemental cooling [stir] fans come on
- Water flows through cool cell / evaporative pad

Choosing Differentials
- Goals
  - Match stage with demand for cooling
  - Provide some buffer between stages
- Differentials tend to be small when more stages are used and for higher fan stages in general (~ 1 °F)
- Differentials for additional cooling are based upon target temperatures
  - Ex. Stir fans on at 75 °F for finishers

Heater Offset
Establishes a new basis for heating differentials - often 2 °F

Reasonable Expectations of [Fan] Controllers
- Monitor and control air temperature well
  - Humidity??
  - Drafts??
- Control fan speed
  - Inlets?
  - Static pressure??
- Airflow??
- Using factory settings

Heater offset [2 °F] ensures heater is off when 1st stage fans are functioning
Controllers - Key Points

- Not overly complex
- Company support and training
- Thermostat backup

Questions