



Outlook of Environmental Controlled Housing System for India

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Agenda

- Introduction
- Historical temperature data for Hyderabad
- Ventilation modes
- Conclusion



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Introduction

It is not about telling "what to do" ... it is about explaining "why"

- Our goal is not to teach you how to do the things!
- Our goal is to teach you WHY things should be done;
- There are 3 basic principles for a modern poultry house:
 - 1 - Correctly calculate the equipment - All systems
 - 2 - Correctly install the equipment once it has been properly dimensioned
 - 3 - Operate all systems correctly



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Introduction

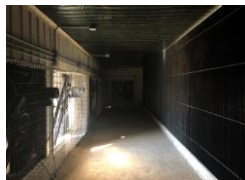
Ventilation is a science!!!

- It is studied as much as any other area, such as nutrition, genetics, animal health, etc.
- There are concepts within ventilation engineering that must be applied in practice to ensure the comfort and welfare of the birds.
- Once applied correctly, the performance of the animals will be better, reflecting in financial gains for the grower and the company.
- We 100% follow all the concepts of calculations and ventilation of the University of Georgia - Engineer Michael Czarick - www.poultryventilation.com



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What type of poultry will be produced?
Pullet?



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What type of poultry will be produced?
Breeders?



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What type of poultry will be produced?
Broilers?



How many kg/m² do you want to produce?

Kn wledge
Day 1

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Where will these birds be raised?

In which part of the planet will these birds be found?



Hyderabad, Telangana, India



What are the climatic characteristics? Is it cold?
Is it hot? Both?

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Day 1

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CLIMATE TABLE // WEATHER BY MONTH HYDERABAD

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature °C (°F)	22.2 °C (72.2) °F	24.9 °C (76.8) °F	28.2 °C (82.7) °F	30.7 °C (87.3) °F	32 °C (89.6) °F	27.9 °C (82.2) °F	25.6 °C (78.1) °F	24.9 °C (76.8) °F	25 °C (77) °F	24.7 °C (76.4) °F	23.2 °C (73.7) °F	21.9 °C (71.4) °F
Min. Temperature °C (°F)	16 °C (60.8) °F	18.4 °C (65.1) °F	21.4 °C (70.5) °F	24.4 °C (75.9) °F	26.6 °C (79.9) °F	24.3 °C (75.7) °F	22.9 °C (73.2) °F	22.4 °C (72.3) °F	22.1 °C (71.7) °F	20.6 °C (69) °F	18 °C (64.3) °F	15.6 °C (60.1) °F
Max. Temperature °C (°F)	28.4 °C (83.4) °F	31.4 °C (88.5) °F	34.4 °C (93.9) °F	36.9 °C (98.4) °F	37.8 °C (100) °F	32.3 °C (90.1) °F	28.9 °C (84) °F	28.1 °C (82.5) °F	28.7 °C (83.7) °F	29.3 °C (84.7) °F	28.6 °C (83.4) °F	27.6 °C (81.7) °F
Precipitation / Rainfall mm (in)	7 (0)	3 (0)	10 (0)	19 (0)	27 (1)	101 (3)	159 (6)	162 (6)	129 (5)	98 (3)	26 (1)	4 (0)
Humidity(%)	50%	43%	37%	38%	37%	62%	74%	77%	78%	69%	59%	53%
Rainy days (d)	1	1	1	3	4	10	13	13	11	9	3	1
avg. Sun hours (hours)	9.3	9.9	10.6	11.1	11.4	9.6	8.1	7.7	7.9	8.6	8.7	9.0

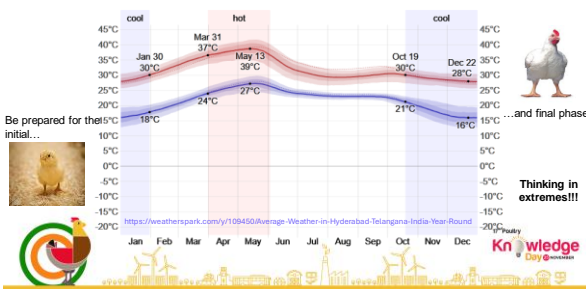
Data: 1991 - 2021 Min. Temperature °C (°F), Max. Temperature °C (°F), Precipitation / Rainfall mm (in), Humidity, Rainy days. Data: 1999 - 2019: avg. Sun hours

<https://en.climate-data.org/asia/india/hyderabad/hyderabad-2801/>

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Day 1

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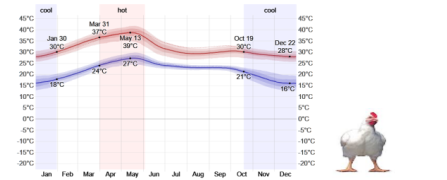
Average High and Low Temperature in Hyderabad



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Lost heat and heat gain...

How much heat does poultry house loss during the cold wheater?



How much heat does poultry house gain during the hot wheater?

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Day 1

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Basic tunnel ventilation system design

38°C (>2,500kg)

Tunnel ventilation system:
Basic design criteria

- 1) House heat removal:
- adequate air exchange
- 2) Bird heat removal:
- proper air velocity;
- 3) Reduce the incoming air temperature:
- proper inlet air temperature.

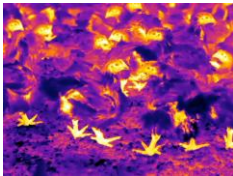


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Tunnel Poultry house ventilation

1) House heat removal

- Quick exchange of air from inside the house with fresh air from outside;
- If not done... Temperature differences will occur between the ends of the inlet and exit of the house;
- Ideal is 2,8°C or 5°F.



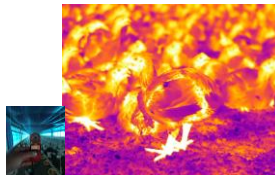
Kn wledge
Day 10

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Tunnel Poultry house ventilation

2) Bird heat removal

- Fast moving air on the birds.



Kn wledge
Day 10

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Tunnel Poultry house ventilation

2) Bird heat removal

- Fast moving air on the birds.



If the air velocity is not adequate, the birds will experience heat stress and panting.

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Day 10

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Tunnel Poultry house ventilation

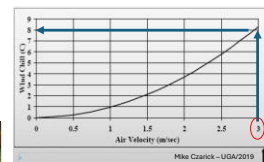
Basic tunnel ventilation system design – Temperature vs air speed

Table 2: Broiler house temperatures. After 27 days of age, temperature should remain at 29°C (84°F) or less, depending on the bird's weight.

Age (days)	Whole House Breeding Temp. (°C)	Brooder Edge Temp. (°C)	2 ft (60 cm) from Brooder Edge Temp. (°C)
Day-old	27.8 (82)	27.8 (82)	27.8 (82)
1	28.8 (84)	28.8 (84)	27.8 (82)
2	27.8 (82)	27.8 (82)	27.8 (82)
3	28.8 (84)	28.8 (84)	27.8 (82)
4	27.8 (82)	27.8 (82)	27.8 (82)
5	28.8 (84)	28.8 (84)	27.8 (82)
6	27.8 (82)	27.8 (82)	27.8 (82)
7	28.8 (84)	28.8 (84)	27.8 (82)
8	27.8 (82)	27.8 (82)	27.8 (82)
9	28.8 (84)	28.8 (84)	27.8 (82)
10	27.8 (82)	27.8 (82)	27.8 (82)
11	28.8 (84)	28.8 (84)	27.8 (82)
12	27.8 (82)	27.8 (82)	27.8 (82)
13	28.8 (84)	28.8 (84)	27.8 (82)
14	27.8 (82)	27.8 (82)	27.8 (82)
15	28.8 (84)	28.8 (84)	27.8 (82)
16	27.8 (82)	27.8 (82)	27.8 (82)
17	28.8 (84)	28.8 (84)	27.8 (82)
18	27.8 (82)	27.8 (82)	27.8 (82)
19	28.8 (84)	28.8 (84)	27.8 (82)
20	27.8 (82)	27.8 (82)	27.8 (82)
21	28.8 (84)	28.8 (84)	27.8 (82)
22	27.8 (82)	27.8 (82)	27.8 (82)

29°C temperature (air)
Bird with 2,500kg

Comfort temperature
20-21°C



38°C (>2,500kg)



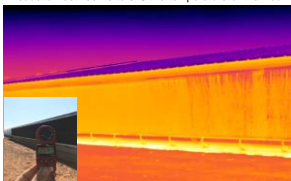
Kn wledge
Day 10

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Tunnel Poultry house ventilation

3) Reduce the incoming air temperature pad cooling system;

Reduction between 5 to 8°C the temperature of the incoming air.



Kn wledge
Day 10

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Tunnel Poultry house ventilation

Heat Production

1) House heat removal

- The total heat absorbed by a house is the sum of the heat that enters through...

- Ceiling/Roof
- Side wall (Curtains or Wall)
- End wall
- Birds
- Light (Lighting)



Kn wledge
Day 10

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Tunnel Poultry house ventilation

Heat Production – Roof or Ceiling



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Tunnel Poultry house ventilation

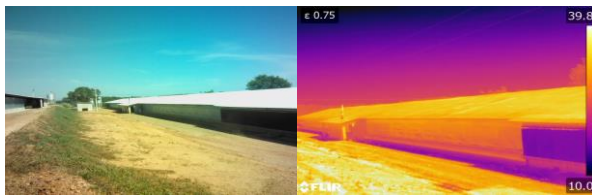
Heat Production – End wall – Front the poultry house



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Tunnel Poultry house ventilation

Heat Production – End wall – Sidewall – Curtain

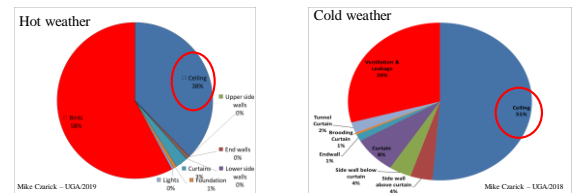


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Tunnel Poultry house ventilation

Heat Production

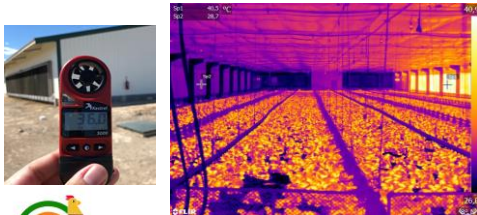
Heat Loss



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Tunnel Poultry house ventilation

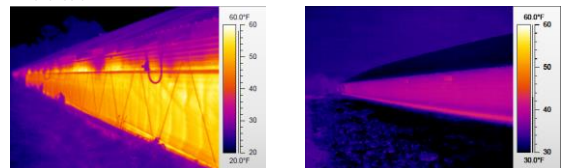
Heat Production – Great difference between one side per other side – WHY???



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Thermal isolation

-Isolate the external variables that can interfere the control of the environment;
- Hot or cold.



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- R-Value is a measure of Thermal Resistance;
- Temperature difference through a thermal insulator;
- The higher the value, the better the insulation efficiency.

Thermal isolation – DROP CEILING – 1st think that you should to protect

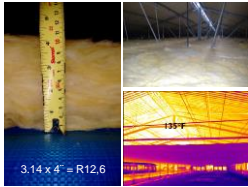


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Thermal isolation – DROP CEILING – 1st think that you should to protect

Materials in general used as insulators
R-value/inch

1) House heat removal – Drop ceiling: R10 - 15

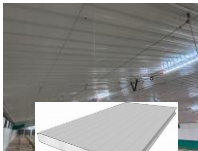


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Thermal isolation – DROP CEILING – 1st think that you should to protect

1) House heat removal – Drop ceiling: R10 - 15

Materials in general used as insulators
R-value/inch



2 x 5" = R10

Building material	R-value (per inch)	Building material	R-value (per inch)
Fiberglass batt	3.14	Soft wood lumber	1.25
Fiberglass blown	2.2	Plywood	1.25
Cellulose blown	3.13	Cedar	1.33
Rock wool blown	3.14	Poured concrete	0.8
Air-entrained concrete	3.9		
Rigid fiberglass	4.0	Building material	R-value
Urea terpolymer foam	4.48	Aluminum/steel siding	0.6
Expanded Polystyrene (beadboard)	5	Concrete block 4"	0.8
Extruded Polystyrene	5	Concrete block 8"	1.11
Polyurethane (foamed in place)	6.25	Concrete block 12"	1.28
Polysocyanurate (foil-faced)	7.20	Brick block 4"	0.44



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Thermal isolation – SOLIDWALL – 2nd think that you should to protect

1) House heat removal – Drop ceiling: R5 - 10

Materials in general used as insulators
R-value/inch



5 x 2" = R10

Building material	R-value (per inch)	Building material	R-value (per inch)
Fiberglass batt	3.14	Soft wood lumber	1.25
Fiberglass blown	2.2	Plywood	1.25
Cellulose blown	3.13	Cedar	1.33
Rock wool blown	3.14	Poured concrete	0.8
Air-entrained concrete	3.9		
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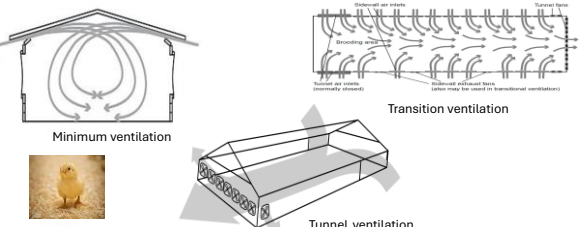
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Environment – Modern Poultury house



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Ventilation modes



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Definitions

- First we need to define what cold and heat are.



We consider it cold or hot when the external temperature is lower/higher than what we want internally. Cold does not necessarily need to be 0°C, it can be 20°C.



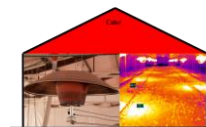
Kn wledge
Day & Night

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Heating

What is the most important temperature for the bird?
Floor temperature

- Contact surface of the bird with the environment;
- Greater exchange of your body temperature with the environment.

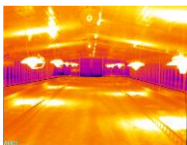


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Day & Night

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Heating Temperature

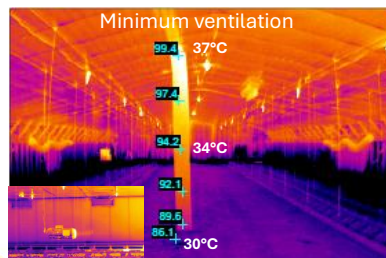
- Promote a minimum of 32°C on the coldest days (nights) of the year;
- Control the minimum temperature of the poultry house;
- Regardless of minimum ventilation.



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Day & Night

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Minimum ventilation



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Day & Night

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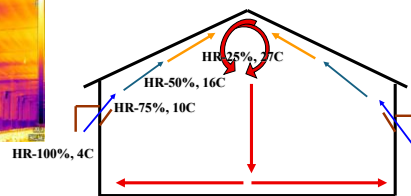
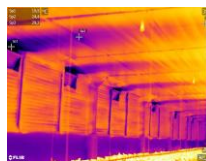
Sidewall inlet – Minimum and transition ventilation



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Day & Night

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Sidewall Inlets - Principles



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Day & Night

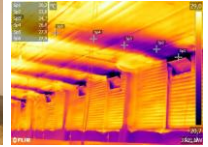
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Minimum Ventilation Mode



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Environment – Temperature and air quality



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Resume



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Conclusion

- Applying the concepts of ventilation science and engineering according to temperature extremes (hot and cold) as well as the type of bird to be produced;
- A poultry house that operates in 3 ventilation modes is essential – Minimum ventilation, Transition ventilation and Tunnel ventilation;
- Thermal insulation, tightness and specific calculation of all systems will be essential for the ideal house;
- Once the systems have been dimensioned; The installation must be suitable for the correct operation of the calculated systems.



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Thank you!!!

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