Poultry Production: Solutions to High Temperatures in Large Poultry Sheds

Universidad Tecnológica Nacional – Facultad Regional Paraná

Students of Electromechanical Engineering

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English II - 2022

The context

- Poultry production is developed in rural zones.

The cause

- In these areas, there are periods of the year where temperatures rise.

The problem

- The high temperatures produce stress on poultry and this leads to a decrease in productivity.

What is the best solution? Is it only one?

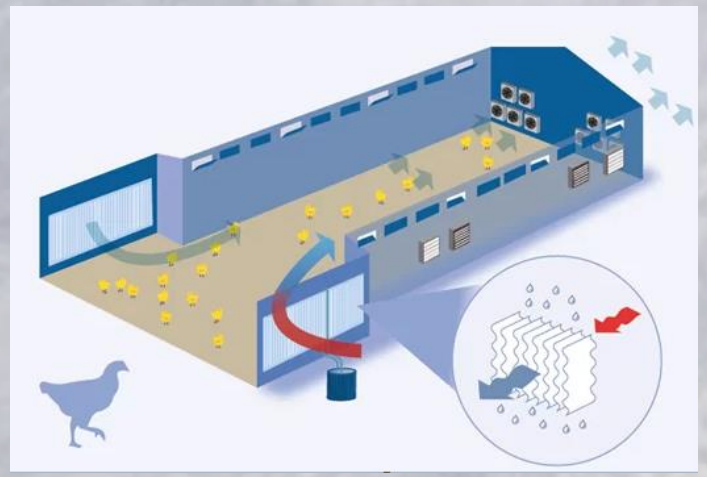
SDG 2 → ***Zero Hunger***

The temperature has severe effects on the production of the birds and, in extreme cases, the chickens may even die.

Map of the Presentation

I. **Optimum condition for poultry production**

II. **The solutions**
   I. Sprinklers
   II. Extractors and cellulose cells
   III. System with extractors only



III. **Solution according to the needs**
   I. Little temperature difference
   II. Middle temperature difference
   III. Large temperature difference

Optimal condition for poultry production

Temperature and Humidity → Factor = Humidity% + Temperature [F]

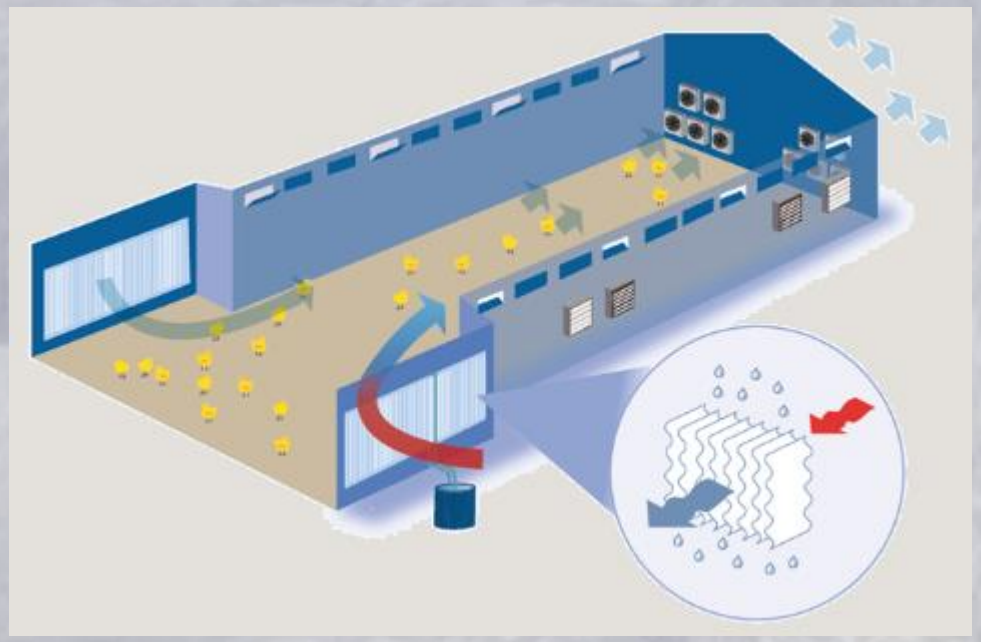
Temperature [F]	Impact
55 – 75	Behavioral change to maintain body temperature
65 – 75	Ideal temperature
75 – 85	Slight reduction in feed consumption
85 – 90	Greater Reduction in food consumption
90 – 95	No food consumption
95 – 100	State of emergency
>100	Mortality risk

Temperature [F]	Humidity [% H2O/air]	Factor	Impact
95	**<45**	**140**	**Stress**
95	**50**	**145**	**Optimal condition**
95	**>70**	**165**	**Stress**

Possible solutions

Objective: to create a comfortable environment in the poultry house

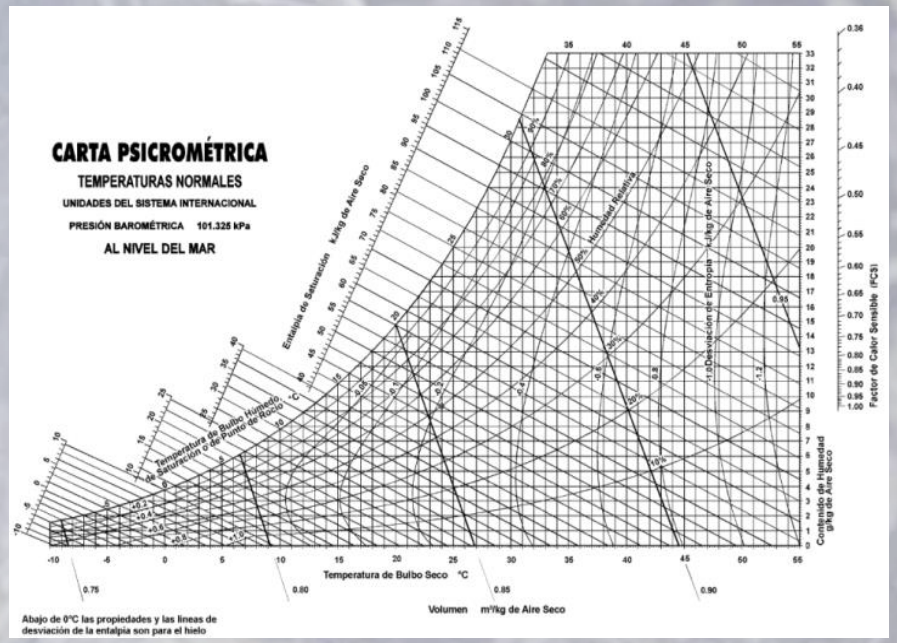
A. Extractors and cellulose cells



Calculations for extractors and cellulose cells

Data to know

- V(volume of the shed): width by length by height [m^3]
- F(flow of air)= V/min [m3/min]
- [T_0] → Maximum temperatura
- H_0 → [%]Relative humidity with the maximum temperatura
- V→[m^3] Volume of the shed
- C→[m^3/min] Flow of the one extractor
- F→[m3/min] Flow of air
- $\tilde{V}$ = Volumetric Flow
- $P \rightarrow Pressure$
- $\dot{m}\boldsymbol{w}$ = Flow of humidity water
- $\dot{m}\boldsymbol{a}$ = Dry air mass Flow
- $\boldsymbol{\omega}$ = Humidity specific
- ϕ = R$elativ\ Hum$idity
- $\tilde{v}$ = Specific volume



$$\dot{m}\boldsymbol{w} = \dot{m}\boldsymbol{a} * (\boldsymbol{\omega 2} - \boldsymbol{\omega 1})$$

B. Sprinklers and extractors

Calculations for sprinklers and extractors

Data to know

- Opering time → 30[s] to 180[s]
- Air changes → 20 times per hour

- V→[m^3] Volume of the shed
- C→[m^3/min] Flow of the one extractor
- F→[m3/min] Flow of air
- $\dot{m}w$ = Flow of humidity water
- $\dot{m}a$ = Dry air mass flow
- ω = Humidity specific

$$\dot{m}w = \dot{m}a * (\omega 2 - \omega 1)$$

C. EXTRACTORS ONLY

Calculations for extractors only

Data to know

- V→[m^3] Volume of the shed
- C→[V/h] Renovation of air
- R→[m^3/h] Renovation of air per hour
- Ve→[m/h]Airspeed in worst condition
- I→[m^2]Air inlet opening
- Q→[m^3/h]Fan air flow
- Cv→Number of fans
- Ci→[m^3/h]Openings minimum flow

- ✓ R = V * C[m^3/h]
- ✓ Ci = Ve * I[m^3/h]
- ✓ Cv = R/Q

SOLUTIONS ACCORDING TO THE NEEDS OF THE POULTRY

For little difference in temperature and low percentages of humidity

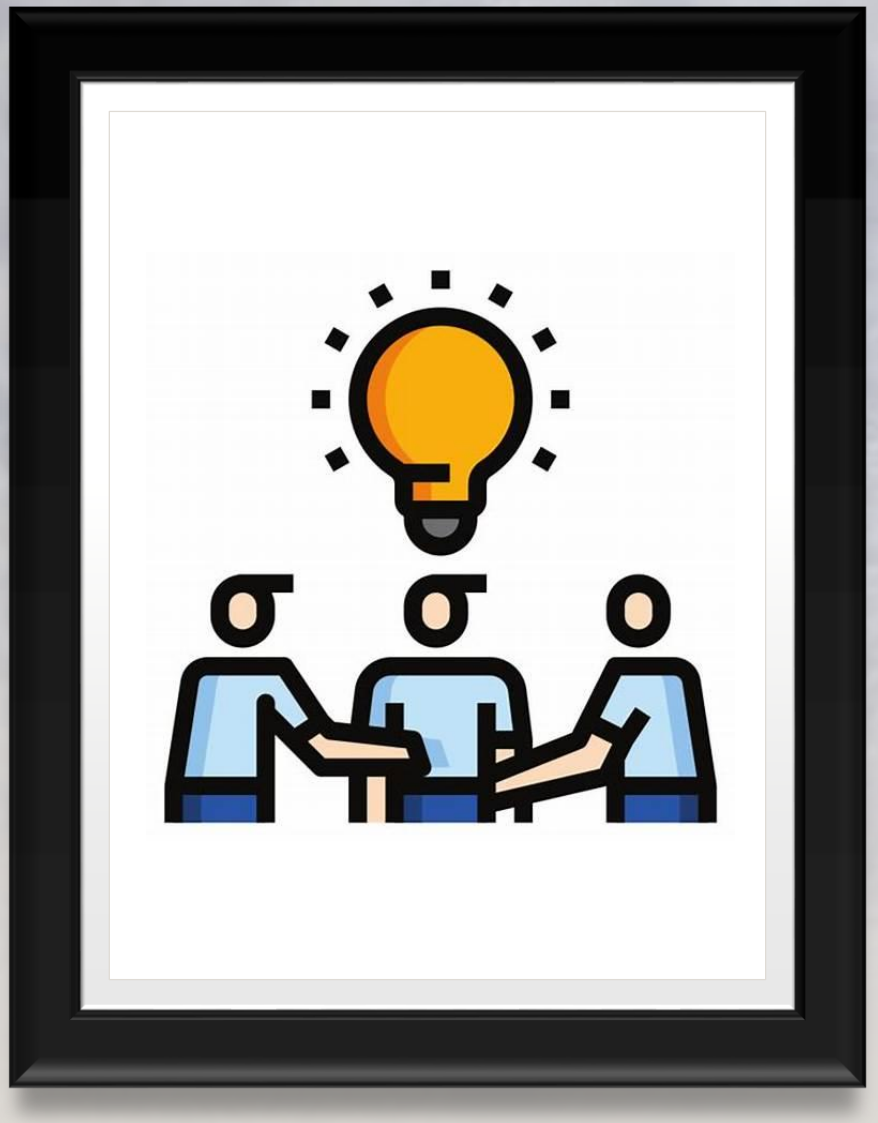
Use of extractors only → It reduces the thermal sensation.

For average temperature difference and intermediate humidity percentages

Use of splinkers and extractors → It reduces the temperature.

For large temperature difference and large percentages of humidity

Use of extractors and cellulose cells → It creates a comfortable environment.



CONCLUSION

- Hot temperature → Decreased poultry production
- Solution
  - Extractors and cellulose cells
  - Sprinklers and extractors
  - Extractors only

THANKS FOR YOUR ATTENTION

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