

Main novelties in the house environment chapter

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HOUSE ENVIRONMENT

- ▶ How to control the effect of temperature on the birds.
- ▶ How to provide good air quality to the birds.
- ▶ How to provide good water quality to the birds.
- ▶ How to control the effect of light on the birds.

To optimize bird performance and health we need a proper environmental control:



COLD WEATHER VENTILATION SYSTEM

Capable of bringing in small amount of fresh air during cold weather without resulting in excessive decreases in house temperature or losses in temperature uniformity:

- ▶ Air quality control

MODERATE WEATHER VENTILATION SYSTEM

to control house temperature during moderate times of the year

- ▶ House temperature control

HOT WEATHER VENTILATION SYSTEM

Capable of removing heat from the house as well as the birds.

- ▶ Heat stress control

HEN THERMOREGULATION

In chicks the thermoregulation starts around 4 days of age, therefore for the first 10 days of life, temperature is a critical factor because, they can't sustain an optimal body temperature without an external source of heat. For this reason, it is also important to know the way that the birds lose heat:

Convection

Heat loss occurs due to the movement of the air which permits the transfer of heat

from the hen's body to the air. This process can be promoted by providing fast air movement around the hen.

Conduction

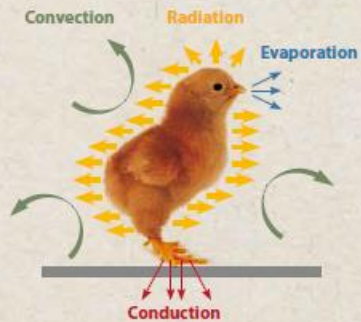
Heat transfer from surface to surface. Normally, it is relatively unimportant as the contact surface is small and the temperature of the litter or of the cage is not significantly different from the body temperature.

Radiation

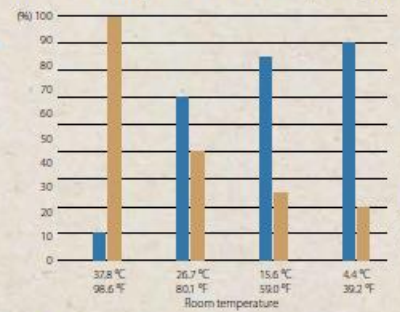
This is the transmission of heat from a warm object to a cold one. Heat loss is proportional to the temperature difference between the body surface and the surrounding air.

Evaporation

Birds use evaporation to stabilize their body temperature by increasing the respiration rate through panting, which is very effective.



Effect of the room temperature on the different ways of losing heat



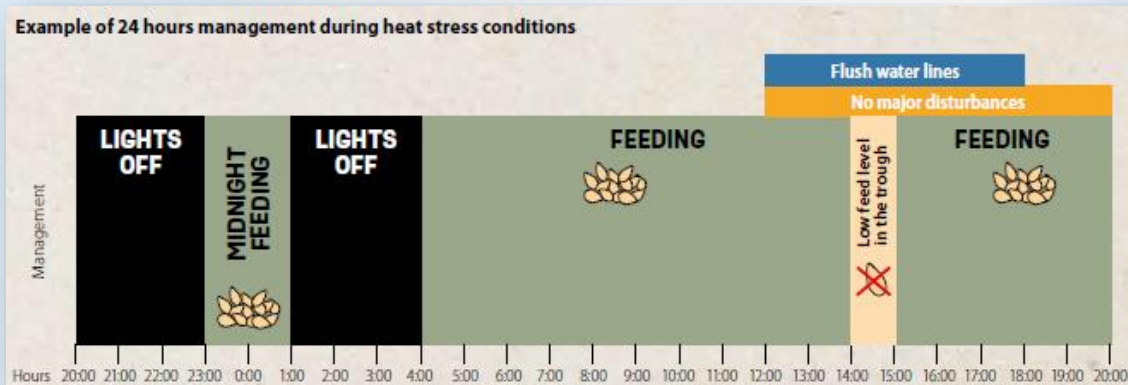
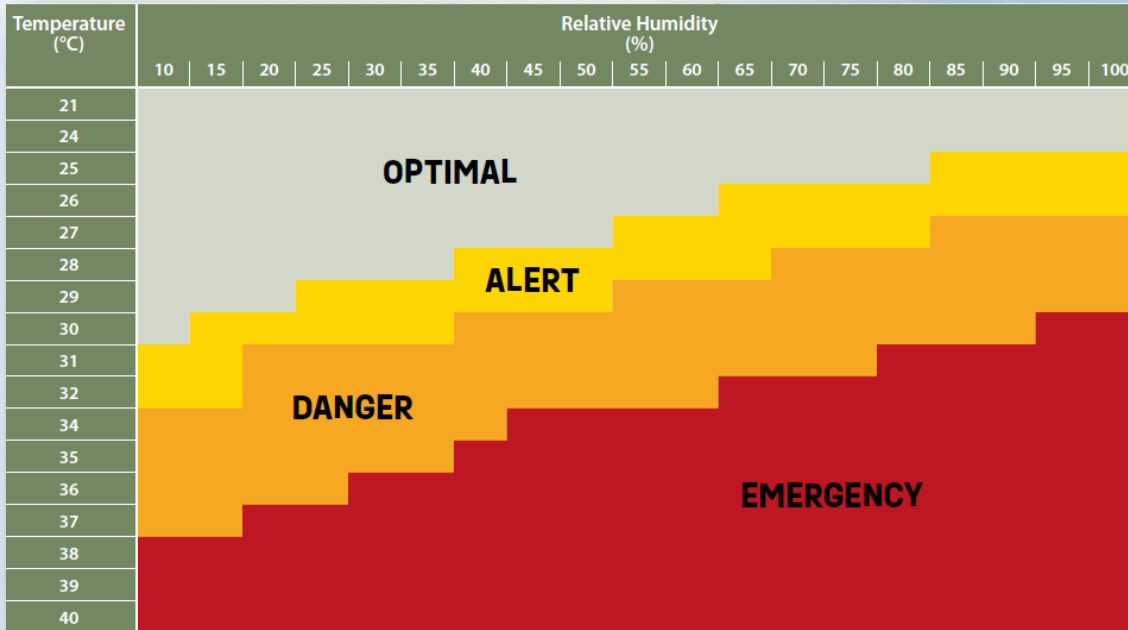
Source: Bird and Weaver, 2002

House Environment

- Provides explanation of the environmental effects on bird's performance.
- How to minimize those effects.
- Temperature, ventilation, air, water and light.

Effective temperature

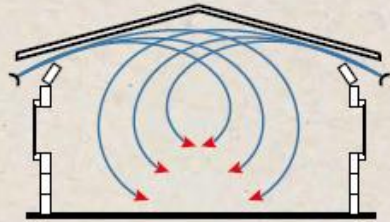
- Temperature + Relative humidity of air = Effective temperature.
- Optimal management to minimize the effect of high temperatures.
- Hot weather management.



VENTILATION SYSTEMS

Transverse Ventilation

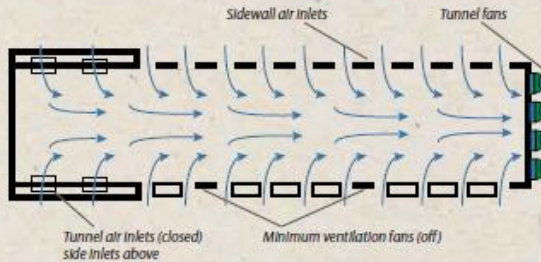
1. Most commonly used during brooding or in cold weather.
2. Cold air is directed to the roof to be warmed up. Air circuit is very important for avoiding cold draft at the bird's level.
3. Important the space between the top tier and the ceiling (at least 2 m) and the inlet design.
4. Normally it is not working in permanence, but it is driven by a timer.



A good transverse ventilation system is intended to warm up the incoming air by directing it to the roof where the air temperature is higher. This sequence of thermal images you can see the effect of an optimal transverse ventilation

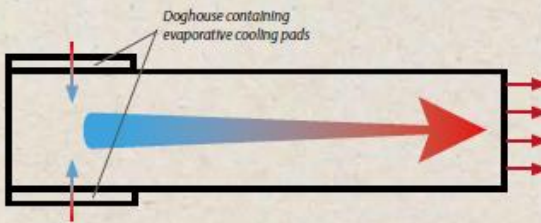
Transition System

1. Used when temperature rise but tunnel ventilation cannot be used (moderate or cold weather conditions, tunnel entrance not installed, young chicks).
2. Air is still directed to the roof.
3. Main function is to reduce the house temperature.



Tunnel System

1. Used in hot weathers and only in adult feathered birds.
2. It generates a high-speed flow at bird's level. It helps to cool the birds by the wind chill effect.
3. Most important driver for this system is the air velocity at bird's level.
4. Best option is to install the cooling pads in a room at the front of the house.



THE KEY TO ANY NEGATIVE VENTILATION SYSTEMS IS THAT THE HOUSE NEEDS TO BE TIGHT, SO ALL THE AIR ENTERS THROUGH THE INLET SYSTEM DURING BOTH COLD AND HOT WEATHER.

Ventilation systems

- Infrared pictures to show the effect of ventilation.
- Characteristics of each system.
- Key points to keep in mind.

Water Quality: in deep

Mineral	Recommended level in poultry	Effects	Treatments
Calcium	< 75 mg/l	There is no maximum limit. However, > 110 mg/l could cause scale buildup.	Same treatment as for water hardness.
Copper	< 0.6 mg/l	Its origin is probably by corrosion of pipes and joints. High levels could change the taste of water, produce oral or gizzard lesions.	
Iron	< 0.3 mg/l	Metallic taste of water, gastrointestinal disorders, decreases efficiency of vaccine and medications. Blockage of water pipes, bad smell and/or taste, encourages bacterial growth.	Treatments include the addition of some oxidant such as chlorine, chlorine dioxide or ozone then aerate and filter through an appropriate mechanical filtration process.
Magnesium	< 125 mg/l	>125 mg/l could cause wet manure due to its laxative effect. Level above 50 mg/l in conjunction with high levels of sulfate or chloride could also produce a laxative effect.	Same treatment as for water hardness.
Manganese	< 0.05 mg/l	Can be deposited in the form of black granules in filters and drinkers.	Similar to iron but can be more difficult to remove due to the slow reaction it has with chlorine. Therefore, it needs a long contact time with chlorine prior to filtration unless an iron ion exchange resin is used when pH is 6.8 or higher. The filtration should be done at a pH around 8.5. Another option is green sand filters with a pH greater than 8.0.
Nitrate	< 15 mg/l (nitrites < 1 mg/l)	Very high levels reduce the absorption of oxygen (apathetic birds, violaceous combs, and wattles), low fertility, lower feed intake, lower weight gain and production.	Reverse osmosis; ion exchange.
pH	5 – 8	Less than 5 can produce metal corrosion. Higher than 8 can affect the performance of disinfectants and the taste of water.	Organic or acid minerals to lower the pH. Basic agents to raise pH.
Phosphorus	0.1 mg/l		
Potassium	< 300 mg/l	Effects will depend on water alkalinity and pH.	
Chlorides-chlorine	< 250 mg/l	Laxative effect, wet manure, reduced feed intake and increased water consumption. Keep in mind that levels of 14 ppm can cause problems if sodium is > 50 ppm.	

Mineral	Recommended level in poultry	Effects	Treatments
Sodium	50 – 300 mg/l	Together with high levels of chlorine or sulfate can cause diarrhea. In addition, it can promote the growth of Enterococci. Level > 600 mg/l could produce alterations in eggshell quality. There may be problems when lower concentrations (< 50 mg/l) are accompanied by chlorides \geq 14 ppm or sulfates > 50 ppm.	Reverse osmosis, lower dietary salt level blend with non-saline water, keep water clean and permanently use sanitizers such as hydrogen peroxide or iodine to prevent bacterial growth.
Sulfate	< 200 mg/l	Laxative effect. If high levels of magnesium and chloride or sulfate are also present (> 50 mg/l), a decrease in performance can occur. The presence of rotten egg odor can mean that there is a high concentration of hydrogen which is a byproduct of sulfate-reducing bacteria.	Aerate water in a storage tank to prevent air bubbles from entering water lines. Apply chlorine shots into the well, without stopping the normal disinfection program.
Alkalinity	< 100 mg/l	It is a value associated with bicarbonate, sulfates, and calcium carbonate. It can give a bitter taste to water which can reduce water intake and be corrosive to evaporative panels. High alkalinity levels make more difficult to lower the water pH.	Acidification (pH target < 6,5), anion exchange to reduce the water alkalinity and aeration.
Water hardness	< 150 mg/l	Water hardness can produce scale that deposit on the inner surface of pipes. Main factors are calcium and magnesium. Iron and manganese can also contribute but in lesser extent. Very high levels can also impact on medications and vaccines.	Water softeners (do not use if sodium levels are high unless potassium chloride is used instead of sodium chloride). Polyphosphates sequester the ions involved in hardness and keep them in solution. Acidify to a pH < 6,5.
Zinc	< 1.50 mg/l	Higher levels are toxic.	Filtration methods.
Fluor	< 2 mg/l	High levels can induce soft bones.	
Total dissolved solids	< 1500 ppm (< 3 weeks of age) < 3000 ppm (> 3 weeks of age)	Levels between 4000 to 7000 ppm can produce diarrhea. Concentration > 7000 ppm isn't recommended for drinking water.	Filtration methods.

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