

Optimization of Ventilation and Environmental Control Systems in Poultry Production



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Modern poultry production faces the constant challenge of maintaining birds in an environment that allows them to express their full productive potential.



Factors such as temperature, relative humidity, gas concentration, and air movement within the facilities directly influence the welfare, health, and productivity of flocks.



For this reason, **the optimization of ventilation and environmental control systems has become a strategic priority for producers around the world.**





The Importance of Ventilation in Poultry Production



Ventilation not only serves to renew the air inside poultry houses but also regulates temperature, controls humidity, removes harmful gases such as ammonia and carbon dioxide, and reduces dust and airborne pathogens.

Proper ventilation:

- ✓ Maintains the birds' body temperature within optimal ranges.
- ✓ Prevents heat stress and production losses.
- ✓ Promotes efficient feed and water consumption.
- ✓ Contributes to flock uniformity and better feed conversion ratios.





Types of Ventilation Systems in Poultry Production



Different systems are used depending on facility design, climatic conditions, and the birds' growth stage:

> Natural Ventilation

This system relies on air currents generated passively through windows, curtains, or openings in the houses. Its effectiveness depends on external factors such as wind and ambient temperature, which limits its application in intensive production systems.



> Mechanical Ventilation

This system uses exhaust fans, blowers, and controlled air inlets to maintain a constant and regulated airflow. There are three main modes:



- > **Minimum ventilation:** Ensures air renewal during the early rearing stages and in cold climates, preventing gas accumulation.
- > **Transition ventilation:** Used in mild climates when it is necessary to increase air circulation to regulate temperature without creating excessive drafts.
- > **Tunnel ventilation:** Widely used in warm regions, it creates a high-speed longitudinal airflow, generating a convective cooling effect that helps reduce the impact of heat stress.



Environmental Control: Beyond Ventilation



Environmental control integrates different parameters that must be managed together:

- > **Temperature:** Thermal comfort is vital for birds. Newly hatched chicks require higher temperatures (32–34 °C), while adult birds thrive best between 18–24 °C. Automated systems allow precise monitoring and adjustment.
- > **Relative Humidity:** The ideal range is between 50 and 70%. High values cause condensation, fungal growth, and bedding deterioration, while low levels increase dust and respiratory susceptibility.
- > **Air Quality:** High ammonia concentrations (>25 ppm) cause eye irritation, respiratory problems, and reduced productivity. Controlling gases and particles through ventilation and filtration is essential for avian health.
- > **Lighting:** Although not directly related to ventilation, lighting is part of environmental control, as it influences behavior, feeding, and productivity. Its regulation should be integrated into the overall automation system.





Impact on Productivity and Animal Welfare



A stable and controlled environment results in:

- ✓ **Reduced mortality and respiratory diseases.**
- ✓ **Better feed conversion and higher weight gain.**
- ✓ **Uniform flocks and superior quality in meat or egg production.**
- ✓ **Lower thermal stress, contributing to animal welfare and compliance with international standards.**



Conclusions



Optimizing ventilation and environmental control systems in poultry farming is not a luxury, but a necessity to ensure the sector's sustainability.



Efficient management of air, temperature, and humidity not only protects the health and welfare of birds but also ensures the producer's competitiveness in the face of growing climatic and production challenges.

Investing in technology, training, and continuous monitoring is key to advancing toward a more efficient, responsible, and future-ready poultry industry.





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