

Poultry Farm Automation: Enhancing Efficiency and Reducing Labor Dependency

Zubair Azhar Nomi¹, Aroob Akram¹, Muhammad Sheraz Zaffar¹, Shahid Ali Rajput^{2*}, Baseer Ahmad²

1. Faculty of Veterinary and Animal Sciences, MNS University of Agriculture, Multan.
2. Department of Animal Feed and Production, MNS University of Agriculture, Multan.

*Corresponding author: shahid.ali@mnsuam.edu.pk

ABSTRACT

The poultry sector upgrade day-by-day due to automation and innovation in industry. Poultry industry play a crucial role by offering egg and meat. The automated systems have been generated for various tasks including egg collection, waste removal, lighting control, and health monitoring. These advancements not only streamline operations but also contribute to improved hygiene and disease prevention. The automation in poultry farming leads to enhanced productivity, reduced manual labor, and a more sustainable and efficient industry. The robotic system controls the water and feeding system along with the assistance in egg collection. Labor dependency is decreasing due to implementation of modern technologies. Mortality rates are also decreasing in the output of climate control and waste management

Introduction:

The modern poultry industry in Pakistan began in the 1960s with the introduction of commercial poultry farming. This development was supported by improved breeds, feed formulations, and management practices, leading to the growth of poultry sector. With the passage of time, it achieved the importance due to fast output in the form of egg and meat. It can prepare high protein quality as compared to livestock. In the beginning, the farming occurred in the open shed. Automation in poultry farming involves the use technology to streamline and optimize various tasks. This includes automated feeding systems, climate control, egg collection, and health monitoring. Automated systems help to improve efficiency, reduce labor costs, and enhance overall productivity in poultry farms [1].

Automated feeding system

Automated feeding system utilizes the sensor i.e., weight sensors or infrared sensors to monitor feed levels in storage container. These sensors detect the amount of feed remaining and send data to a control system. The control system, based on predefined parameters, can trigger the dispensing of additional feed when levels are low. This ensures a consistent and controlled supply of feed for animals without manual intervention. Automatic feed dispensers release precise amounts of feed through smart technology and calibrated mechanisms. Using sensors and algorithms, these dispensers ensure that the birds receive optimal nutrition without waste. After that, automatic dispensers release a precise amount of feed through the integration of accurate measurement mechanisms, often utilizing motor-driven augers or conveyor systems. The dispenser's control system is programmed to determine the desired feed quantity. When activated, the system calculates the duration or revolutions needed to dispense the specified amount. For example, a dispenser with an auger might rotate for a specific time, delivering a controlled volume of feed per rotation. Alternatively, a conveyor system could precisely transport a predetermined quantity of feed to the desired location. The combination of sensors, control algorithms, and mechanical components allows these systems to achieve precision in feed dispensing. The level of feed and water should be greater than 98.79% [1].

Climate control System

This system automated the adjustment of ventilation based on temperature and humidity through sensors and control algorithms. Temperature sensors measure the ambient temperature, while humidity sensors gauge the moisture level in the air. The system then uses this data to determine whether ventilation is needed or not. These adjustments are typically managed by a centralized control system that communicates with various sensors throughout the ventilation infrastructure. It's a proactive approach to maintaining a comfortable and healthy indoor environment while optimizing the energy. The temperature sensor regulates the heating and cooling system and ensures optimal conditions for birds' comfort and growth. The relationship between feed consumption and meat production in broiler chicken production can be defined by thermal factor which is a determinative factor [2].

Egg collection systems

Conveyer belts or robotic arms collect the eggs. Conveyor belts in egg collection systems transport eggs from laying hens to a central collection point. Robotic arms, equipped with sensors and grippers, then pick up the eggs by carefully handling them to avoid breakage. The robots follow predefined paths or use computer vision to locate and grasp the eggs, ensuring efficient and gentle egg collection in poultry farms. Sensors in egg processing

systems typically use imaging technology to identify damaged or dirty eggs. These sensors analyze factors such as shape, color, and surface abnormalities. So, this technique helps to improve efficiency and reduces labor for egg collection. In free-range farming, chicken shows their natural behaviors including laying eggs. Collection of eggs by labor is time consuming. Robot pick up the eggs and collect them [3].

Health monitoring

Sensors track bird health by monitoring temperature, weight, environmental conditions, heart rate, and behavior. The data collected provides insights into overall well-being, allowing early detection of potential health issues for prompt intervention. Automated alerts for potential diseases or abnormalities are generated by analyzing data from various sensors monitoring bird health parameters. Deviations from normal patterns trigger alerts, enabling prompt intervention by farmers to address potential health issues in poultry farms. Data of bird's health is maintained through hardware and software combination which showed on a web page with environment conditions in very less human effort [4].

Watering System and lighting control

Automated water dispensers maintain a continuous water supply by using sensors to detect water levels. When levels drop, the dispenser automatically refills, ensuring a constant and reliable water source for chickens. Automated water dispensers reduce the risk of dehydration and enhance bird health by ensuring a consistent and readily available water supply. This eliminates the possibility of water shortages, promoting hydration and overall well-being in poultry, without reliance on manual monitoring. When the sensor finds water level low, it automatically refills the water tanks which helps to save time and efforts with upgrading the poultry business [5].

Automated lighting systems simulate natural day-night cycles in poultry by controlling artificial lights. They mimic sunrise and sunset, regulating the duration and intensity of light exposure. This simulation helps to maintain circadian rhythms, promoting healthier poultry behavior, reproduction, and overall well-being. Furthermore, energy-efficient lighting in poultry promotes efficient egg production by using LED systems tailored to hens' light sensitivity. These systems optimize energy consumption, providing the right light spectrum and duration. This not only supports hen welfare and health but also enhances egg-laying patterns, contributing to overall efficiency in poultry farming [6].

Waste Management

Automated waste removal systems in poultry efficiently manage waste by utilizing conveyors or belts to transport litter away from the production area. This automated process enhances cleanliness, reduces manual labor, and promotes a healthier environment in poultry farming. This automation reduces disease risks by preventing the accumulation of waste, creating a more hygienic environment that supports overall poultry health. Waste includes feathers, dust and hatchery debris which can cause harmful diseases [7].

Conclusion

In conclusion, poultry farm automation significantly enhances efficiency by streamlining tasks and minimizing labor dependency. The integration of automated systems not only improves production rates but also ensures precision in monitoring and managing various aspects of poultry farming. This technological advancement marks a pivotal shift in the industry,

promoting sustainability and increased output while reducing the reliance on manual labor.

References

- [1] Valenzuela-Lino YS, Rosales-Fierro JE, Ortiz-Zacarias JR, Moggiano N, Coaquira-Rojo CA, Huamanchahua D. Design of an Automated Feeding and Drinking System for Turkeys in Different Stages of Development. In 2022 IEEE International IOT, Electronics and Mechatronics Conference (IEMTRONICS) 2022 Jun 1 (pp. 1-6). IEEE.
- [2] Upachaban T, Boonma A, Radpukdee T. Climate control system of a poultry house using sliding mode control. In 2016 international symposium on flexible automation (ISFA) 2016 Aug 1 (pp. 53-58). IEEE.
- [3] Sheela A, Prithivi K, Nivesh NS, Pavithran A, Pradeep C, Babu KP. Automation in egg collecting system in poultry farms. In AIP Conference Proceedings 2021 Nov 1 (Vol. 2387, No. 1). AIP Publishing.
- [4] Choukidar GA, Dawande NA. Smart poultry farm automation and monitoring system. In 2017 International Conference on Computing, Communication, Control and Automation (ICCUBEA) 2017 Aug 17 (pp. 1-5). IEEE.
- [5] Batuto A, Dejeron TB, Cruz PD, Samonte MJ. E-poultry: An IoT poultry management system for small farms. In 2020 IEEE 7th International Conference on Industrial Engineering and Applications (ICIEA) 2020 Apr 16 (pp. 738-742). IEEE.
- [6] Arowolo MA, He JH, He SP, Adebawale TO. The implication of lighting programmes in intensive broiler production system. World's Poultry Science Journal. 2019 Mar;75(1):17-28.
- [7] Sarker BC, Alam MA, Rahman MM, Islam AF, Chowdhury MG. Waste management of commercial poultry farms in Bangladesh. Journal of innovation and development strategy. 2009;2(3):34-7.

