

Design and Fabrication of Automatic Cattle Feeder System Using IOT

¹Ganeshan P, ²Devadharshan P, ³Anistonrahul R and ⁴Vijay P

^{1,2,3,4}Department of Mechanical Engineering, Sri Eshwar College of Engineering, Coimbatore, Tamil Nadu, India.

¹ganeshan.p@sece.ac.in

Article Info

S. Venkatesh et al. (eds.), *Emerging Trends in Mechanical Sciences for Sustainable Technologies*, Advances in Intelligent Systems and Technologies,

Doi: https://doi.org/10.53759/aist/978-9914-9946-4-3_17

©2023 The Authors. Published by AnaPub Publications.

This is an open access article under the CC BY-NC-ND license. (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

Abstract – The old-fashioned method of physically feeding cattle takes time. Before feeding the animals along the side of the feed fence, the autonomous cow feeding system employed in this research travels a predefined path for a specified amount of time. The feed mechanism is operated over a predetermined time period by the prototype using an Arduino circuit. Considering that more than 40 percent of total work time is devoted to this activity, feeding constitutes one of the higher expenditures for farm owners in addition to being directly tied to the production of the cattle. Due to the lack of technological utilization, the dairy business has a significant Labor need. These labors are particularly expensive for the owner of the dairy farm since they are only required for 3 hours each morning and three hours in the evening, but they must be paid for the entire day. Hence, an automatic cow feeding equipment has been created to decrease the owner effort and expense. In this research we use two barrels to store the cattle food and a sensor is placed to open the barrel opening to fill the food in the collector in which the cattle eat their food. This process is done for period like morning once and evening once.

Keywords – Cattle Feeder, Sensor, Motor, Arduino Uno.

I. INTRODUCTION

In some rural areas, cow feeding is still done the old-fashioned way, by hand, with intermittent human involvement. The animals must be fed; thus, the operation is quite time consuming and stressful. While it is a straightforward concept, any cattle producer may relate to it. And the dairy business has a high labor need because technology is not used in it [1]. The local dairy owner must pay a high price for these labours since the dairy farms only need labor for a couple of hours, yet they must pay them for the entire day [2]. So, it is essential to create an autonomous cow feeding system in order to decrease labor costs, labor hours, and to free up the dairy farm owner's time to feed the cattle. Farmers needed away to simplify this vital work, therefore the idea of an automatic cow feeding system was developed [3-6]. Farm automation is becoming more and more common among dairy producers. Since many years ago, systems have been dispenser and automatic watering in use. Over the last ten years, a number of firms have also launched automatic cattle feeding systems (AFS). Where as Farms that feed with a once or TMR using conventional feeding systems (CFS) often offer just twice a day and demand manpower more set of work schedule, the key benefit TMR with a of AFS is the ability to deliver frequent schedule minimal requirement labor [7]. Increased feed distribution frequency is possible using AFS. Also, a greater frequency shortens the duration on feeding on the manager while lowering the risk of contamination and abnormal fermentations. The process of feeding cattle without the aid of automated feeding devices is known as a manual cow feeding system. This type of feeding system is normally used in small farms, ranches, or homesteads with a small herd of cattle can adopt this approach [8]. In manual cattle feeding system they have to determine what kind of feeding you are going to give to the cattle like grains, silage, and pasture. And then calculate the amount of grain you are going to give to the cattle base don the work, age and nutrition requirements. And then they have to schedule the time of feeding the cattle. They divide the feeding amount of the cattle for one day into two or three times like morning and evening. They have to do this work regularly without break to maintain the cattle health [9]. And they also want to clean the place of cattle in which it is feed. This method is a hard process, and the farmer needs to work hard every day to feed the cattle and they also keep some workers to take care of the cattle. And it is not possible to feed the cattle when they are not in home. To avoid this type of problems automatic cattle feeding system is introduced to help the farmers. A technical advancement that helps farmers save time and increase the effectiveness of their operations is an autonomous cow feeding system. The technology is made to

automate the feeding of cattle so that farmers may concentrate on other areas of their company. By the help of automatic cattle feeding system, it helps the farmers to save more time by eliminating manual cattle feeding and allows them to concentrate on their other works. And it also improves to increase the efficiency of the feeding and it can be programmed to feed at correct time and the amount to be feeder. It also reduces the wastage and improves the health of cattle. It also helps the farmers to save money by reducing the waste. It can be programmed to give the exact amount of feed which should be given to cattle and reduces the feed waste. Automatic cattle feeding system also used to improve the health of cattle by feeding them at correct time and correct quantity which should be given to the cattle. It also eliminates under feeding and over feeding [10].

II. MATERIAL & METHOD

A fully accessible software and hardware platform called Arduino. It is used to enable users to build a variety of electrical projects, from straightforward LED blinkers to intricate robotic systems. You may link different types of sensors, motors, and other electronic parts with an Arduino board to make interactive creations. In this research, Arduino is used to control the DC gear motor to turn ON and OFF the rotation of the motor. And it includes timing to run the motor. It helps to turn on the gear motor when the process is needed. In this research Arduino plays an important role to run the motor which rotates the disc which has a hole in it. Arduino plays a major role in our research. An electric motor that combines a DC motor and a gear box is known as a DC gear motor. The rotational power is provided by the DC motor, and the gear box outputs more torque while reducing speed. Therefore, a motor that can provide great output at low speeds has been created, which makes it perfect for a variety of commercial and industrial uses. Robotics, automotive systems, industrial machinery, and medical equipment are just a few of the many areas where DC gear motors are frequently employed. Because of their high torque production, accurate control, and low power consumption, they are chosen over other types of motors. In this research the DC gear motor is used to rotate the disc, which is not fixed, and this not fixed part rotates over and gears the fixed part and that disc also has a hole. When the two holes intersect each other, the cattle food stored in the fixed disc falls through the hole with metal.

- 150 RPM 12VDC motors gear box metal
- 18000 RPM base motor
- 6mm Dia shaft with M3 thread hole
- Gear box diameter 37 mm
- Motor Diameter 28.5 mm
- Length 63 mm without shaft
- Shaft length 30mm
- 32 kg-cm torque

III. RESULT AND DISCUSSION

The usual components of an automatic cow feeding system include a feed device, feed storage containers, and a control module. According to the system, the feeding mechanism may differ, but typical options have included a conveyor, drill, and pneumatic tube. The system control unit is setup to distribute a specified feed quantity at predefined intervals. Using a timer or other sorts of detectors, including such mass sensors or proximity sensors, may be done manually or configured to run automatically.

The control unit turns on the feed mechanism to transfer the feeds from the storage containers to the feed lot or container when it's ready to dispense it. Typically, a pre-set amount of feed is delivered; however, this amount can be changed. Automatic cattle feeding system is introduced to reduce the work of the farmers and this type of cattle feeding system uses sensors to automate the feeding process and it can be programmed to dispense the right amount of food at right time and this process is based on the weight and nutrients required by the cattle.

In this research we use two barrels to store the cattle feed which act as a feed bin which stores the feed and two pipes which act as a conveyor which transmit the feed materials through it to the dispensing unit provided in the pipe which is closed till the time which is programmed to open. And the dispensing unit is the right amount to program to dispense feed to eliminate unhealthiness of the cattle.

This system can be also programmed to feed the cattle for specific periods of time, and we can also provide a monitor in which the amount of feed given to the cattle can be displayed and the farmer also knows the amount feed the cattle is consumed. Thus, automatic cow feeding systems provide precise and consistent feeding while reducing the effort and time needed to feed the animals. They also aid in waste reduction and feed optimization.

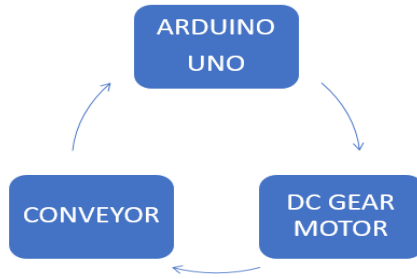


Fig 1. Circuit Diagram

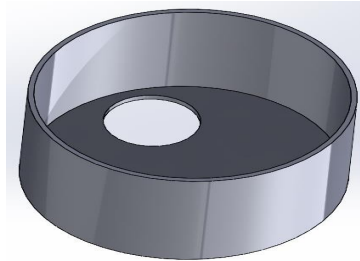


Fig 2. Movable Disc

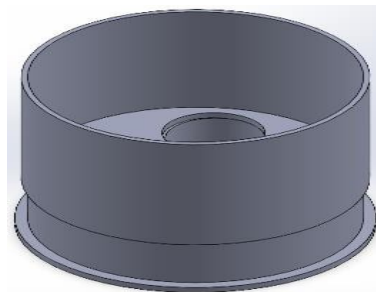


Fig 3. Model of the Research

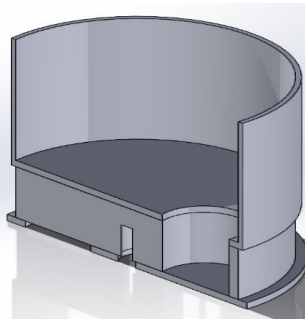


Fig 4. Cross Sectional View of the Research

IV. CONCLUSION

Producers may gain from using automatic cow feeding systems in sever always, including higher productivity, lower labor costs, and better herd health. To ensure so each animal gets the correct quantity of nourishment, such systems dispense feed inside a precise and regular manner using computer-controlled technology. This may lead to higher rates of improved feed, quicker weight increase, and less waste. Also, producers may benefit from increased flexibility from automated cattle feeding, which make it simple for them to modify feed Schedules and rations in accordance with the requirements of their herd. These devices can also assist farmers in more effectively managing their water and feed inventories. Overall, using automated cattle feeding technologies may be a useful tool for farmers who want to increase their operations production.

References

- [1]. Kim D. E., Chang Y. S., Kim H. H., Kim J. G., Cho H. K., "An automatic seedings system using machine vision for seed line-up of cucurbitaceous vegetables," in 2006 ASAE Annual Meeting, 2018, p. 1.
- [2]. J. C. Burgatti and R. A. Lacerda, "Slim Refrigerated Combo Vending Machine (XY-DLE-6C)," in *Revista da Escola de Enfermagem da USP*, vol. [volume number], no. [issue number], Mar. 2019, pp.
- [3]. J. J. Xu, J. Y. Yin, H. C. Zhang, and T. J. Cui, "Compact feeding network for array radiations of spoof surface plasmon polaritons," in *Scientific Reports*, vol. 6, no. 1, Mar. 7, 2016, article 22692.
- [4]. F. Dharssi, J. D. Kitterman, W. P. Reddie, and V. D. Rigney, inventors; DSD Communications Inc, assignee, "System and method for including packets with goods during automated packaging," United States Patent US6993887, 2017
- [5]. N. Wagner and J. M. Rondinelli, "Theory-guided machine learning in materials science," in *Frontiers in Materials*, vol. 3, Jun. 27, 2016, article 28.
- [6]. Vidal AR, Campilho RD, Silva FJ, Sánchez-Arce IJ. Re-purposing a WeldingFrameforaTubeCutting Machine.In *Flexible Automationan Intelligent Manufacturing: The Human-Data-Technology Nexus: Proceedings of FAIM2022*, June 19–23, 2022, Detroit, Michigan,USA, Volume 2 2023 Feb. Cham:SpringerInternationalPublishing.
- [7]. W. J. Wardal, K. E. Mazur, K. Roman, M. Roman, and M. Majchrzak, "Assessment of Cumulative Energy Needs for Chosen Technologies of Cattle Feeding in Barns with Conventional (CFS) and Automated Feeding Systems (AFS)," in *Energies*, vol. 14, no. 24, pp. 8584, Dec. 20, 2021.
- [8]. A. Pezzuolo, A. Chiumenti, L. Sartori, and F. Da Borso, "Automatic Feeding System: Evaluation of energy consumption and labour requirement in North-East Italy dairy farm," in *Proceedings of Engineering for Rural Development*, vol. 15, pp. 882-887, May 25, 2016.
- [9]. Rushen J,Chapinal N, de Passile A M. Automated monitoring of behavioural based animal welfare indicators. *Animal Welfare*. 2012 Aug; 21(3):33 9-50.
- [10]. C. Bisaglia, F. Nydegger, A. Grothmann, and J. C. Pompe, "Automatic and frequency programmable systems for feeding tnr: state of the art and available technologies," in *Proceedings of the XVIIth World Congress of the International Commission of Agriculture and Biosystems Engineering "Sustainable Biosystems through Engineering,"* 2010, pp. 10-10.