

Design and Development of Automatic Cattle Feeder for Smart Agriculture

Kunal Bachhav¹, Aniket Ghayal², Shivraj Gunjal³, Aniket Khairnar⁴, Prof. V.V. Shinde⁵

¹Student, Mechanical Engineering, MVP's KBTCOE, Nashik, Maharashtra, India

²Student, Mechanical Engineering, MVP's KBTCOE, Nashik, Maharashtra, India

³Student, Mechanical Engineering, MVP's KBTCOE, Nashik, Maharashtra, India

⁴Student, Mechanical Engineering, MVP's KBTCOE, Nashik, Maharashtra, India

⁵Assistant Professor, Mechanical Engineering, MVP's KBTCOE, Nashik, Maharashtra, India

ABSTRACT

Automatic feeding machines are especially designed for distributing feed to a large number of animals on a farm or any other facility. These are automated machines which require little to no human intervention during feeding process. The main objective is to design automatic cattle feeding system that moves around the fence to distribute the feed uniformly. The use of automation ensures precise and an exact determination of feed requirements. Basically, the feeding of the cattle is manual which is effort and time consuming. In this project, automatic cattle feeding system is introduced where food feeder follows the path through a predetermined distance and places the feed to the cattle by the side of the feed fence using conveyer system. The prototype is developed using automation unit interfaced with controller i.e. IOT that tracks the conveyer system to follow. The motors are interfaced to operate in either direction. A hopper door operated is places the feed. Similarly, controller- based switching feature is added for manual intervention. As the result, the developed automatic cattle feeder system is able to track and distribute the feed in specified path and distance respectively

Keyword: - Automation, little to no, IOT, Control-based System.

1. INTRODUCTION

The cattle need to be fed. It is a simple statement, but one that resonates with every cattle producer. To make this necessary task easier for farmers, the concept of automatic cattle feeding system came into existence. Automatic feeding machines are especially designed for distributing feed to a large number of animals on a farm or any other facility. To make this necessary task easier for farmers, the concept of automatic cattle feeding system came into existence. Automatic Cattle Feeding System is a feeding system that is capable of feeding an equal amount of feed. The feed is manually loaded in the feeder and it follows the feed fence through a pre-determined route until it reaches the feeding fence at a pre-determined distance where it places the feed through a sliding door. To ensure the precise, timely and adequate feeding of cattle of each group, this project is applicable in an agricultural country like India where the lack of manpower in cattle farming has an adverse effect on dairy production.

1.1 Objectives

- 1) To develop IOT based automatic cattle feeder.
- 2) To allow feeding of cattle with automation in timely manner and with precision and less wastage.
- 3) To reduce cost of labour for feeding cattle. To characterize feeding pattern of cattle.
- 4) To ensure timely and adequate feeding of cattle group wise.

1.2 Scope

Experimental manufacturing of Automatic Cattle Feeder System and its implementation in feeding dairy animals in agriculture sector.

2. LITERATURE SURVEY

Saran Kumar et.al explained in this paper on Design and Fabrication of Automatic Animal Feeding System for Cattle Breeds using Conveyor Technique, to design and build the automatic animal feed system for cattle breeds that would operate on a conveyor basis through the use of this system. It will provide schematics to be used for the

wiring of the system, image and procedures for the construction of an aesthetically pleasing and useful outer-casting. In this project work an effort made to develop a labour/time saving automatically operated automatic feeder that will optimize feeding of birds. Thereby it is possible for a farmer to remain competitive despite rising energy costs and declining subsidies for solar power. Based on the present data, now it is necessary to carry out model calculations.

Franz Nydegger, et.al investigated and presented in this paper Automatic feeding systems for dairy cattle – potential for optimization in dairy farming. A survey carried out on 18 farms in Switzerland, Germany, Denmark and the Netherlands indicates current trends in cattle feeding. An increasing number of farms are relying on automatic feeding to ease their workload, save time and achieve flexibility. The farms surveyed were practical users of automatic feeding systems. The working time measurements of the automatic feeding systems (AFS) show, that by using an AFS it is possible to save time and achieve greater flexibility.

M. Parthasarathy, et.al investigated in their paper Design and Fabrication of Automatic Cattle Feeding Machine about AFS. The AFS is a new practical and completely modern concept to overcome the difficulties due to labour shortage and to increase the white revolution. AFS is an automated feeding machine with proper technique of refilling the fodder at correct interval. The primary benefit of this machine is to do the work more efficient in order to suffice the manual source. The AFS relies on the programmable logical Control method. The basic work to be performed by the AFS machine is to grab the fodder from the stockyard to cutting machine through conveyer and then the feed which has to be given to the cattle is cut as per the required conditions, then the feed is directed to the feed distributor chamber through conveyer.

Rosemarie Oberschätzl, et.al explained in their paper Automatic feeding systems for cattle and it's working. Automatic feeding systems (AFS) for dairy cows and fattening bulls gain in importance. One main reason is to reduce labour time and workload. But increasing automation and mechanization can lead to rising energy consumption and costs. Therefore, the aim of the study was to analyse the electrical energy consumption of AFS on four Bavarian farms (three farms for dairy cows and one for fattening bulls). Furthermore, the costs incurred should be compared with the costs of diesel when feeding with a fodder mixing wagon.

3. PROPOSED SOLUTION

Automatic Cattle Feeder is a system which makes feeding farm animals automatically. System is equipped with belt conveyor for transferring of feed to each animal. The system also has battery in power outage conditions. The system has timer which enables the operation to be carried out on our preferred time. This system will be IOT based so farmer can operate the system via mobile application.

4. METHODOLOGY

The various components present in the proposed automated cattle fodder system are listed. The system consists of a power supply which acts as an energy source for supplying electricity to the system. Gear Motor which helps for operation of the conveyor and feeder gate mechanism respectively. The feeder motor which then fall in conveyor that carry the chopped feed, from that it moves to the conveyor. This is provided with a controller & timer base system for cattle food to the box which kept in front of the cattle and helps the entire system to be in the closed loop, Control unit which consist of timer controller. This is used to control the number of feeding cycle time at an interval of time and integrate all these systems together and make the entire system as the closed loop system. In this chapter introduction of the project as well as the problem definition are discussed. To solve all the problems discussed above we are producing a new machine, as our project under this topic in our academic year 2022 – 2023, we are preparing a working scale model of this machine. We have proposed a methodology to solve the problems. Our methodology is divided in different parts, under different titles.

1. Proposed Methodology 1 – Literature survey.
2. Proposed Methodology 2 – Design of Machine Components.
3. Proposed Methodology 3 - Selection of Components for Machine.
4. Proposed Methodology 4 – CAD modelling of Machine
5. Proposed Methodology 5 – To calculate i/p and o/p of components.
6. Proposed Methodology 6 – Conclusion

5. COMPONENTS

5.1 Sheet Metal



Fig-1: Sheet Metal

Thickness	4mm
Material	Mild Steel
Usage / Application	Construction
Finishing	Polished
Country of Origin	Made in India
Technique	Hot Rolled

Fig-2: Sheet Metal Table

5.2 Roller



Fig-3: Roller

- Ga. galvanized steel tube
- 12" between frames to suit 12" overall width
- gravity conveyors
- Crimped, oiled bearings; 90 pounds' load capacity per roller
- 40 diameters mild steel axle, 12" long Spring retained on one end.

5.3 Deep Groove 6200 Ball Bearings 10mm × 30mm × 9mm

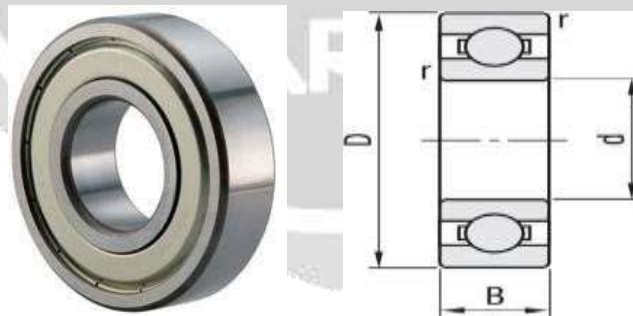


Fig-4: Deep Groove Ball Bearing

- Model Numbers: B6200
- Brands Carried: MISUMI
- Bearing Sizing: ID 10mm × OD 30mm × W 9mm, 10 mm Ball Bearing
- Bearing Seals: Open, Single Shielded, Double Shielded, Rubber Sealed

6. DESIGN OF MACHINE



Fig-6: 3D CAD Model of System

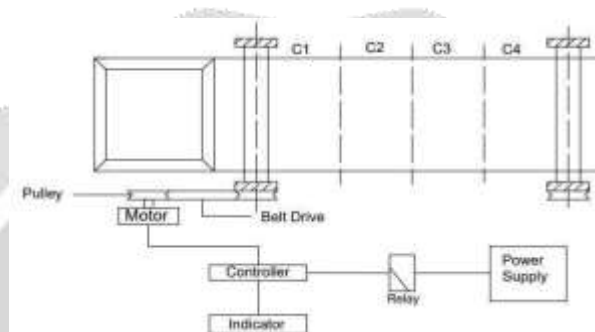


Fig-7: 2D CAD Model of System

7. CONCLUSION

Traditional feeding system have more feeding cost, labour cost and there is more wastage of feed. Hence to overcome this, we have developed IOT based Automatic Cattle Feeder for Smart Agriculture which is very useful in Dairy industry. Our prototype increase feed efficiency and optimize productivity. Due to IOT based Automatic Cattle Feeder for Smart Agriculture we reduced labour cost, time, wastage of feed.

8. ACKNOWLEDGEMENT

We would like to express our deepest gratitude to our supervisor, Prof. Vishal Shinde, for his guidance and support throughout this project. His insightful feedback was invaluable in shaping our research and helping us to overcome various obstacles along the way.

9. REFERENCES

- 1 Saran Kumar.M, Santhana Bharathi.B, Praveen Kumar.V, Saranraj.R, Design and Fabrication of Automatic Animal Feeding System for Cattle Breeds Using Conveyor Technique, IJCRT.
- 2 Anne Grothmann¹, Franz Nydegger¹, Christoph Moritz¹, Carlo Bisaglia², Automatic feeding systems for dairy cattle – potential for optimization in dairy farming, UNIMI.
- 3 M. Parthasarathy, K. Mohanprasanth, P. Ganesh Pandi, M. Kishorprasanth, Design and Fabrication of Automatic Cattle Feeding Machine, IJERT.
- 4 Rosemarie Oberschätzl, Bernhard Haidn, Stefan Naser, Automatic feeding systems for cattle, Researchgate.
- 5 Pratiksha Karn, Nisha Somai, Sonam Ghimire, Preety Sitikhu, Saban Kumar K.C, Automatic Cattle Feeding System, ResearchGate.
- 6 Vishal Shinde, Krushna Gangurde, Vedant Lohakane, Rishikesh Sawant, Design and Development of Voice-Command Controlled Autonomous Vehicle, IRJET, DOI: 10.13140/RG.2.2.23965.90084