International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 09 Issue: 05 | May 2022 www.irjet.net p-ISSN: 2395-0072

Design and Fabrication of Automatic Cow Feeding Machine

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Abstract - *Conventionally the feeding of the cattle is manual which is time consuming. In this project, an automatic cattle feeding system is introduced where food feeder follows the path through a pre-determined distance and places the feed to the cattle by the side of the feed fence. The prototype is developed using Arduino circuit for the operation of feed mechanism with certain time space. The motors are interfaced to operate in either direction. A rail bogie is operated by a DC motor to feed the cattle at certain time space. This mechanism is basically controlled by pulling mechanism by winding the rope around the motor operated shaft.*

Key Words: **Cattle Feeding, Arduino UNO, Time Sensing, Bogie, Conventional Method**

1.INTRODUCTION

In certain regions of rural area, cow feeding is done conventionally by hand and periodic time stamps by human interference. This process is really hectic and time consuming, 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 Cattle Feeding System is a robotic feeding system which consists of a battery operated robotic vehicle 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 moving bogie.Fully automatic feeding systems for pigs or poultry are already in use. The process of milking cattle using automated milking systems is also sufficiently mastered. An interesting trend is the installation of automated feeding systems for cattle feeding.

1.1 Problem Statement

The main problem farmers facing now is feeding the cattle with conventional and time consuming method. This conventional method is really an hectic task for the farmers. By considering those factors we decided to develop this project.

1.2 Objectives

- The objective of this project is to minimize the human efforts.
- To feed the cattle with periodic time steps in a day.
- To minimize the time of human.
- To neglect the conventional time consuming process.

1.3 Best Healthy Feed for Beef Cattle:

1. Grain Supplement. Grain can get cattle growing quickly and can help cattle get fat.
2. Hay. Hay can provide every important nutrient for cattle, but it has to be picked at the height of its nutrient richness — that is, before it becomes too dry.
3. Pasture and Forage.
4. Concentrates

1.4 How do farmers feed the cow?

Commercial gains farmers feed to cows are often composed of corn, oats, barley or a mixture. While barley is the least expensive, oats are often the preferred grains because they are easily digested by cattle due to the high fiber content

1.5 How many times a day should you feed a cow?

The study also found that steers fed three times/day consumed more feed and had greater daily gains and heavier slaughter and carcass weights than steers fed once or twice daily. Feed-to-gain, dressing percentage and USDA quality and yield grades were not affected by feeding frequency.

2. working principle

The project is about automation in the process cow feeding. In this project the bogies which are being used for feeding cows are controlled by the Arduino circuit.
In this Arduino circuit we are going to burn the program to control the movement of the Bogie twice a day. At 12 PM and 5 PM. When the timing is set to the Arduino circuit we just need to pour the bogie with feeder manual in the morning and the rest of the work is done by the system itself.

2.1 Arduino UNO

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.The Arduino platform has become quite popular with people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware (called a programmer) in order to load new code onto the board -- you can simply use a USB cable. Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package.

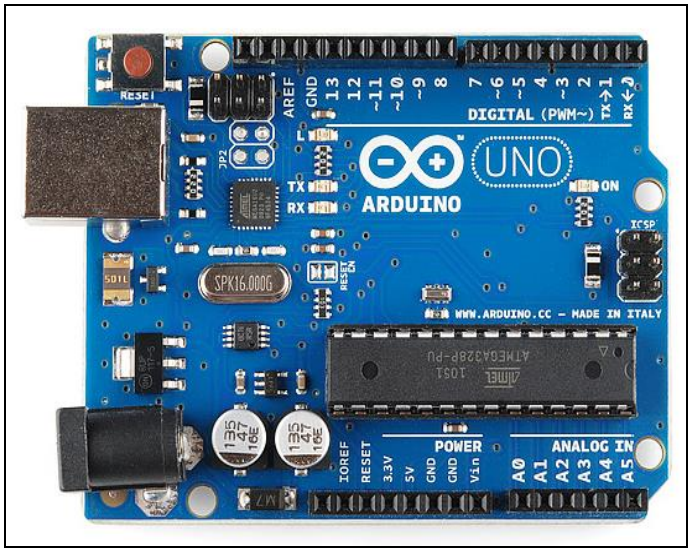

Fig - 1: Arduino UNO

2.2 Control of motor for pull bogie

Connection of motor control is given to D4 port. The relay is used to control the voltage difference of motor. Delay is provided before and after of starting and the stopping of the motor.

2.3 Control of motor for supply Water

Connection of pump control is given to D5 port. The relay is used to control the voltage difference of pump. Delay is provided before and after of starting and the stopping of the motor. After stopping the pump by supplying water of afternoon, the system will close.

Sr.No	Connection ports		Delay	Motor status	Pump Status	Result
	D4	D5				
1	OFF	OFF	ON	OFF	OFF	Delay at starting
2	ON	OFF	OFF	ON	OFF	Motor start for morning feeding
3	ON	OFF	OFF	OFF	OFF	Motor stop after morning feeding
4	OFF	OFF	ON	OFF	OFF	Delay after morning feeding
5	OFF	ON	OFF	OFF	ON	Pump start for morning water
6	OFF	ON	OFF	OFF	OFF	PUMP stop after morning water
7	OFF	OFF	ON	OFF	OFF	Delay for afternoon
8	ON	OFF	OFF	ON	OFF	Motor start for afternoon feeding
9	ON	OFF	OFF	OFF	OFF	Motor stop after afternoon feeding
10	OFF	OFF	ON	OFF	OFF	Delay after afternoon feeding
11	OFF	ON	OFF	OFF	ON	Pump start for afternoon water
12	OFF	ON	OFF	OFF	OFF	Pump stop after afternoon water
13	OFF	OFF	OFF	OFF	OFF	System Stop

Fig - 2: Working Process

2.4 Process chart

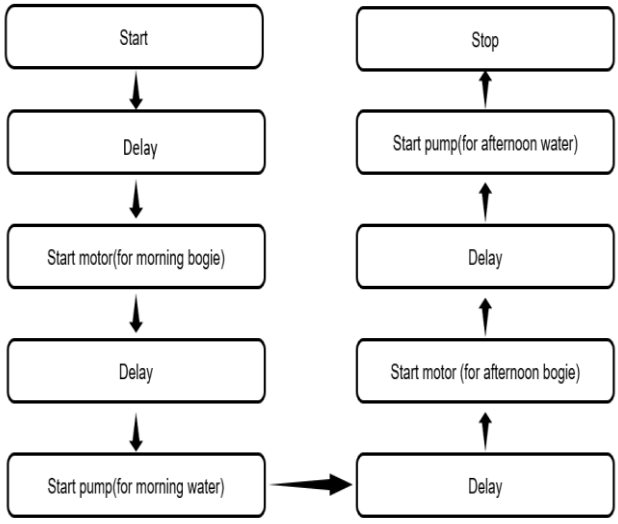

Fig - 3: Process Chart

3.DESIGN

Design includes the arrangement of the bogies as shown in figure. There are two bogies mounted such that each bogie will travel back to back. The DC motor is mounted at another end of frame to pull the bogies. After singles passed to motor from Arduino then motor will start and run for a specified delay. This delay is amount of time which required for reach a bogie at a place where cattle will left from bogie. Pump is provided to supply the water to the cow as per time.

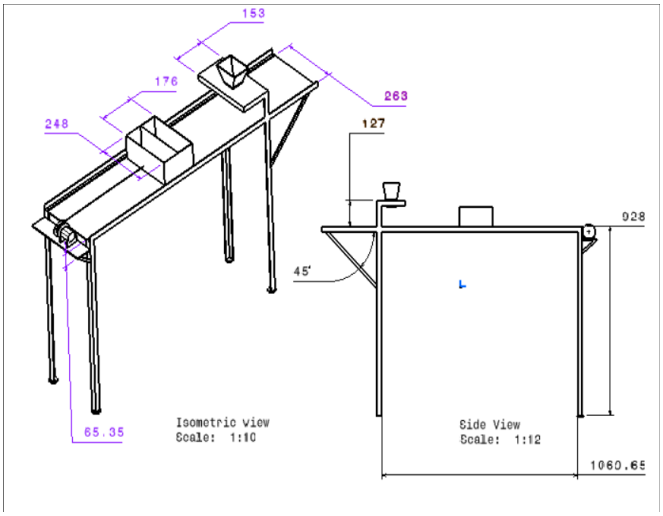

Fig - 4: 3D Drafting

4. CALCULATIONS

4.1 Motor Selection

Consider weight of the consumable = 3kg (approximately)

So the force applied is equal to = 3x9.81 newton.

F= 29.43N

Hence, the torque required = 29.43x 760 mm

= 22336N-mm=22.36N-m

So we have to select a motor having considerably similar torque as calculated.

Speed=60 rpm

Power of motor= H = T x rpm/5252 (HP)

Power= 22.36* 60/5252

Power= 0.21 HP

4.2 Frame Specification

We have used 25 x 25 x 3mm angle for the manufacturing of frame.

The frame is of 1300 x 300 mm

4.3 Volume Of Bogie

Width and length of bogie = 254 mm

Height of the bogie= 50mm

Volume of bogie= 254 x 254 x 50 = 3225800 mm^3

So, the weight of the consumable bogie can carry is 3.226kg

Dia of pully: 25.31 mm

Circumference of circle: C =2*3.14*r

= 2*3.14*12.65

C = 165 mm

Distance to first bogie= 270mm

Distance to second bogie= 110mm

4.4 Rotation of motor required for first bogie

$$\frac{\text{Distance to first bogie}}{\text{Circumference of circle}} = \frac{270}{165} = 1.63 \sim 1 \text{ and half}$$

4.5 Rotation of motor required for second bogie

$$\frac{\text{distance to second bogie}}{\text{Circumference of circle}} = \frac{110}{165} = 0.56 \sim \text{half}$$

5. CONCLUSIONS

1. In this project we successfully designed and fabricated a Automatic cow feeding machine.
2. We used the Arduino UNO for control the movement of motor and pump.
3. Achieved better accuracy in time management for cattle and water supply.

ACKNOWLEDGEMENT

It's my great pleasure to present project report entitled **"Design and fabrication of Automatic cow feeding machine"**. This projects an outcome of various efforts by us in Collating and identifying the sources of information and knowledge. I use this occasion to thank my guide with whose guidance this effort would not have borne fruits. I find no words to express my gratitude to **Prof.N.S.Biradar**. Who not only advised and guided me during the report writing but also answered all my queries concerning collection of data, proper structuring of the report, and its improvement. I would also thankful of my friends which gave me a properguide line about my subject. I am virtually indebted to the Head of the Department **Prof. N. S. Biradar** from Imperial College of Engineering and Research who have bestowed all their blessings in the form of guidance which was the leading light to complete this seminar report. I would also like to thank our principal, **Dr. R. S. Deshpande** who provided me valuable support in completion of seminar by providing me different facilities in college and by giving permission for working out of college.

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