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Automated feeding and watering system for farmyard

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ABSTRACT

With the advent of technology, the world around us is getting automated. Automatic systems are being favored over manual systems, as they are energy efficient and minimize the need for tedious manual labor. With diary industry being the primary economic sector of India and other developing countries, it is essential to automate it in order to increase efficiency. A typical farm requires a lot of labor. Automation can proficiently moderate the amount of manual labor, and make farming easier and faster, leading to more industry growth. The concept of automation is extended to the cattle farms and farm houses. In this project automatic feeding, watering and animal waste disposing system was implemented for the farmyard. In a context characterized by the need for maintaining high production standards and of decreasing the costs, the adoption of automated systems for the food and watering unit can represent a valid solution, especially in specialized farms.

Keywords: Automation, Energy Efficient, Farm House, Feeding, Tedious.

INTRODUCTION

Automation is the use of mechanical and electronic equipment to reduce the need for human. Application of automatic technologies is a growing trend in the livestock industry and plays an important role in the future prospects. The automatic systems most commonly used in animal production concern the various objectives which include automatic feeding, watering and waste cleaning.India, well known as oyster of the global dairy industry accounting to 132 million tons (MT) of milk production is a major contributor to the total livestock output value to gross domestic product (GDP). By 2022 demand is expected to be 200 MT, due to this rapid increase in demand for dairy and its products and increasing urbanization.

So the dairying has taken a new turn by venturing itself on commercial basis leading to the growth of milk-production activities in and around urban areas. The success of dairying as a form of business depends on profitable milk production which is influenced by various input variables and their judicious use. Though dairy is being effectively practiced, the information on cost and incomes from milk production and productivity of different factors is scanty, which is most important from producer point of view who under takes dairying as a new enterprise.

The domestic production could be increased in terms of quantity and quality with adoption of Automated Dairy Farming Practices. In modern society consumer concern about methods of food production include food safety. The output of dairy and dairy products from India is increasing day by day in their international market. Considering its economic potential, extensive and intensive exploitation of milk can both contribute to the nutrient requirements of the Indian people and increase the income of farmer by introducing automation.

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EXISTING SYSTEM

The duties of a farmer may include feeding, administering medication, maintaining facilities, monitoring the herd for signs of illness, assisting with calving, performing artificial insemination, and managing waste. Farm managers must be able to schedule employee shifts, address employee concerns, and oversee the day to day activities on the farm. As is the case with many livestock careers, a cattle farmer may work long hours. It is not uncommon for cattle farmers to work weekend, evening, or holiday shifts. AschalewAssefa, MaledeBirhan, YalewDemoz and ShewangzawAddisu [1] investigate non-conventional livestock feed resources and their utilization practice in north Gondar. From this study, it can be concluded that conventional feed resources like grazing pasture was low due to land shortage and the utilization practice to improve the feeding value of nonconventional feeds was poor. This paper focus on overcoming these disadvantages by implementing automation in farmyard.

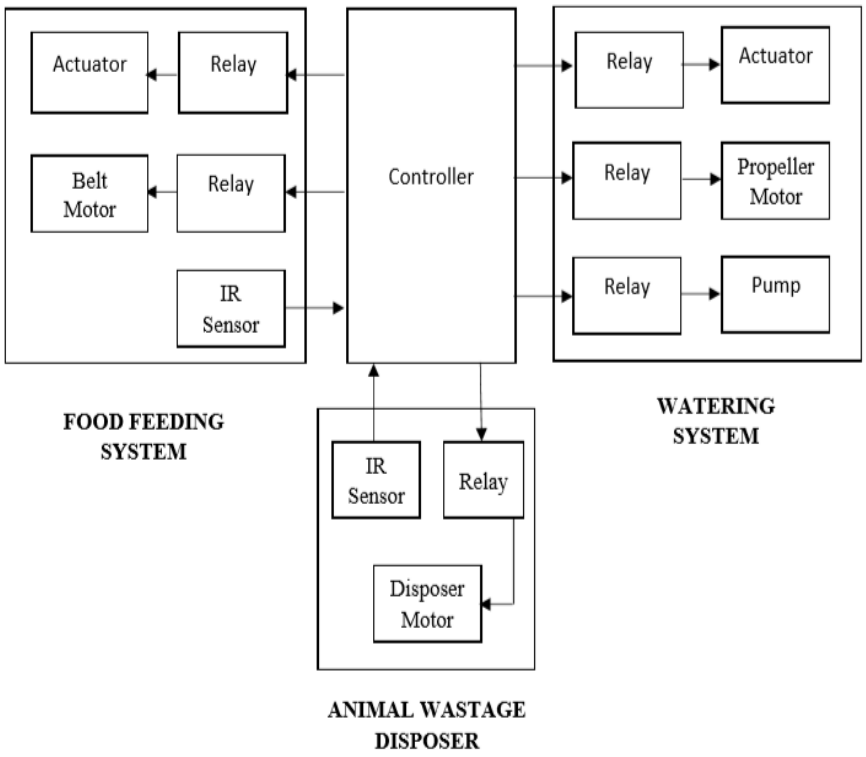

Fig 1.Block Diagram of Proposed System

METHODS AND MATERIALS

The main objectives of this proposed work are,

- To design automated farmyard for cattle.
- To increase production by reducing manpower and production cost.
- To ensure hygienic production

The block diagram of this paper shown in Figure 1.This method propose an automation process for the farmyard which includes,

- Food feeding system,
- Water feeding system and
- Animal waste disposer.

Food feeding system

A modern approach to individual concentrate allotment uses automatic feeding system that feed cows according to their energy requirements. Automatic food feeding system conveys rations through feed belt to the animals at pre-specified time [2]. A tough and quietly running motor draws the loaded belt into the barn. The software controlling feeding system may also adjust automatically for factors such as milk production and stage of lactation, and may dispense feed at the eating speed of the cattle. The components used in this system are as follows,

Drive system

The PMDC motor is used as driver system for food feeding. The working principle of PMDC motor is when a current carrying conductor comes inside a magnetic field, a mechanical force will be experienced by the conductor and the direction of this force is governed by Fleming's left hand rule. The technical data of PMDC motor is as follows,

- 12V operating voltage
- 55rpm speed
- 2A free running current
- 10A stall torque
- 120W motor power
- 100m shaft diameter

PVC BELT

- Glass fiber reinforced PVC, tear strength 20 t
- Food-safe, resistant to feed acids
- Belt thickness: 2.5 mm
- Belt length: up to 100 m
- Belt width: optional

The PVC belt is used to deliver the food to the livestock.

Actuator

The actuator is a mechanical or electro-mechanical device which is used to offer controlled, positioning and sometimes limited movements which are functioned manually, electrically, or by a variety of fluids like air, hydraulic, etc. its function is to convert the electrical signals from the control unit into an action.

IR sensor

Infrared transmitter is one type of LED which emits infrared rays generally called as IR Transmitter. IR Receiver is used to receive the IR rays transmitted by the IR transmitter. It is used to detect the position of belt.

Controller

Arduino Uno is a microcontroller board based on the ATmega328P is used as controller. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.

- Operating Voltage : 5v
- Input voltage : 7-12v
- 14 Digital Input pins (6 PWM output pins)
- 6analog input pins

Software description

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

Watering system

Automated watering systems can provide water with less variability and deliver the highest quality water to animals [3]. The Watering system consists of following components,

Centrifugal pump

Centrifugal pump is a hydraulic machine which converts mechanical energy into hydraulic energy (i.e. pressure energy) by the use of

centrifugal force acting on the fluid. The technical data centrifugal pump is as follows

- Rated current : 500 mA
- Rated Voltage :12v
- Capacity : 6.5 lit/min

The Centrifugal pump is used to supply the water to the Propeller unit for mixing the water and flour. Actuator is used to supply the flour to propeller unit and DC motor are also used to drive propeller were discussed in the section 3.1.3 and section 3.1.1 of this chapter. The Arduino Uno controls the operation of this system is discussed in section 3.1.5.

ANIMAL WASTE DISPOSER SYSTEM

Animal Waste Disposal system is best suited for walkways of different lengths with different floor coverings. The system can be used on alleys with rubber surfaces or concrete floors. It has following components

Scrapper

V shaped scrapper directing the waste towards the middle of the scrapper. This design promotes waste collection by underground tube rather than by the alley. Built with heavy-duty steel for a long life span.Tube installation with provided concrete forms.

The motor used to drive scrapper is discussed in section3.1.1 of this chapter. Working of Actuator used to detect the scrapper is discussed in section3.1.3 and The Arduino Uno controls the operation of this system is discussed in section3.1.5.

RESULT AND ANALYSIS

The Food Feeding System consists of a feed belt with the drive system. The Storage unit had Actuator is connected to the controller for feeding the ration to cattle. Both the Actuator and drive System to start up at a pre-specified time, thus feed falls on the belt is taken to the cattle and automatically services to the feeding area[4] Before Beginning of each new feeding cycle, the controller automatically left across the belt and residual feed is cleaned by the Scrapper in the Starting position. Here IR sensor is used to detect the Start and ending position of the belt.

Figure 2 and Figure 3 explains the operation of food feeding system. Thus food feeding is ideally suited for coordinated feeding [5]. Feed several groups at the same time production groups, dry cows and mother cows. The feed belt conveys the mixed rations to the respective groups. That ensures calmness and promotes healthy animals. Reduce overall space requirements, since you no longer need room to maneuver tractors, and achieve a higher milk output through flexible feeding [6].

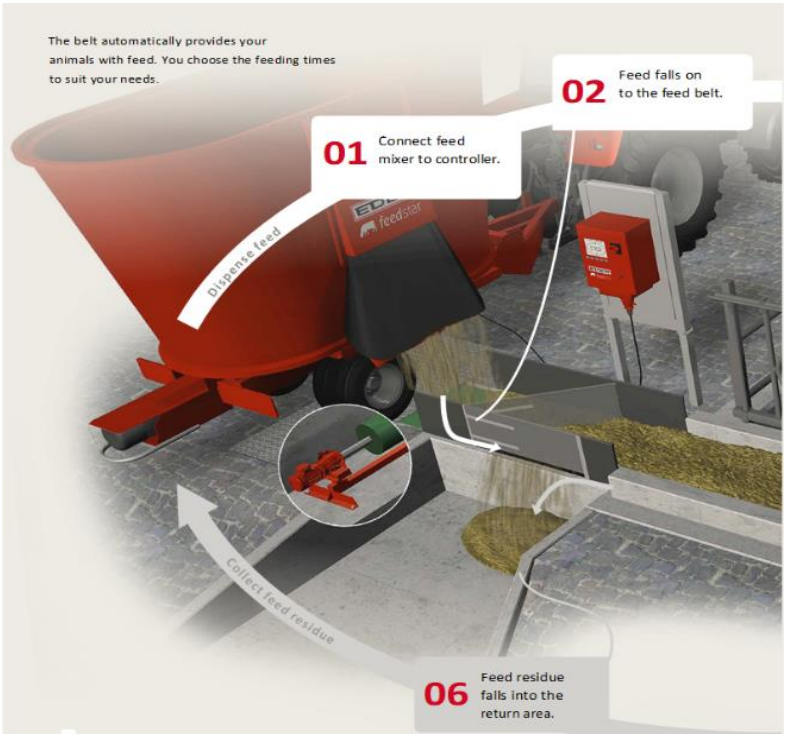

Fig 2. Operation of food feeding system

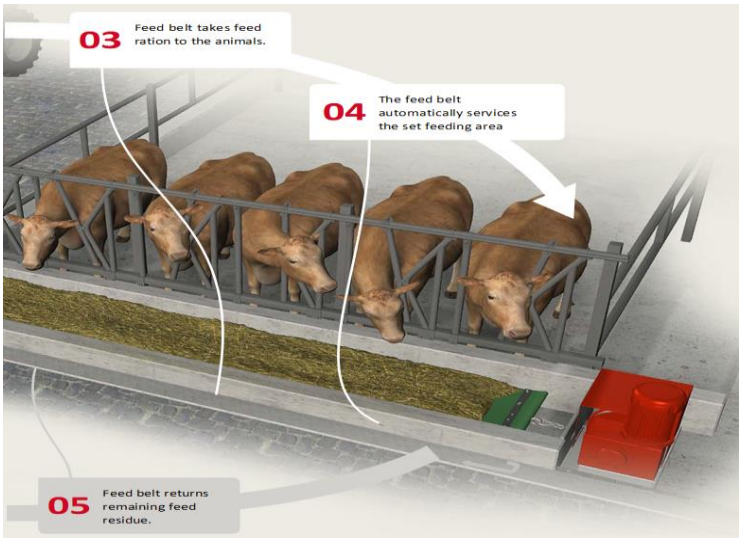

Fig 3. Operation of food feeding system

The Flour and water are supplied to the mixer from storage through actuator and centrifugal pump respectively. Flour and water are mixed in the mixer unit which has a propeller driven by dc motor[7].

The flour mixer is distributed to the individual cattle at a pre-specified time by the controller. Automated watering systems can provide water with less variability and deliver the highest quality water to animals.

The scraper unit assembly is pushed up and down the passage by the channel drive rail, cleaning and scraping the waste out of the passage. The center scraping blades within the assembly float up and down on the passage floor, thus ensuring a better scrape of each passage [8]. The wings float up and down; this gives perfect scraping, even on ramped or uneven parts of passage. The Scrapper is operated at a pre-specified time by the controller.

CONCLUSION

Automation is the use of mechanical and electronic equipment to reduce the need for human labor. It has been used for carrying out various farm operations like automatic feeding, watering and waste disposing in the livestock farms and grazing lands. Positive points are that automation saves time, requires less labor, and improves product quality and FCR, increases production, efficiency, accuracy and safety.

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