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SMART MANAGEMENT SYSTEM FOR COWSHED USING PLC AND SCADA

Dr.K.RENGANATHAN[1], R.S.AKSHAYA[2], H. LAVANYA[3], R. PRITHIGA[4], S.PRIYA[5]

[1] Head of the Department, Department of EIE, Sri Sairam Engineering College, Chennai-44.
[2-4] Student, Department of EIE, Sri Sairam Engineering College, Chennai-44.

Abstract- *The maintenance of herd of cow for commercial purpose is a tedious. The proposed project deals with automated activities related to the cows such as food feeding, water feeding, cleanliness of the shed and fencing protection of the shed. This ends up with a hassle–free monitoring of the cowshed which ultimately aims in reduce the presence of the cowherd all the time at the station. In addition to the above features, the cow waste and auxiliary wastes produced in the entire process is utilized in the production of Gobar gas, which would be stored and leads to the harvesting of bio-electricity generation. These autonomous processes reduce the manual operations by satisfying the on-time needs of cows. This system can be implemented by using PLC and SCADA. Also, it is proposed to automate additional features in the interior of the shed such as monitoring and controlling the temperature, humidity, health monitoring of the cow, etc…*

***Key Words*: PLC, SCADA, Gobar gas generation, Theft protection**

1. INTRODUCTION

The fundamental purpose of this project is to finely utilize the barren land available in either rural areas or city limits. Thus by encouraging the need and ideas for setting up cow farms in even cities. The basic processes like food feeding, water feeding to the cows, cleaning the cow and shed cleaning are all integrated in one platform of automation. In additional to these processes, the theft protection and Gobar gas generation are included. The electricity is obtained by the gobar gas generated. The fencing system could provide the limitation to the theft activities to an extent thereby the machinery and the resources could be safely guarded.

2. EXISTING SYSTEM

- All the activities in the cowshed are being done using Delta PLC of series DVP-SS211R.
- For feeding purpose, there is a silo which contains hay which will drop in small amount on the conveyor through which the feeding is done. The heads of the cows are free so they can easily take their meal; the frequency of feeding is thrice a day.
- In case of drinking, there is trough in which water is filled automatically and the water level is also controlled.
- In this system there is a wiper at the surface of the ground which slides from one side to another side cleaning all dung or the waste from the cows and collects it at the other end. This assembly is driven with the help of screw rod.
- For the fire safety there is a sensor which continuously detects whether there is fire or not, if the sensors sense the fire then it will turn on the alarm and the motor will be turned on and the sprinklers will spray the water which will extinguish fire as well and gates of the cowshed is opened automatically for escaping the cows from the shed.

3. PROPOSED SYSTEM

The proposed system comprises of food feeding, water feeding, shed cleaning, cow cleaning, fencing and method of electricity generation processes. These following systems are explained individually as follows:

3.1 FEEDING SYSTEM

The feeding system comprises of the feeder tank, conveyer driven by the piston and compressor set up, residual collector, wiper. The food is released on the conveyer belt until the belt reaches the end limit point. Then the conveyer halts for a defined time delay, and the wiper is activated to push the grass into the compartment. The wiper is further activated by the pressure from compressor to the piston. Then e pressure is released and the wiper returns back.

3.2WATER SYSTEM

Considering the water feeding, the compartments are provided individually with a water tub which fills to the desired level by regulating the water outlet from the main tank by control valves fitted in the pipe leading to the each water tub. The lower level reach in the tub is sensed and automatically regulates the corresponding tank valve to turn on.

3.3 SHED CLEANING SYSTEM

In this process the residues of food to cow and dung is collected in the compartment area and backed up as the bio waste. This is done by wiper action along the floor. The wiper is activated forward by pressure from compressor and it returns back when the pressure is released.

3.4 COW CLEANING SYSTEM

Here in this system, the presence of cow is checked at the place of clean initially. Once the presence is detected the brushes on either side starts to rotate and little quantity of water is sprinkled. By this process the cow is tidy. And the brushes stop, after a time delay. The above process is shown in Fig.1.

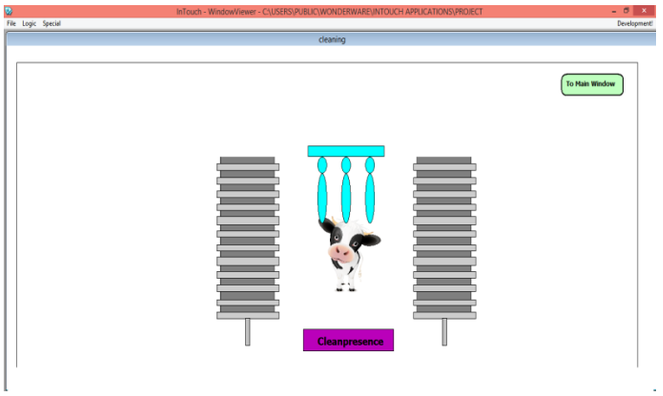

Fig.1 Cow cleaning process SCADA simulation

3.5 FENCING SYSTEM

This system comprises of the compound wall raised with tall pillars(required heights) equally spaced. In which the human intervention sensors are implanted. These sensors detect the theft activities and the alarm is raised.

3.6 GOBAR GAS GENERATION & ELECTRICITY

The bio wastes collected from cow shed compartments are directed to the bio pit. On gradual accumulation of the matters the gobar gas is obtained and it is used to generate the electricity. This could be directed to be used for the internal purposes to manage the shed there by attaining the efficiency. The above process is shown in Fig.2.

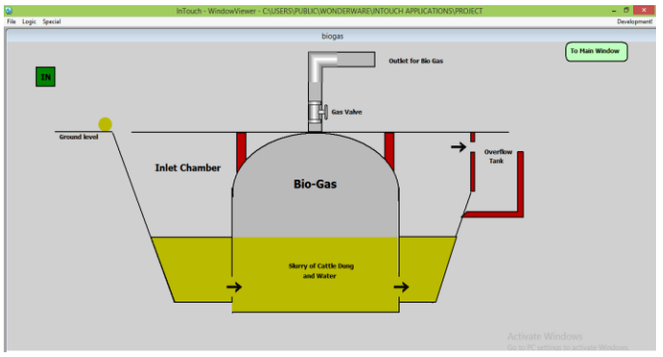

Fig.2 Bio-waste accumulation

4. FUTURE SCOPE

The proposed system could extended by including additional features in the future. The features are:

4.1 ADDITIONAL FEATURES

- The solar based power system could be implemented to meet the needs of the management of the cow shed. Thereby increasing the efficiency of management process.
- The smart over shed of the cow farm could be atomized by sensing the temperature and humidity of the place using sensors. Then the open and close of the over shed be defined based on the threshold values.

It could also be operated in manual mode by disabling the sensors and command is passed by bypass (manual) switch.

- The feeding of food to each cow is analyzed and it is to be processed such that every cow is provided the required quantity of food thereby eliminating the wastage on excess food.

5. RESULTS AND DISCUSSION

The obtained results are shown using SCADA simulation.

SCADA SIMULATION

SCADA Simulation is done here using *Wonderware Intouch* software. Usage of SCADA promotes controlling and monitoring from remote places. The main window displays the compartments present in the shed along with its individual features such as inner tank, whose low and high level are indicated using blink; wiper whose vertical to and fro movement is shown; exhaust fan which turns on when the threshold temperature is reached; PIR sensor, to indicate presence of cow in the compartment. A conveyor along with wiper is shown which is used to push the grass inside the compartment. Empty feeder is indicated by an alarm, which has to be acknowledged manually after re-filling the feeder. High and low level of main tank are also indicated using blink. The above mentioned processes are shown in the following Fig.3.

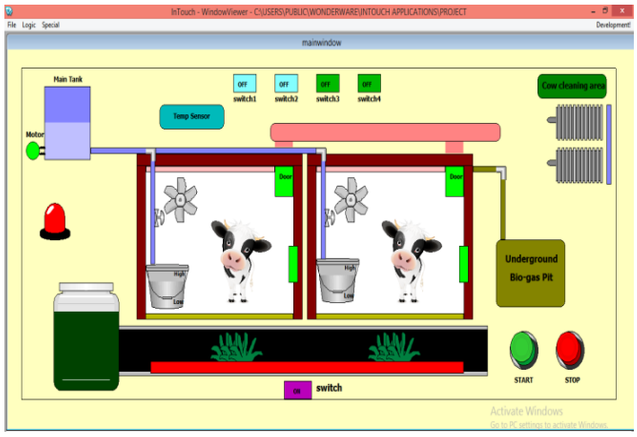

Fig. 3 Main window view

6. PROTOTYPE

The set up of the prototype is constructed by erecting two compartments with attached doors at the back provisioned for cows to exit which would open and close based on the stepper motor. PIR sensors are implanted to check on the presence of cows and the compartments each are provided with small container placed elevated from the ground which gets filled with water from the tubes connecting to the main tank. The set up is shown in Fig.4.

Fig. 4 Setup of compartment

The presence of cow is indicated by the sensor which directs towards initiating of processes. At instance a conveyor is placed at a safer distance from the shed onto which the grass gets filled once motor turns on and conveyor stops having covered the compartments and the wiper pushes the grass into the compartment for easing the feed. The presence indication is shown in the Fig.5.

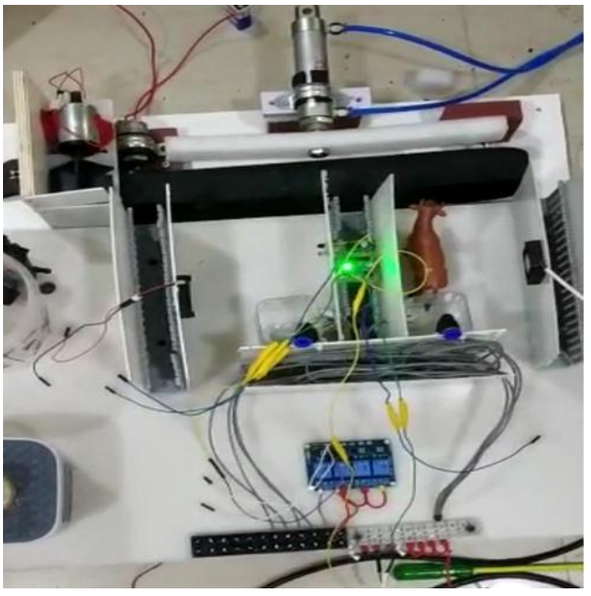

Fig.5 Indication of cow presence

6. CONCLUSION

The approach of this system can be very useful to set up the automized cow farm. Thus all the basic requirements of the cow could be fulfilled automatically, without human intervention. In addition to the existing systems like food feeding, water feeding also the methods are proposed for shed cleaning, cow cleaning, fencing, generating electricity with the gobar gas produced from biomatters.

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