"FULLY AUTOMATED FERTILIZER MIXING SYSTEM"

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***Abstract*— This paper shows the design and execution of an innovative system, titled as "Fully Automated Fertilizer Mixing System" aimed at automating fertilizer mixing process.**

I. INTRODUCTION

Automation is the successful field in today's world and it has become the backbone of control engineering. Automation plays an effrctively important role in the world economy and in daily experience.

The goal is to give plant operators and experts the tools to monitor and control their plant more efficiently. With the rapid development in technology, the more focus is on selection of application oriented Controllers and tools. PLC and DCS are the most efficient and widely used tools in industrial automation. Automation is taking a system or process and making it automatic by eliminating human work as much as possible.. Benefits of Industrial Automation are product produced faster, product produced more consistently, products produced more reliably and decreased labor expenses. Nowadays we are moving towards a world of automation and intelligent systems. This project will be responsible for mixing of the different types of fertilizers and provide the mixture to the required crop. The proportion of the fertilizers is user settable value so that one can change the proportion according to the requirements. The main equipments of this system are PLC, valves and the sensors. The control logic for the proper operation of the system is developed in the PLC using the different programming languages. The idea is to mix the different fertilizers and provide the resultant mixture to the plants/crops.

The user can select or set the amount of proportion of the each fertilizer from three tanks. After the selection all fertilizers will be collected in separate tank and they can get mixed together with the help of the agitator. For the mixing purpose agitator is used and will be driven by the motor. To take out the mixture from the tank we are connecting ON OFF valves in the system. 9 Once the fertilizers gets mixed the resultant mixture is provides to the crops with help of ON OFF valves.

The Level Sensor is used at each tank to continuously sense and measure the level present in the tanks. The level of each tank will be displayed to the user so that they can take appropriate actions. In this project we are also designing the User Interface for the users. For this purpose we are using the Supervisory Control And Data Acquisition (SCADA).

The user can use the SCADA screen for monitoring and controlling purpose. All the necessary alarms and information is provided on this user interface. This screen will be containing the complete process of the project. PLC works as industrial computer, which decreases man power and enhance the productivity with less time and cost. The purpose of this system is to enhance productivity, in preparation of chemical mixing, with less time and to reduce the efforts of the workers in material handling.

II. LITERATURE SURVEY

[1] L. Luo and B. Liu, "Research on PLC-Based Control System for Mixing," 2020 International Conference on E-Product E-Service and E-Entertainment, Henan, China, 2020, pp. 1-3, doi: 10.1109/ICEEE.2020.5661377.

[2] M. Sreejeth and S. Chouhan, "PLC based automated liquid mixing and bottle filling system," 2019 IEEE 1st International Conference on Power Electronics, Intelligent Control and Energy Systems (ICPEICES), Delhi, India, 2019, pp. 1-5, doi: 10.1109/ICPEICES.2019.7853685.

[3] M. Sreejeth and S. Chouhan, "PLC based automated liquid mixing and bottle filling system," 2019 IEEE 1st International Conference on Power Electronics, Intelligent Control and Energy Systems (ICPEICES), Delhi, India, 2019, pp. 1-5, doi: 10.1109/ICPEICES.2019.7853685.

[4] C. Joseph, I. Thirunavuakkarasu, A. Bhaskar, and A. Penujuru, "Automated fertigation system for efficient utilization of fertilizer and water," in 2019 9th International Conference on Information Technology and Electrical Engineering (ICITEE), 2019, pp. 1-6.

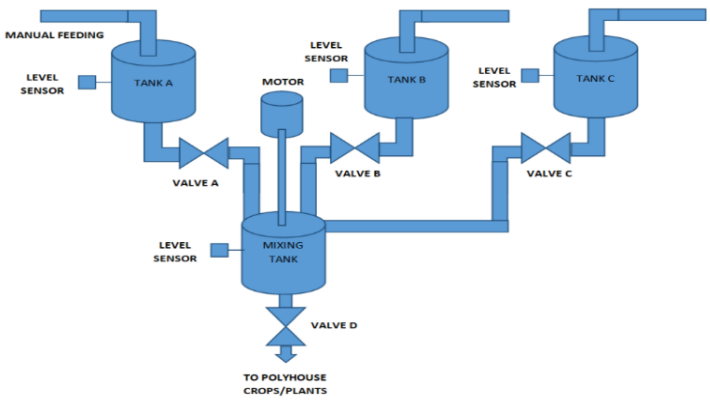
[5] A. Y. Kachor and K. Ghodinde, "Design of microcontroller based agribot for fertigation and plantation," 2019 International Conference on Intelligent Computing and Control Systems (ICCS), Madurai, India, 2019, pp. 1215-1219, doi: 10.1109/ICCS45141.2019.9065768.

[6] L. Schiop and M. Gaiceanu, "Mathematical modelling of color mixing process and PLC control implementation by using human machine interface," 2018 3rd International Symposium on Electrical and Electronics Engineering (ISEEE), Galati, Romania, 2018, pp. 165-170, doi: 10.1109/ISEEE.2018.5628522.

III. METHODOLOGY

The proposed system is mainly to automate the mixing of the different types of fertilizers and monitoring the complete process on the Supervisory Control and Data Acquisition (SCADA). The MicroLogix 1400 is the main part of the project which acts as a brain of the project. The PLC will control all the logic and give all necessary commands to the motor and valves. We will monitor and control the overall process on SCADA..

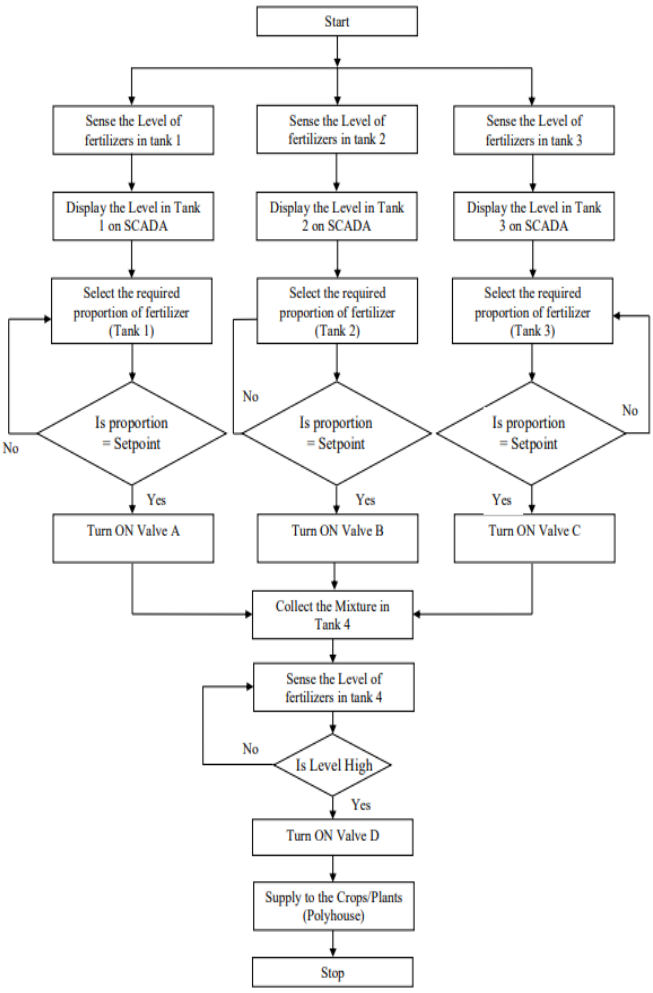
At the initial stage 3 tanks are manually filled with fertilizers as per requirement .Level sensor detects the level of the tanks and displays it. Three valve are connected to the mixing tank. The mixing tank is responsible for mixing all the fertilizers together and it is largest tank than other tanks. The mixing is done with the help of agitator. The resultant fertilizer is then provided to the polyhouse.



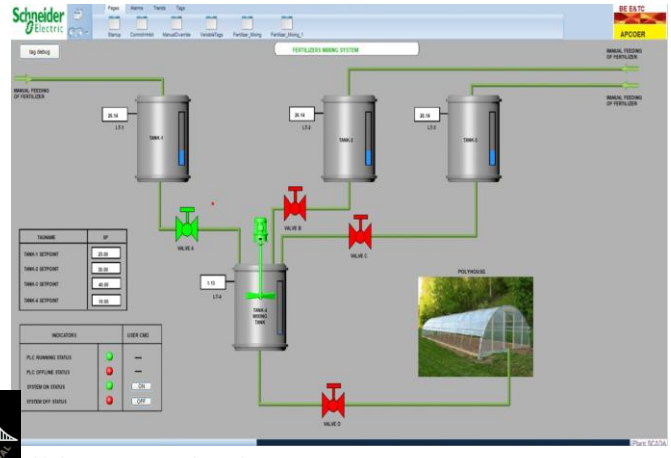
Hardware Mechanical Design

The system consist of 4 tanks namely tank ‘1’, tank ‘2’, tank ‘3’ and tank ‘4’. Each tank has its own ON OFF valves namely valve ‘A’, valve ‘B’, Valve ‘C’ and valve ‘D’. A manual feeding of fertilizer is required at level 1 tank. Once all the three tanks at level 1 are filled with fertilizer thier level sensors will sense the amount of fertilizer present in the tank. Tank 4 is also known as mixing tank it has motor connected to agitator into it for mixing purpose. Once all the fertilizers get mixed in mixing tank the resultant mixture is provided to crops or plants in the Polyhouse. TABLE I Standard table for degree of arrow and corresponding wind direction

FLOWCHART



IV. RESULT



V. CONCLUSION

In this project we have developed a system which will automatically mix the different types of fertilizers Also we have developed a user Interface screen for monitoring and controlling of the process with help of supervisory control and data acquisition system. The system is able to mix different types of fertilizers automatically and the produced mixture is collected separately and provided to the crops/plants at Polyhouse. We have successfully developed and tested the Fully Automated Fertilizer Mixing System project

VI. FUTURE SCOPE

Looking ahead, the project has potential for future advancements in the field of agriculture technology.

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