

Juice Flow Stabilization Using PLC and Simulating With SCADA

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Abstract— For the recent years, the manufacturing industries have been growing rapidly due to large demand for the quality product. This needs a huge production rate and also maintenance of quality. Automation provides an efficient way for manufacturing and quality control. Automation is accomplished with the help of different hardware and software like Distributed Control System(DCS),PLC, Supervisory Control And Data Acquisition (SCADA), Human Machine Interface(HMI),Microcontroller (uC) etc. This project gives a mean for stabilized juice flow in sugar industry using PLC. It also provides an easy to use visual interface to control the action with help of SCADA. Juice flow stabilization system is necessary due to fluctuations of juice intakes and the volumes handled by raw juice tanks.

Index Terms—DCS, PLC, SCADA, HMI.

I. INTRODUCTION

THOUGH the PLC Based Juice Flow Stabilization System maintain uniform and steady flow of sugar cane juice to the clarification house. The juice flow rate is supervise by electromagnetic flow meter / mass-flow meter and the same is keep stable by either of the following two methods.

- By automated control the bypass valve fixed at juice receiving tank pump delivery
- By automated control the speed of pump using variable frequency drive

The system also supervise the level in juice receiving tank. During high levels cane crusher is tripped. Likewise at low levels, the set point is auto decremented. By-pass valve is totally open (or pump is tripped in case of variable frequency AC Drive) during low levels to prevent dry running of pump. Juice Flow Stabilization helps in improving the filtration house capacity by way of avoiding change in Pumping speed. Because of Uniform Juice flow, the dosing of different chemicals and heating of juice will be very effective

FEATURES:

- Uniform and stabilized juice flow to the system ensures uniform juice heating.
- Ensures better sulphitation by reducing variations in Sulphited juice.
- Improves juice clarification.
- Better mud settling.

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- Improves the efficiency of RAW juice pump.
- smooth and constant the Boiling house process. This project will overcome all the problems associated with the previous system.

II. EXISTING SYSTEM

The system which is existing currently has some consequences such as level signal is not used for control purpose where overflow of juice storage tank may occur. In this system, flow meter gives input to the VFD and ultimately it will drive the pump. This driving speed of the pump is directly proportional to the reading given by the flow meter 4 to 20mA signal is scaled in the range of 0 to 100 percent. If signal coming from flow meter is 4mA then no change in supply providing to the motor and if the signal is 20mA then full supply is given to the motor hence juice will be pumped more efficiently.

III. PROPOSED SYSTEM

A. DESIGN OF SYSTEM

The proposed system consists of valves and transmitters connected to the system. The transmitters output will be fed to the PLC which accordingly give the signal to the final control element. The actual state of the system will be visualized on the SCADA.

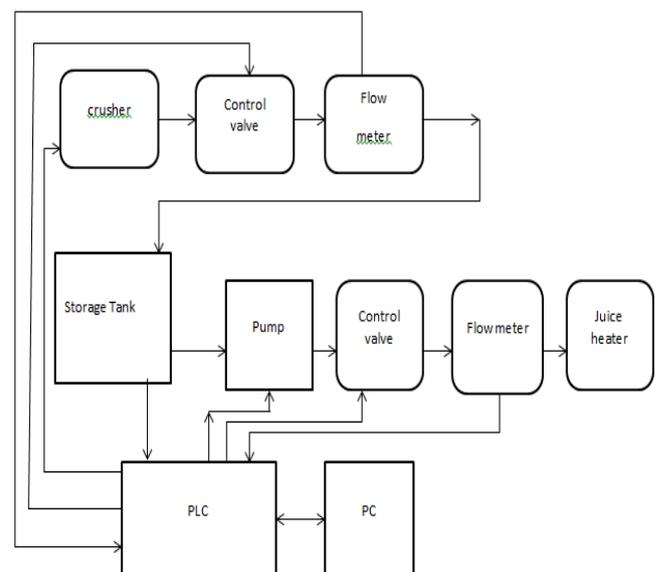


Fig. 1. Block Diagram

1) Flow Transmitters (FT)::

The flow is measure using mass flow meter flow meter manufactured by Forbes Marshall. In this, flow is directly proportional to the velocity of the fluid. Thus the electromagnetic flow meter measures the velocity of the fluid

which in turn is directly proportional to flow. We are using mass flow meter because of good accuracy and it gives precise output

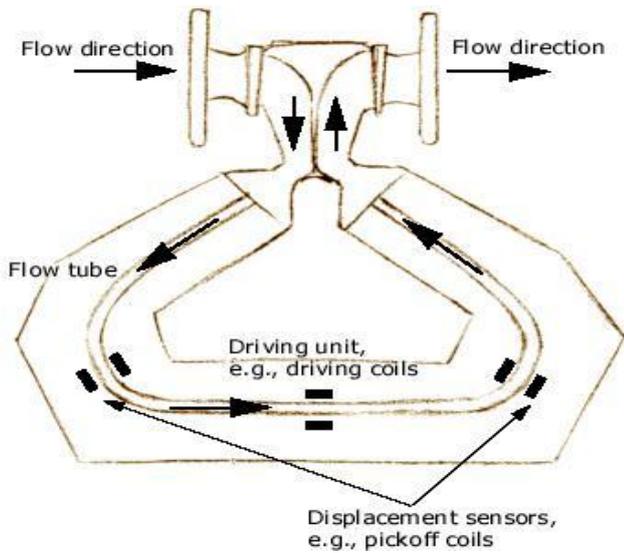


Fig. 2. Mass-Flow-Meter

2) Level Transmitter::

The Level transmitter used is Differential pressure (DP) cell manufactured by ELECTROMAGNET EQUIPMENT. This DP cell works on the principle of pressure difference on either side of transmitter and thus the Level of the storage tank is measured. By using level of juice in the tank we can measure the quantity of liquid present in the tank by using the formula for a cylindrical tank that is $\pi r^2 h$.

3) PLC::

The main function of the synchronization is Carried out by PLC. The PLC accepts the input from the FT and compares it with the benchmarks already fed into the PLC. The error between the actual reading and the benchmark will modulate the final control element to reduce this error to zero. The PLC will function according to the logic or program fed into it by the user. The PLC will generate a database for analyzing the problems.

4) Control Valves:

The control valves are the final control element. The actual change is carried out by using valve. The signal from the PLC is given to the valve and the valve accordingly takes position to change the flow. The final finishing control element of the system is control valve with linear characteristic and having neumatic controlled actuators. The input to the control valve is given from the PLC. Now the pneumatic actuator are driven by compress airflow of air is control by PLC with the help of I-to-P converter . According to the ladder program the valve will throttle and allow the juice to flow. And also the valve used is of air-fail-to-open type as if any error or problem occurs then the valve should immediately Open to protect the boiling section from excessive heating

5) SCADA::

The SCADA is used for real time monitoring. The actual system is display on the SCADA. This helps in easy supervise and control of the process by the executives and operators and then analysis.

B. WORKING OF PROJECT

The juice from the crushing unit will collect and store in the juice storage tank after the immibition system. The Level Transmitter is installed on the juice storage tank. The tank should be filled according to the respective higher and lower level limit and Level transmitter give this signal to the PLC. And motor Pump the juice from the tank to the boiling house the flow of this juice is measure by the flow meter and this signal is fed to the PLC. According the error between set point and measure signal control valve is open or close and stabilize flow of juice is transfer to the further processing These are the problems in synchronizing the flow signal and level signal in real time .This synchronization is to be achieved through PLC. The main valve and transmitters are connected to the PLC and SCADA. The SCADA will give the visual appearance on the PC at the main server station. So the main valve will be controlled through PLC. The PLC program will automatically modulate the main valve as required. The transmitters will send the respective readings to the server through PLC. And the PLC will generate a database consisting the flow and level readings at various instants. This will be beneficial for analyzing the problems associate with the synchronization

C. FLOW CHART

This flow chart gives the Logic for the programming purpose

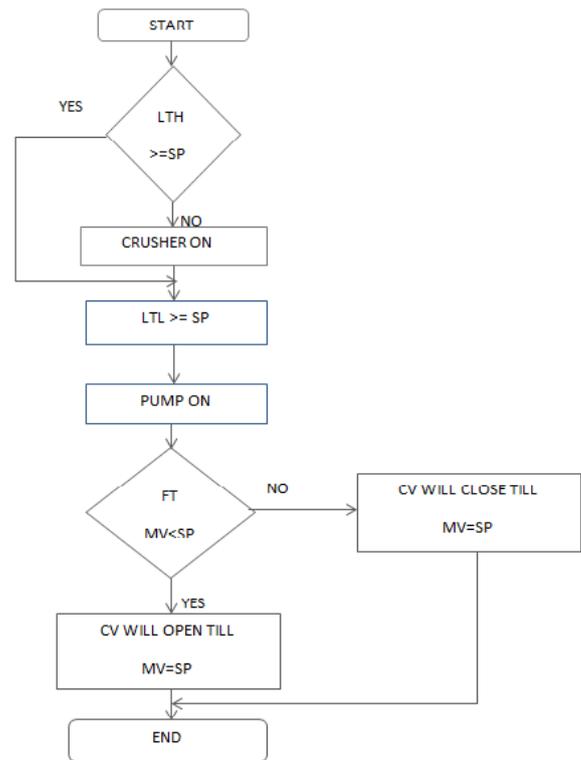


Fig. 3. Flow chart

IV. CONCLUSION

This project will improve Uniform and stabilized juice flow to the process ensures uniform raw juice heating & Smooth operation of boiling house process. Ensures better

sulphitation by reducing fluctuations in sulphited juice
.Improves juice clarification. The database created will help
us to analyze the operation of the process which will help us
for letter improvement in the process

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