
Automatic Cane Feeding and Mill Speed Indication in Sugar Plant

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ABSTRACT

In order to help the management with continuous productivity we have decided to introduce automatic cane feeding and speed indication in the existing sugar mill. At present they are using microcontroller based speed correcting system. With the emerging Programming Logic Controller (PLC) technique it is possible to install switch to indicate the speed. In our project we proposed that, when the load is given and it automatically indicates speed of the process. And it is done by using Programmable Logic Controller (PLC) and monitored by means of Supervisory Control and Data Acquisition System (SCADA) application software. This helps to reduce man power. The time consumption for the operations to happen is high in case of manual operation.

KEYWORDS: PLC, SCADA, Switch.

1. INTRODUCTION

It is highly mandatory, inevitable and important to control the process in all the process industries which cannot be done by human beings all times. Hence we developed a centralized control system which continuously monitors the process. This project shows the automatic cane feeding with the load and indication of speed that occurs in the process.

The process of cane feeding and mill speed indication is done using PLC. From this process, it is made effectively to reduce error, to reduce man power and to reduce time. And the load is determined using PLC which results as advanced techniques in sugar industries.

2. PROBLEMS FACING IN SUGAR INDUSTRY

It is impossible for human beings to access the process by staying near the plant. It is highly necessary for the operators to present near the process and monitor its performance and make required changes to improve its efficiency. As a cane is fed in a manual process it slows down the entire process when it comes to the next level. This process failure can cause complexity to the entire plant.

3. SOLUTION FOR THE PROBLEM

By developing the automatic application software the major problems faced by industry can be eliminated and provide a better solution for the process. The project has been developed for the automatic load and speed indication in Sakthi Sugars Limited, Appakudal, Bhavani. The entire process are depicted in the form of block diagram. The block diagram that represented below describes about the process of cane feeding and mill speed indication. The overall block diagram of is shown in Fig.3.1

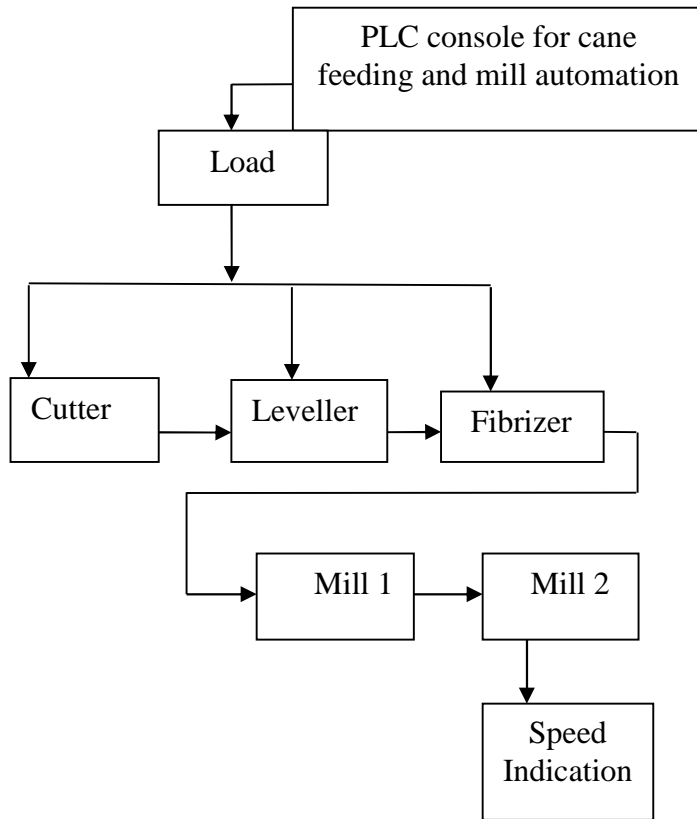


Fig. 3.1.Preparatory Devices Section

This preparatory devices section diagram describes about the cane feeding process in the sugar industry

3.1.Cutter

There are several methods to choose from when cutting sugarcanes, each with their own set of advantages and disadvantages. The process of cutting canes must be done with care to ensure optimal quality of the cane’s sugar content. This process is done in sugar industry by a machine called cutter. Fig.3.2 denotes the Cutter in the sugar industry



Fig 3.2 Chopper

Utilizing machinery to cut sugar canes sometimes means accepting losses to soil compaction and a decrease in the quality of the sugarcane. Dirt tends to associate itself more with machinery, affecting every process of sugar production, from the fields, to the grindings, to the final product.

3.2. Leveller

When the sugarcane pieces are fed into the leveller, the leveller takes the sugarcane in such a way that the machine can level according to its manner. Leveller also places a major role in the sugar industry for the manufacture of sugar. The precision makes self sharpening hard faced knives are made out of special alloy steel.

The leveller which is used in sugar industry for making sugar is shown below. Fig.3.3 shows the Leveller used in the sugar industry.

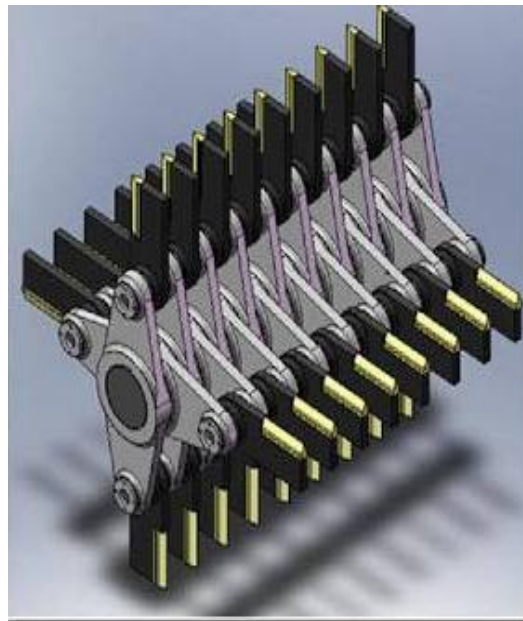


Fig 3.3 Leveller

Further treated to enhance the working properties are fitted to leveller, for chopping the large stalk of sugarcane into small pieces before the fibrizer.

3.3. Fibrizer

Dual performance of cutting and shredding of the fibrizer rotor enables the unit to consume less power and prepares the cane to its maximum level. Swing hammer type fibrizer is used in preparation and excellent in operation for in sugar industry.

All the unwanted dust particles are filtered using a process that is called fibrizer. Fig.3.4 shows the representation of Fibrizer in sugar industry.



Fig 3.4 Fibrizer

In this fibrizer hammers are pivoted to hubs and hubs are mounting on shaft which will rotate on high speed, this hole assembly is covered by means of hose. Dual performance of cutting and shredding of the fibrizer rotor enables the unit to consume less power and prepares the cane to its maximum level.

In sugarcane industry fibrizer is in main role to cane preparation after a process of levelling of cane. These hammers are fitted to the fibrizer or unigrator and are used for cane preparation. Preparation index is depended on power, grid plates, front wall etc... this is helpful with modifications in so that preparation index is increased also it is easy in working, less maintenance, less power consumption and cost reduction machine.

4. PROGRAMMABLE LOGIC CONTROLLER

Programmable Logic Controller (PLC) is used in cane feeding and to indicate the speed in automatic process. A Programmable Logic Controller or Programmable computer is a digital computer used for automation of industrial processes. A PLC is an example of a real time system since output results must be produced in response to input conditions within a bounded time, otherwise unintended operation will result.

5. SOFTWARE USED

WPL software which is being used in this project. SCADA plays an important role in the monitoring of the load and speed indication of the process. It is a real time monitoring system which shows the output. SCADA stands for Supervisory Control and Data Acquisition system. As the name indicates, it is not a full control system., but rather focuses on the supervisory level. It is used to monitor and control plant or equipment. The control may be automatic or initiated by operator commands. The Data acquisition is accomplished firstly by the RTU's scanning the field inputs connected to the RTU (it may be also called as PLC 'Programmable Logic Controller'). This is usually at a fast rate. The central host will scan the PTU's (usually at a slower rate). The data is processed to detect alarm conditions, and if an alarm is present, it will be displayed on special alarm lists.

6. SIMULATION RESULT AND HARDWARE DESCRIPTION

6.1 Simulation Result For Mill 1

The cutter, leveller and fibrizer acts as major part in the process of mill 1. The simulation result for mill 1 process is shown in Fig.6.1



Fig.6.1 Process Window of Mill 1

The load is automatically loaded in the cutter, and respectively the speed of the cutter is also indicated automatically in the simulation. And the same process is repeated for the leveller and the fibrizer.

6.2. Simulation Result For Mill 2

The fibrizer crushes the cane and the juice is fed into the crushers. The crushers filters the unwanted dust particles and the extracting juice from the crushers is fed into the collecting tank. The simulation result for mill 2 process is shown in Fig.6.2.

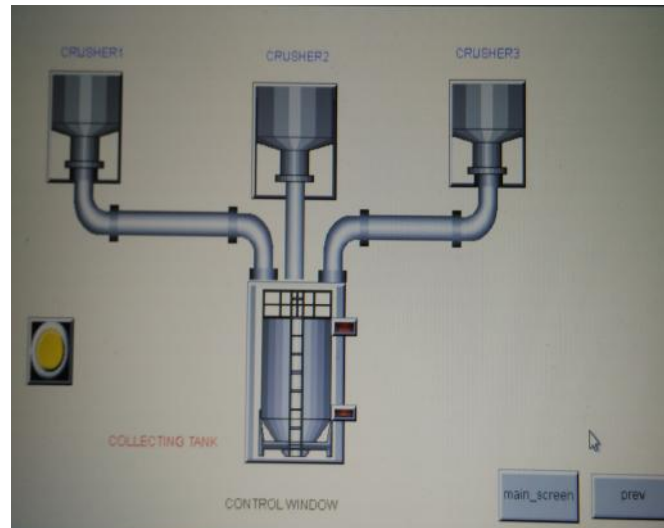


Fig.6.2 Control Window for Mill 2

And after the collecting tank gets filled it automatically indicates that the tank gets filled and the whole process is made to stop. This process can also be used in sugar industry to save time.

6.3. Hardware Setup

Hardware setup includes PLC, SMPS (Single Mode Power Supply), switches, which is connected in series. The hardware setup for this project is shown below in Fig.6.3.

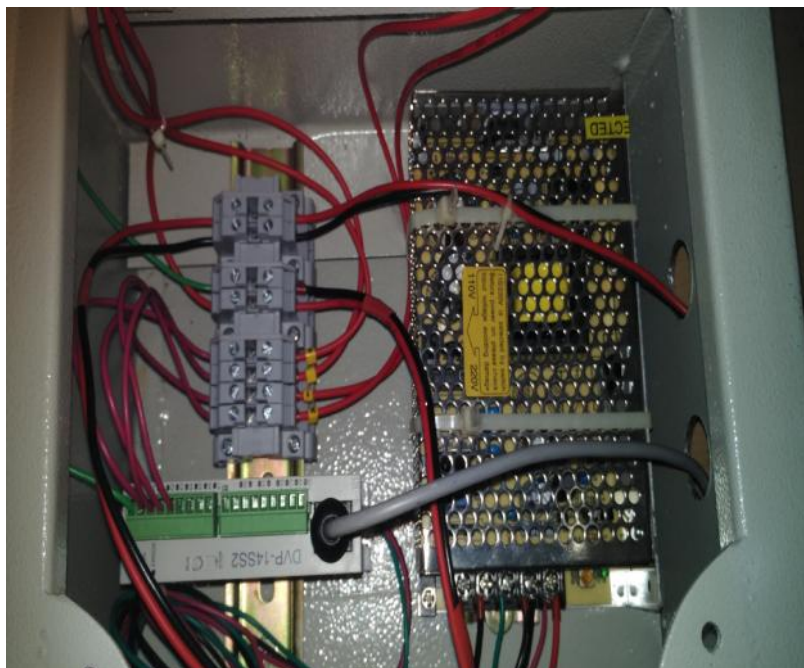


Fig.6.3 Hardware Setup

So this helps in working PLC. It also includes RS232 cable to interface with the computer, which helps to display the simulation results. The switches help to play a major role in ON/OFF condition to indicate load value.

This method can also be practically used in sugar industry, which helps to manage time, reduce man power, accuracy in the simulation results, and error free. The hardware setup is made in such a way that it cannot be replaceable and it is immovable. Hence results are only displayed in a simulation form.

7. CONCLUSION

The results are shown in the WPL software for cane feeding and mill speed indication. Some of the helping software which includes e-Remote, screen editor. All these software play a major role in displaying software. This project is fully automatic and helps the industry in many ways that includes, reduce man power, save time, error less. At present the amount of load fed into the initial process is not determined, whereas in our project we have introduced the loading value to be determined. And the speed of the mill (cutter, leveller, fibrizer) is also determined. The complete project is simple, inexpensive and efficient. Hence this project can also be used in the sugar industry.

8. FUTURE WORK

This project can be expanded further and also has huge applications that can be made. After collecting juice in the collecting tank from the crushers tank the collected juice is also can be drained further. And also the overall mill speed can be detected to know the complete systematic procedure.

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