FINAL YEAR PROJECT REPORT

Sugar Mill Automation using PLC

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Sugar Mill Automation using PLC

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In

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Abstract

Aim of this project is to automate sugar mill using PLC (Programmable Logic Controller) and we have controlled some basic processes of sugar mill with PLC. Basic element of the project is to properly understand the concepts of automated industry.In a traditional Sugar Mill system, all control devices are wired directly to each other according to how the system is supposed to operate. Here human is the main to control the Processes & that passes through large drawbacks such as more wiring work, appears large mechanical faults & difficulties in troubleshooting & repair work .Due to these drawbacks industrial production decreases largely

Theme behind the execution of this project is how the industries controlled all their process automatically make their work more accurate and efficient.

Dedication

The project is dedicated to our Parents, our honorable advisors, especially our worthy Teachers, Friends, and our venerated Institution University of Management and Technology.

Acknowledgements

We express our special thanks to our project advisor**Mr. SaleemAta**for always lifting our moral high and guiding us in the ups and downs, and our parents for being the biggest support always.

The great appreciation goes to the rest of Lab staff also, that helped us from time to time during the project. The whole program really brought us together to appreciate the true values of friendship and respect to each other.

Last but not least we would like to thank all our friends especially those who worked together and were the continuous source of inspiration and encouragement.

We would also like to thank our teachers. Their technical knowledge helped us a lot in finishing this project within the limited time, and to Almighty ALLAH for showering his blessings on us.

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1 Introduction

We are using PLC to control the Sugar mill processes. Programmable Logic Controller (PLC) is a small computer used for automation of real-world processes, such as control of machinery on factory assembly lines. The PLC usually uses a microprocessor. The program can often control complex sequencing and is often written by engineers. The program is stored in battery-backed memory and/or EEPROMs. Unlike general-purpose computers, the PLC is packaged and designed for extended temperature ranges, dirty or dusty conditions, immunity to electrical noise, and is mechanically more rugged and resistant to vibration and impact. By implementing this project we decreases man power, thus increase in production of the industry.

Engineering has evolved over time. In the past humans were the main methods for controlling a system. More recently electricity has been used for control and early electrical control was based on relays. These relays allow power to be switched on and off without a mechanical switch. It is common to use relays to make simple logical control decisions.

The development of low cost computer has brought the most recent revolution, the Programmable Logic Controller (PLC). The advent of the PLC began in the 1970s, and has become the most common choice for manufacturing controls. PLCs have been gaining popularity on the factory floor and will probably remain predominant for some time to come. Most of this is because of the advantages they offer.

- Cost effective for controlling complex systems.
- Flexible and can be reapplied to control other systems quickly and easily.
- Computational abilities allow more sophisticated control.
- Trouble shooting aids make programming easier and reduce downtime.
- Reliable components make these likely to operate for years before failure.

1.1 Purpose

The main purpose of our project is to control the mix items for the preparation of the Product with the help of different valves and sensors. We would also be cleaning bulk Storage so that the next process could take place in a neat and clean environment. In the end we will be monitoring the whole process through the software on the computer.

1.1.1 Problems and Need

The project will control the process of mixing required chemicals in container and the automation of double filter controlled by the PLC. Double filter is used to filter liquid of various solid, fruit juice, sugar juice, milk, and other beverage. It is no need to stop working for cleaning filter net. In Project, turning off and on of LEDs will represent the different stages of the sugar making in the plant; process can also be displayed by software interface

1.1.2 Background

Initially most of the sugar mills were based on manual control .The cost and production time was very large. The huge number of laborers was needed to accomplish the process. An automation system using PLC as the control we can reduce the production cost and time of production.

The needis increasing gradually as the population is increasing day by day. To meet with the needs of the people we have to come up with solution that is more reliable and effectively reduce the production time by spending the process.

(Figure 1.2) This fig shows old sugar mill with filter plant

1.1.3 Benefits of the System:

This automation project will modified bring with it benefits which will maximize profit to make maximum profit by bringing decrease production cost. Some of the benefits that will be achieved after the implementation are as under:

- A time efficient process for cleaning the plant.
- Maximizing pure sucrose yields from the syrup.
- A decrease in labor cost.
- Efficient energy consumption.

1.1.4 Modification in Existing Plant

In existing plants, workers operates plant manually (open and close valve, add chemicals to process). Plants are completely operated by **relay based panels** and **switches**.

By using PLC, we are automating complete process, so in our plant, there will be no need of relay based panels for switching. And **using double tank** in plant, cleaning process of plant will become easier as compared to existing plant , where manufacturing have to stop for cleaning.

1.2 AUTOMATION IN SUGAR INDUSTRY

1.2.1 Industry

The main advantages of automated manufacturing are higher consistency and quality, reduced lead times, simplified production, reduced handling, improved work flow, and increased worker morale when a good implementation of the automation is made.

1.2.2 Automation in sugar industry

As in many other industries factory automation has been promoted heavily in sugar refineries in recent decades. The production process is generally controlled by a central process control system, which directly controls most of the machines and components. Only for certain special machines such as the centrifuges in the sugar

1.3 SUGAR REFINARY

A sugar refinery is a factory which refines raw sugar. Many cane sugar mills produce raw sugar, i.e. sugar with more color and therefore more impurities than the white sugar which is normally consumed in households and used as an ingredient in soft drinks, cookies and so forth. Raw sugar is either processed into white sugar in local refineries or sold to the local industry and consumers or it is exported and further processed in the country of destination.

1.3.1 PLANTING

Sugarcane cuttings are planted in fields by workers or mechanical planters. In order for the cane to grow, the seeds must be planted in well-drained soil. Typical cane soil is made of a mixture of silt, sand, clay particles and organic matter. Canes are spaced at least 4-feet apart and lined in rows and covered with soil. Fertilizers are applied from the time of planting up until the beginning of the ripening period. Cane fields are also routinely weeded to provide for optimum growth of the cane. Depending on the region where the crop is planted, cane seasons last from 8-22 months.

1.3.2 COLLECTING THE HARVEST

Mature canes are gathered by a combination of manual and mechanical methods. Canes are cut at ground level, its leaves are removed and the top is trimmed off by cutting off the last mature joint. Cane is then placed into large piles and picked up, tied, and transported to a sugar factory.

1.3.3 CLEANSING AND GRINDING

Stalks are thoroughly washed and cut when reaching the sugar mill. After the cleaning process, a machine led by a series of rotating knives, shreds the cane into pieces. This is known as "grinding." During grinding, hot water is sprayed on to the sugarcane to dissolve any remaining hard sugar. The smaller pieces of cane are then spread out on a conveyer belt.

1.3.4 JUICING

The shredded pieces of sugarcane travel on the conveyer belt through a series of heavy-duty rollers, which extract juice from the pulp. The pulp that remains or "bagasse" is dried and used as fuel. The raw juice moves on through the mill to be clarified.

1.3.5 CLARIFYING

Carbon dioxide and the milk of a lime are added to the liquid sugar mixture and it is heated to the boiling point, as the process of clarifying begins. As the carbon dioxide travels through the liquid it forms calcium carbonate, which attracts non-sugar debris (fats, gums, and wax) from the juice, and pulls them away from the sugar juice. The juice is then pushed through a series of filters to remove any remaining impurities.

1.3.6 EVAPORIZATION

The clear juice which results from the clarifying process is put under a vacuum, where the juice boils at a low temperature and begins to evaporate. It is heated until it forms into thick, brown syrup.

1.3.7 CRYSTALLIZATION

By evaporating what little water is left in the sugar syrup, crystallization takes place. Inside a sterilized vacuum pan, pulverized sugar is fed into the pan as the liquid evaporates, causing the formation of crystals. The remaining mixture is a thick mass of large crystals, which is sent to a centrifuge to spin and dry the crystals. The dried product is raw sugar, still inedible.

1.3.8 REFINERY

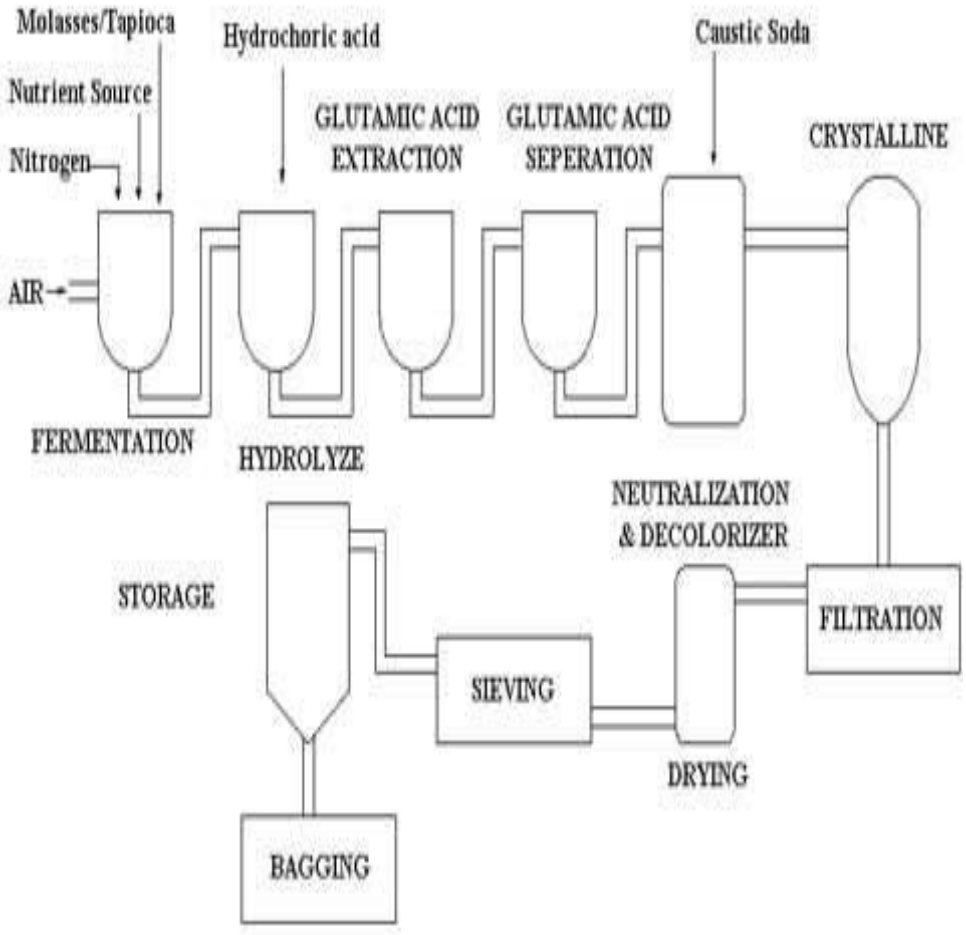
Raw sugar is transported to a Cane Sugar Refinery for the removal molasses, minerals and other non-sugars, which still contaminate the sugar. This is known as the purification process. Raw sugar is mixed with a solution of sugar and water to loosen the molasses from the outside of the raw sugar crystals, producing a thick matter known as "magma." Large machines then spin the magma, which separate the molasses from the crystals. Crystals are promptly washed, dissolved and filtered to remove impurities. The golden syrup which is produced is then sent through filters to remove the color and water. What's left is concentrated, clear syrup, which is again fed into a vacuum pan.

1.3.9 SEPARATION AND PACKAGING

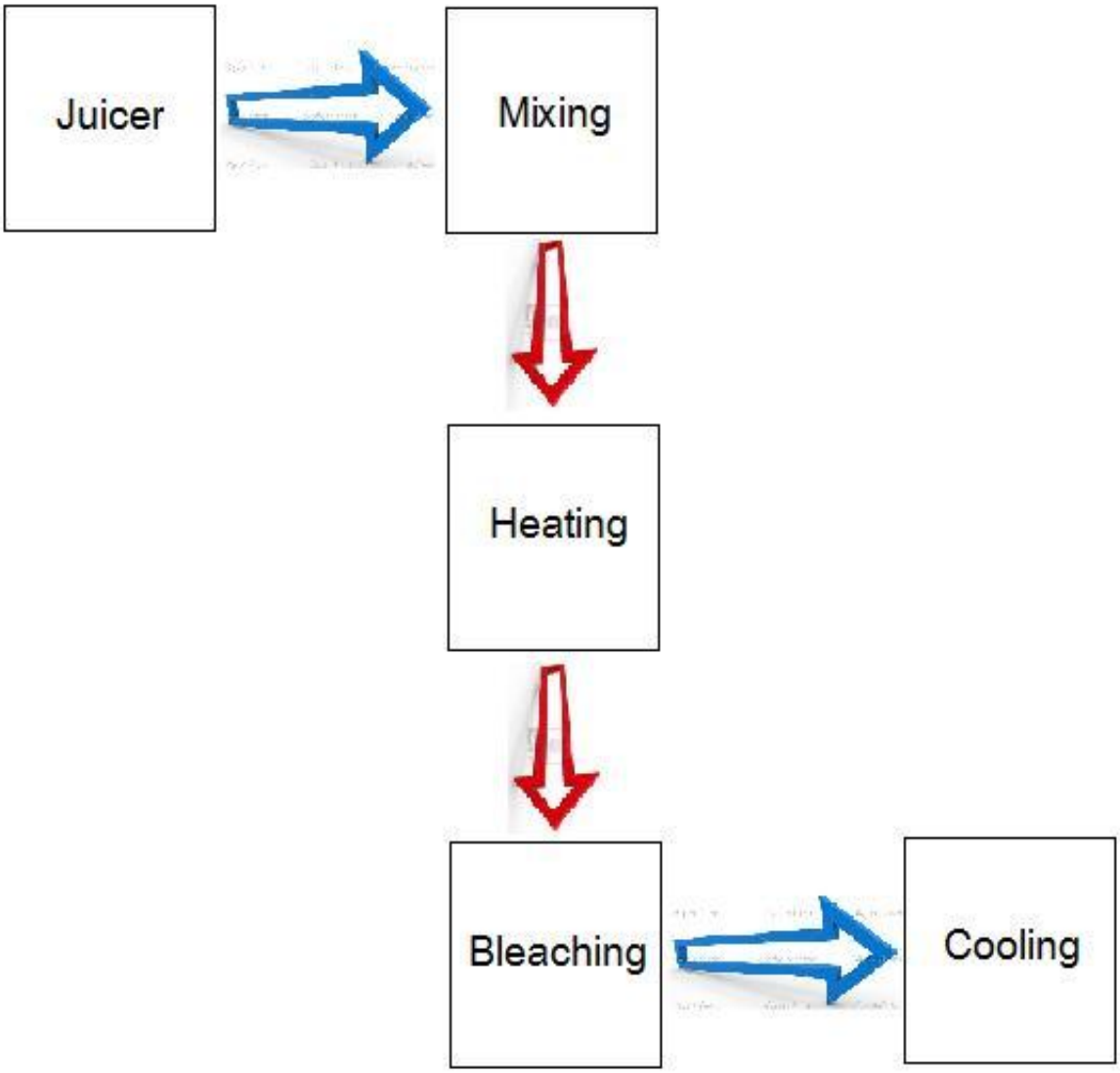
Once the final evaporation and drying process is done, screens separate the different sized sugar crystals. Large and small crystals are packaged and shipped, labeled as white, refined, sugar.

1.4 FACTS ABOUT SUGAR MANUFACTURE

REFINED white sugar is 99.9-percent sucrose. WHITE sugar is pure sucrose, containing no preservatives or additives.



1.5 FLOW DIAGRAM OF OUR PROJECT



1.6 PROJECT BRIEF DESCRIPTION