

Domestic Smart Sugar (JAGGERY) Making Machine using PLC

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Abstract—This paper gives a medium range of a complete jaggery production unit. In order to satisfy the needs of sugarcane cultivators in all aspects with this project. It is the worth mentioning thing for both the cultivators and consumers. Coming to the part of technical area using programmable logic controller it completely process the production from initial stage to final stage. It involves various types of operation in different stages. Through proper coding used in the PLC and also via dedicated pins in the PLC the process is easily coordinate with back to back operation. It is a kind of domestic sugarcane production unit which is used for sugarcane cultivators. It is a simple process, compact and most reliable product. It consume less time. The jaggery powder obtained is completely natural and it does not show any effect towards health. Sugar contains empty calories whereas jaggery contains various minerals and vitamins so it provide energy for longer time.

I. INTRODUCTION

The sugar industry within the world is an important one in so far as it generally encompasses several linkages to the economical and domestic markets in which it operates. The industry is a strategic sector for employment creation throughout the region and it form an important part of agriculture and development policy and the region although there is a progressive more towards these firms. The world sugar market has in the past been highly distorted & EU markets for several least developed countries consider this paper is for important development.

An important feature of global sugar industry is that 70% of world's sugar production is consumed within the country of the origin and the rest is traded. Regional competition can serves a competitive discipline to the large firms in those small economies where markets are concentrated. Their relationship with governments, their control over investments patterns and their market power can affect the pricing and supply of sugar.

So the regional people can face various difficulties in fixing the sugar value. The importance of competition authorities' developmental policy makers to consider and share knowledge about firm behavior at a regional level, which is primary purpose of this study. Recent literature establishes the important link between growth and development and removing constraints to access economic activities and improve the market power.

In addition to that it creates a great effect on people causing diabetes, heart attack, weight gain, cellular aging etc. These are the various problems faced by using the white sugar. In our project "Domestic Smart Sugar

(jaggery) Making Machine Using PLC” the above problems are easily eliminated. The above machine makes the process very simple and making it a compact and reliable product.

These solutions reduce maintenance costs, improve availability and provide very less time for obtaining sugar. In addition to that, it provides a best solution for obtaining sugar naturally without any chemical processes. However, the white sugar manufacturing process takes maximum of three months, but the machine has to be less time consumable.

II. PROPOSED SYSTEM FEATURES

The main features of smart energy meter are listed as follows;

- ❖ Use automated process to take less amount of time to make sugar.
- ❖ The cane is crushed only once which gives the real taste of Cane Juice.
- ❖ By using the natural Sugar, So many diseases are reduced.
- ❖ Total cost is reduced compare to the industry process.
- ❖ It is Two in One method; we get Jaggery and Sugar cane juice.
- ❖ It is a compact size.

III. BLOCK DIAGRAM

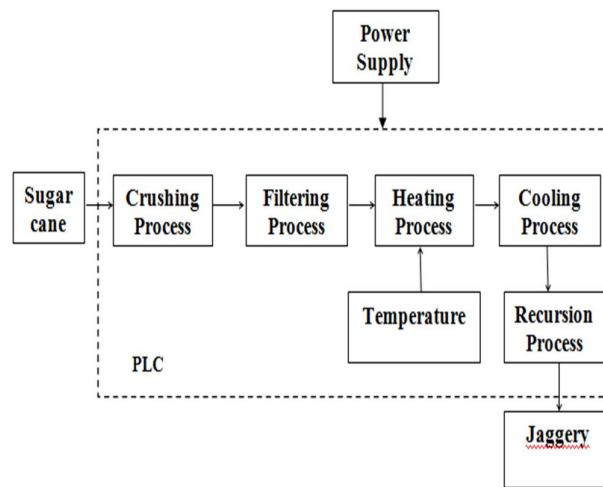


Fig.1.Block diagram of Domestic Smart Sugar Making Machine Using PLC

- ❖ **Crushing:** This process is used to crush the sugarcane to obtain sugar cane juice.
- ❖ **Boiling:** The heating process is done by induction principle. So the juice can be heated under the temperature of 1600 Degree Celsius to produce sticky sugar cane juice.
- ❖ **Filtering:** It can mainly use in this project for filter sticky sugar cane juice drop by drop in flat plate for cooling purpose.
- ❖ **Cooling:** Fan cooling process is used here and it used to cool and freeze the sticky sugar cane juice on the plate for the purpose making jaggery powder.
- ❖ **Recursion:** In this process an Arm can be used in forward and reverse direction to push out the jaggery powder
- ❖ **Output:** The pure jaggery is the final output product. It doesn't contain any chemical product and so it does not cause any effect towards diabetes. It is completely a natural product and has more health benefits.

IV. WIRING DIAGRAM

In this paper, the main component used is Delta PLC which is used for the automatic purpose. In this Delta PLC has 8 input and 8 output among these we use 5 input and 8 output. In Delta PLC the inputs are represented as X0, X1, X2, X3, X4, X5, X6&X7 and the outputs are represented as Y0,Y1,Y2,Y3,Y4,Y5,Y6 & Y7.This PLC is

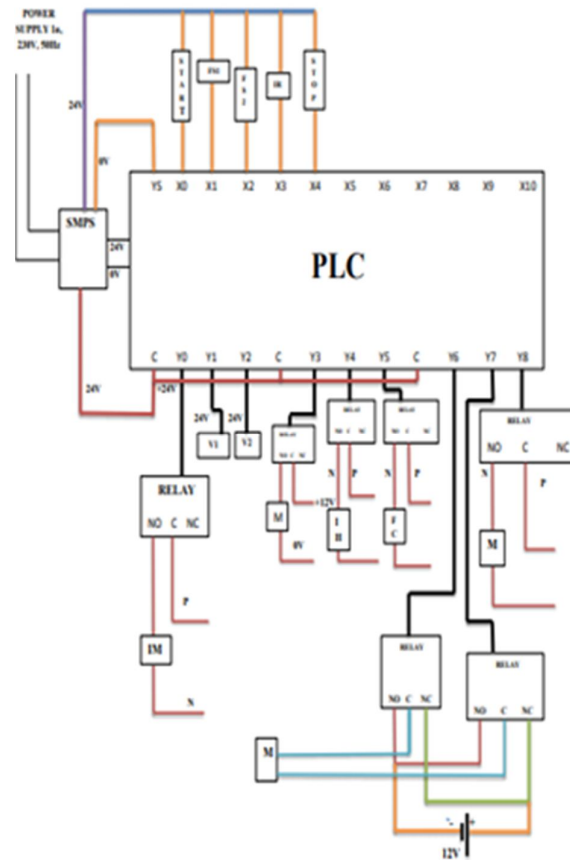


Fig 2.Wiring diagram proposed method

connected with SMPS and for SMPS we give the 230V,50 Hz AC power supply and SMPS gives the output as 24V and it is given to PLC. From this 24V is given to input and input X0 is connected with Starting switch. When the Start switch is ON, then the induction motor is ON which is connected at Y0 through relay circuit because, it can't run at 24V supply. Induction motor requires the 230V supply. If induction motor1 is ON, then the sugarcane inserts in to the machine for crushing process and produces the sugar cane juice. Then juice is poured into the vessel1. In the vessel contain the two float sensor; one is at the bottom (FS1) and another one is at top (FS2). If the liquid is poured into vessel1 first it reaches the bottom float sensor, then the two valves V1 are open. When the Sugar cane juice in the vessel1 is reach the FS2 means Induction motor stop the rotation. At the time Sugar cane can't insert into the machine. Sugar cane juice through the V1 is poured the vessel2 for heating process through the solenoid valve. The induction heating method can be used for heating process. The time limit can be set for the heating process. There is one valve (V3) is attached to the vessel2. After completing the heating process the valve can open for particular time by the Induction motor2 rotation .IM2 connected through the relay from the PLC and it having 230V AC supply. At the time of V3 open condition the heated sugar cane juice in the form of sticky is poured in to the filtering circuit. There is one flat plate placed under the filtering circuit. The sticky sugar cane juice cane can be collected in flat plate drop by drop through the filter. After completing the particular time V3 can be automatically closed. The fan can be attached for cooling process. There is sticky sugar cane juice in plate the fan can be automatically ON for particular period of time limit. The fan can be connected through the relay circuit to the motor. So, it requires 230V supply. Then the sticky juice cooled and freeze is in the form of crystal and fan cooler is OFF. There is one arm is connected for recursion process. That means the arm can move in forward and reverse direction. The arm can move forward direction through relay which is connected with the motor to force crystal out in the form of Jaggery. If all the Jaggery is come out, then the arm is gone back to its own place and then the V3 is open for particular time. The sticky sugar cane juice can be collected in flat plate drop by drop through the filter. This process is repeated. The juice in the

vessel1 is below the FS1 means the motor is automatically start to rotate and insert sugar cane for crushing process. If keep a cup near to valve V2 then the valve V2 is open and the juice is poured into the cup otherwise V2 in closed condition. For that purpose Infrared sensor can be used which is connected with the input X4. Thus this method is Two in One method use extinct get both the sugarcane juice and the jaggery powder.

A. PLC

A programmable Logic controller (PLC) or programmable controller is an industrial digital computer which has been ruggedized and adapted for the control of manufacturing processes, such as assembly lines, or robotic devices, or any activity that requires high reliability control and ease of programming and process fault diagnosis.

PLCs were first developed in the automobile manufacturing industry to provide flexible, ruggedized and easily programmable controllers to replace hard-wired relays, timers and sequencers. Since then, they have been widely adopted as high-reliability automation controllers suitable for harsh environments. Compare with other type of PLC Delta PLC is cost is Low. So, the Delta PLC can be used.

B. DVP Series

Delta's DVP series programmable logic controllers offer high-speed, stable and highly reliable applications in all kinds of industrial automation machines. In addition to fast logic operation, bountiful instructions and multiple function cards, the cost-effective DVP-PLC also supports various communication protocols, connecting Delta's AC motor drive, servo, human machine interface and temperature controller through the industrial network in to a complete "Delta Solution" for all users.



Fig 3. Delta PLC DVP -14SS2

The 2nd generation DVP-SS2 series slim type PLC keeps the basic sequential control functions from the DVP-SS series PLC but with faster execution speed and enhanced real-time monitoring capability.

C. Specifications

- MPU Points: 14(8DI + 6DO)
- MAX.I/O points: 494(14 + 480)
- Program capacity: 8K steps
- COM port: Built-in RS-232 & RS-485 ports, compatible with Modbus ASCII/RTU protocol Can be master or slave.
- High-speed pulse output: Supports 4 points (Y0 ~ Y3) of independent high-speed (max. 10kHz) pulse output
- Supports PID Auto tuning: DVP-SS2 saves parameters automatically after the PID auto temperature tuning is completed.
- Built-in High speed counters

V. EXPERIMENTAL MODEL OF THE PROPOSED SYSTEM



Fig.4.Experimental model of the proposed system

VI. CONCLUSION

Finally the natural sugar (jaggery) can be obtained without any chemical processes. In the commercial purposes, it has to meet the desired requirements for the daily users and also it should be flexible to the consumers regarding to its preparation methodologies. The technology insists to be applied is PROGRAMMABLE LOGIC CONTROLLER. In this project the processes are completely automated. So the system is completely depending upon smart automation. The operating time is nearly about 35 minutes. The user cannot want to wait until the operation completes. It should be very helpful to the agriculture people where they can fix their rate according to their financial resources. The initial and the maintenance cost is considered to be minimum as compared with the cane industry. The machine mainly focuses on the household consumers. The “Domestic Smart Sugar (jaggery) Making Machine Using PLC” takes only less time. The output product obtained is completely natural and they don’t show any effect towards the diabetes. This project is fully based on product development. The flexible market system can be existed in the society while fixing the price of sugar. Therefore the product can be resulted in simple process, compact size and maintenance free.

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