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Automatic Food Processor

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***Abstract:** In the current scenario the advent of automation technology is limited to industrial use only. This proposed system of Automatic food processor based on PLC and SCADA software is designed to cook food automatically as required by the user. This PLC based automated system is already pre-programmed to do the operations and the output is obtained. A HMI interface is available to the user to select the quantity and give their preferences. A water level sensor is placed in the tank which monitors the water level present. The ingredients necessary are added with the help of a linear stepper motor and solenoid valves. PLC is used to control the working of the whole system and SCADA is one of the emerging technologies which is used for complete monitoring.*

***Keywords:** PLC, Solenoid valve, HMI(Human Machine Interface) , Linear stepper motor, Water level sensor, SCADA.*

I. INTRODUCTION

Food is one of the most integral part of our life. The main reason behind the idea of this project is that, most people like their food in a particular way that they try to recreate the same taste every time but it is close to impossible to recreate any dish or drink in the same way it was like before. Machines have proved that it is capable of repeating a process how many ever times without any error in many fields. The project's idea is to create a system in which the recipes will be preprogrammed and stored and is able to execute the recipe perfectly countless number of times without any error. Food processing is a term that consists of various wide aspects inside it. It refers to a lot of things inside the food processing. It includes numerous components, the machines used for processing, and the systems used to prepare, handle, cook and packing of the food. Even though all the components aim at improving in the palatability, consumability and prolonging the quality of the food. A fair number of equipment are aimed at performing the auxiliary functions regarding the food industry.

The proposed system completely automates the food processing system. It uses modern technology such as PLC and SCADA with which the entire process can be completely automated and efficiently managed. There is also a linear stepper motor used which helps in adding larger ingredients to the dish

II. OVERVIEW OF THE SYSTEM

A. *Existing System*

The existing system is primitive in the aspect that all operations are used only industrially. Automatic food processors are not that much involved commercially. Humans are prone to mistakes at some point and are not physically capable of doing the same thing again and again without making any mistakes. There are no methods currently to cook an entire dish automatically.

B. *Proposed System*

The proposed system has the following features:

1) Uses PLC and SCADA hence automating the process completely.
2) No usage of manpower to cook the dish.
3) No limit in the working capacity of the machine as long as sufficient ingredients are available.
4) Constantly producing dishes with utmost finesse and taste is possible.
5) HMI interface allows the user to give his preferences to the system before cooking to match the needs of the person.

The proposed system aims to create a fully automatic device capable of cooking a dish as per the orders received through the HMI. By making the cooking process automatic; the system aims at reducing human made errors in cooking that tends to alter the taste or affects the palette of a person. Also, it is made by a machine the amount of food to be prepared can be huge, the system will be able to perfectly cook all the food with the result being, the taste and quality of the food prepared is same throughout the entire process. For example, if 100 dishes are to be prepared, manually it is not possible to make all the 100 dishes to taste the same, however our system aims to do it by copying the recipe of the dish and storing it as a program. So from the program the system repeats the same thing again and again creating the same dish countless number of times. This will be the result of our proposed system.

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III. COMPONENTS IN THE DESIGN

A. Programmable Logic Controller(PLC)

PLC is an electronic device that accepts the input from the system via sensors and transmitters and then performs the logic stored in its memory space and generates the useful outputs on the required ports to operate the system.

B. SCADA

SCADA (Supervisory Control and Data Acquisition) is a system used to monitor and control field instruments. It provides intelligence in the field equipment which allows us to communicate with SCADA unit. The hardware is configured by WinCC Simatic HMI and the status is displayed on the SCADA screen. We are using Wonderware Intouch in our project.

C. Water Level Sensor

Conductive sensor is used for accurate level sensing of liquids that are conductive in nature such as water and different corrosive liquids. In other words, two differently sized metallic probes of varying length are put inside the tank and is used for detecting the water level present.

D. HMI

Human machine Interface (HMI) allows the user to directly interact with the system and to give out conditions for the system to work on.

E. Solenoid Valve

Solenoid valve is a valve that can be operated electromechanically. It is connected to the output of PLC. It is used to control the flow of water that is entering into the house from the tank. The valve is operated by a PLC controller depending on the predefined program.

Advantages of Solenoid Valve

1) More reliable.
2) Long life.
3) Safety switching.
4) Fast switching.

F. Linear stepper Motor

Electric motor is a type of electrical device which converts the input into Mechanical energy. Similar to most linear motors, a linear stepper motor is typical to the general motor but varies in its variation of the rotary design. It is cut radially and is laid out flat. It is capable of producing high resolution at high speeds.

IV. CONSTRUCTION AND WORKING

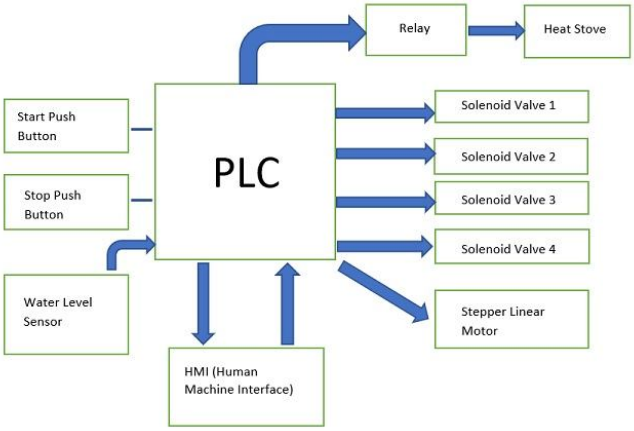


Fig1: Block Diagram

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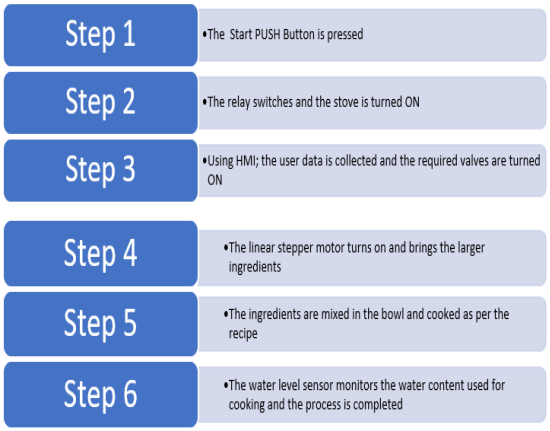


Fig2: Working Flow chart of the system

The above Fig2 show the implementation of the the project. Consider the start push button is pressed in the system. The button activates the relay which switches ON the stove. After that the user gives out the quantity of the food and the preferences of the cooking to the system which gets stored in the PLC. The solenoidal valves contain funnels with the required ingredients inside them. As per the recipe preprogrammed the valves pour in the ingredients.

When the ingredients needed are bigger than the funnel size, they are brought by a bigger pipe.This operation is carried out by the linear stepper motor. A water level sensor is used in order to monitor the amount of water in the tank as water is the main component for cooking almost all the ingredients. These operations are controlled by the PLC, works based on pre defined program or user requirement. In case of malfunctions or faults, the SCADA software has memory points which allows the PLC to safely completely the current process. It also helps in intimating the fault to the concern person

The SCADA software gives the complete visual representation of the work place in the control room. In case of any mishaps taking place, it can be viewed in the software.

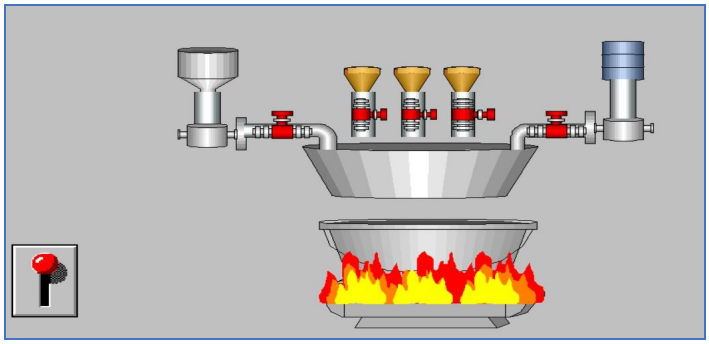


Fig3: SCADA Simulation Diagram

V. FUTURE SCOPE

A. The status of the cooking can be checked and can be developed into an android application
B. Pay and use methods can be implemented and the machines can be used in hotels too.
C. The machine can be extended into doing the serviing of the food too.
D. Automatic fault rectification standards can be used.
E. By using SCADA we can able to monitor and control whole system from main control units
F. No man power is needed

VI. CONCLUSION

In the present; the usual method of recipe making is used in paint and cement industry dominantly. By implementing the concept into cooking/food industry there could be huge change in perspective. Since it is automated and machine made, there will be no change in taste and the food would be precise to the recipe in every aspect. Since PLC and SCADA are used to monitor the system, errors occurring are greatly reduced too. Hence, we successfully studied the program

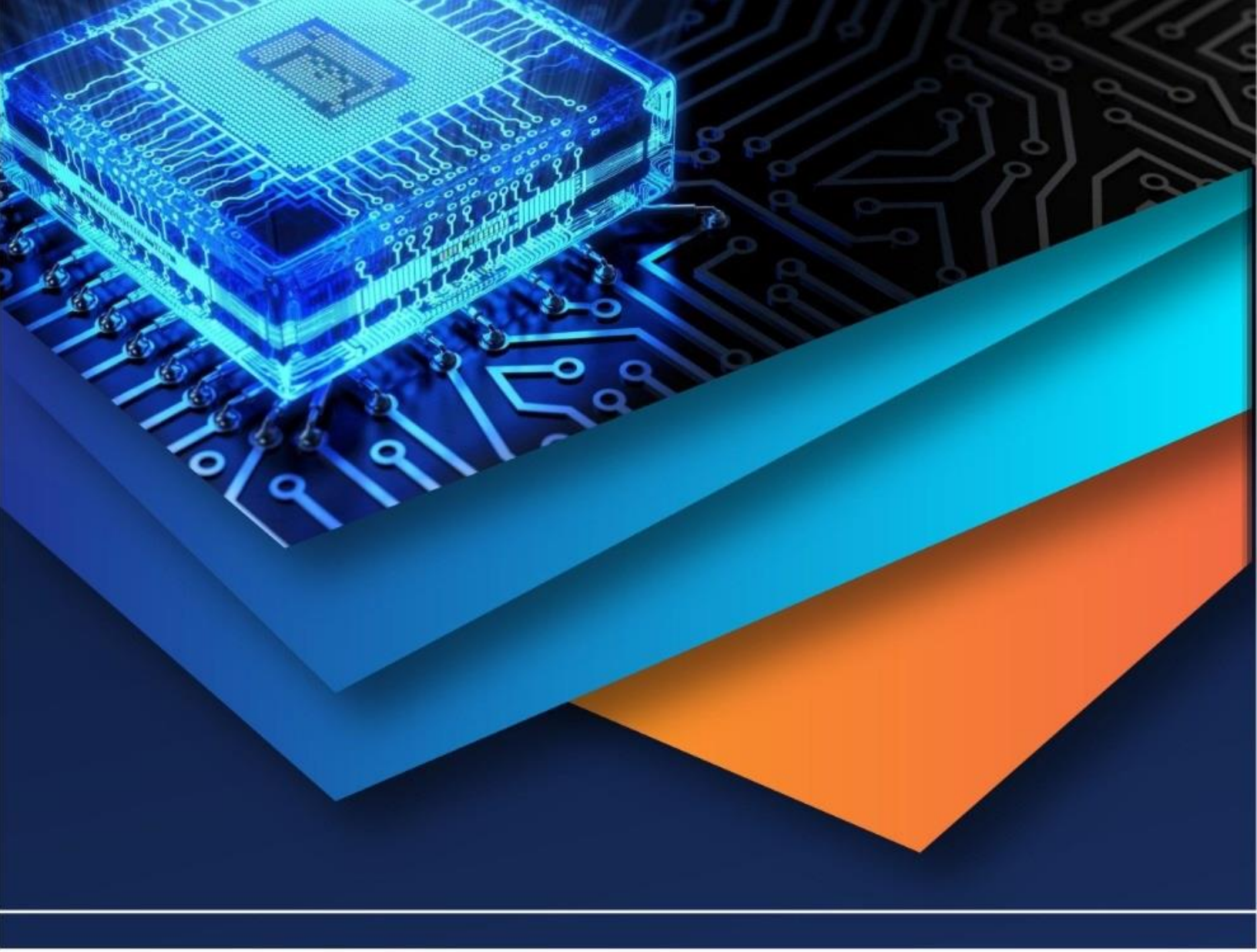
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