SMART SYSTEM FOR FOOD INDUSTRIES AND BAKERIES

Ankit R. Songire[1], kunal B. Sawant[2], Sudarshan D. Shinde[3], P. S. Londhe[4]

[123]students, Department of Electrical Engineering, Late G. N. Sapkal College of Engineering, Nashik, Maharashtra, India
[4]Professor, Department of Electrical Engineering, Late G. N. Sapkal College of Engineering, Nasik, Maharashtra, India

---

Abstract *- Today at least 80% of the food that we purchase is manufactured or processed in some way, and ultra processed foods have an increasing market share. Food manufacturing is the UK's largest manufacturing sector, employing 400,000 people at 9,600 sites across the country. The sector grew massively over the course of the 20th century, increasing in scale and complexity and moving from a system of relatively localized small manufacturers to a globalized industry controlled by multinational corporations. Nonetheless, there are checks on the centralization of food manufacturing, not least the desire from consumers for freshness and cultural specificity, which help keep the food industry more widely distributed than some other manufacturing sectors. The practice of agriculture ("farming") is the process of producing food, feed, and many other products by the cultivation of certain plants and the raising of livestock. Agriculture is the backbone for most countries, providing food for humans, directly and indirectly. The world's population will grow to an estimated 8 billion of people by 2025, thus it is widely recognized that global agriculture productivity must increase to feed a rapidly growing world population Application of nanotechnology in food system.*

Keywords: Temperature Sensor , PLC, DC Motor, Oven.

1 INTRODUCTION

In the propose work solution to the bakeries and food industry is provided through the automation by using PLC.In Food industries and Bakeries, baking and cooling process is done manually so it is time consuming process by which production is affected. This automation of bakery will leads to less accident, no wastage and good quality production. Manual process is also hazardous for the labours who always present in the contact with high heating areas and take part in the process. In the propose work we make the process automated by using PLC so that the labour efforts can be minimized and also risk factor is minimized and process will be more safe and fast. Here we are making a smart conveyor on which the tray of dough will be placed and as the tray is placed the conveyor will be move automatically, when the tray will reach to the oven area the conveyor will be stopped and the doors of oven will be closed and the process will be execute for particular time period for example the food is to be take for 20 min on 100*C. After the process is completed the doors will be open and the conveyor will be run automatically and the tray will reach to the cooling fan and the fan will be turned on for some time to cool the tray. The whole process will be automated and controlled by PLC and no labour efforts will be needed for this process.

1.1 Problem Definition

- Due to more accident at high heating areas.
- Due to more wastage of food.
- For done this work labour efforts are maximized.
- Due to the bad quality production.

1.2 Objectives

- **Minimized Accident Risk**
  In food Industry and bakery ovens are used for heating purpose. At the time of production because of mishandling of heating products, many accidents had occurred which caused injuries to the workers. Present work provides solution to this and minimized risk of accident.
- **System Automation**
  With system automation human interference is reduced and the quality of system is improved.
- Minimize the wastage of production.

2 LITERATURE SURVEY

The paper presents the automatic segregation and directing of the materials using PLC. The materials on the conveyor belt are destined to different stages of manufacturing. The idea is to automate the process of conveyor based on the material parameters using proximity sensors, colour sensors-RYB and limiting sensors. The rotating mechanism which is driven by the motor is placed at the junction of the conveyor so as to direct it to the corresponding destination. The main purpose is to replace the manual system being used in the industry and decrease the time delay. In addition to this,

the status of the belt and count of the products are also determined. The project uses a ladder diagram representation for its simulation in ABB AC31 V212 PLC software and is implemented. [1]

Industrial automation is largely based on PLC-based control systems. PLCs are today mostly programmed in the languages of the IEC 61131 standard which are not ready to meet the new challenges of widely distributed automation systems. Currently, an extension of IEC 61131 which includes object oriented programming as well as the new standard IEC 61499 are available. Moreover, service-oriented paradigms where autonomous and interoperable resources provide their functionalities in the form of services that can be accessed externally by clients without knowing the underlining implementation have been presented in the literature. In the supervisory control theory, methodologies based on formal models have been developed to improve the coordination of concurrent and distributed systems. In this paper, an event-driven approach is proposed to improve the design of industrial control systems using commercial PLCs. At a lower level, basic sequences are coded in elementary software objects, called function blocks, providing their functionalities as services. At an upper level, a Petri Net (PN) controller forces the execution of such services according to desired sequences, while by a PN supervisor constraints on the sequences are satisfied. [2]

A companion paper (New and Wittey) describes a new Power Equipment Rack concept. The present paper describes the design of a SMPS for the new rack. The SMPS operates on 240V 50Hz s.p A.C., producing a nominal 28A D.C. at a preset level between 52 and 58V D.C. The active element is a power transistor half-bridge switching the transformer primary winding at 20kHz between the centre tap of series connected capacitors across a D.C. link, using PWM for load-dependent regulation. The D.C. link is provided by af.w. diode bridge across the line, feeding a small reservoir capacitor, topped up by a shunt-transistor (boost) converter giving line-dependent pre-regulation. The rectified transformer output (40kHz) after filtering for ripple and RFI may be used to provide an output of either polarity. A low power auxiliary inverter provides isolated supplies for the transistor base drives. The module is totally enclosed for better mechanical protection and freedom from RFI, and has a single full length `thermal wall' heat sink carrying insulated devices, which forms the mechanical `back bone' of the module. 95% of the drilling and tapping operations are carried out in this heat sink using a steel jig. Almost all interconnections are made using PCB tracks, leaving only a few wire links between PCB and devices. Overall efficiency is better than 90% at f.l.c. and the psophometric ripple is about 1mV. Line power factor is better than 0.97 and fold back current limit below 40V cuts the current back to 2.

3 PROPOSED SYSTEM

3.1 Block Diagram

In block diagram there are two sensors i.e IR sensor and Temperature sensor. These are connected to the input of the Programmable Logic Controller(PLC).The power supply (24volt) given to the PLC through Switched Mode Power Supply (SMPS) for its working. At lower side of block diagram Conveyor, Oven, Cooling fan, Heating Lamp are connected to output of the Programmable Logic Controller(PLC).

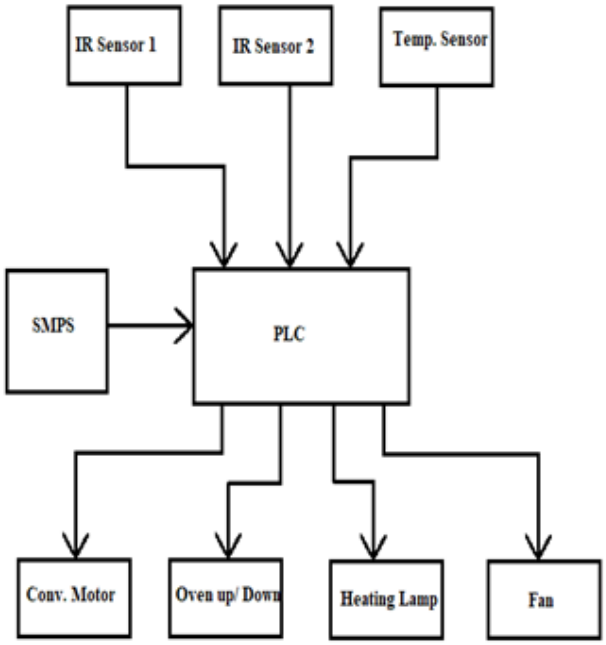

Fig No 1 Block Diagram of System

3.2 Working

230 Volt AC Supply given to the input We are using 230/5 V Step down transformer, then connected to the rectifier. Further rectified output supply is given to Temperature Sensor and IR Sensor. LM 35 sensor will sense the temperature and gives signal to the PLC. 5 Volt DC supply is given to IR sensor. IR Sensor will sense the tray of dough and will give input signal to PLC. PLC will run (Start /Stop) the conveyor according to the user requirement. It is necessary to set the temperature inside oven for PLC programming. Once the dough will completely baked at desired temperature oven supply will cut off automatically by PLC signal. 12 Volt DC supply required for motor for operating conveyor and oven door motor by using step down transformer. Step down supply is given to the rectifier. Rectified Output supply is given to the regulator IC. By using the regulator IC we can regulate supply as per

user requirement. Once the dough is baked completely then it is cool by using the cooling fan. Cooling fan is operated by using PLC.

3.3 Circuit Diagram

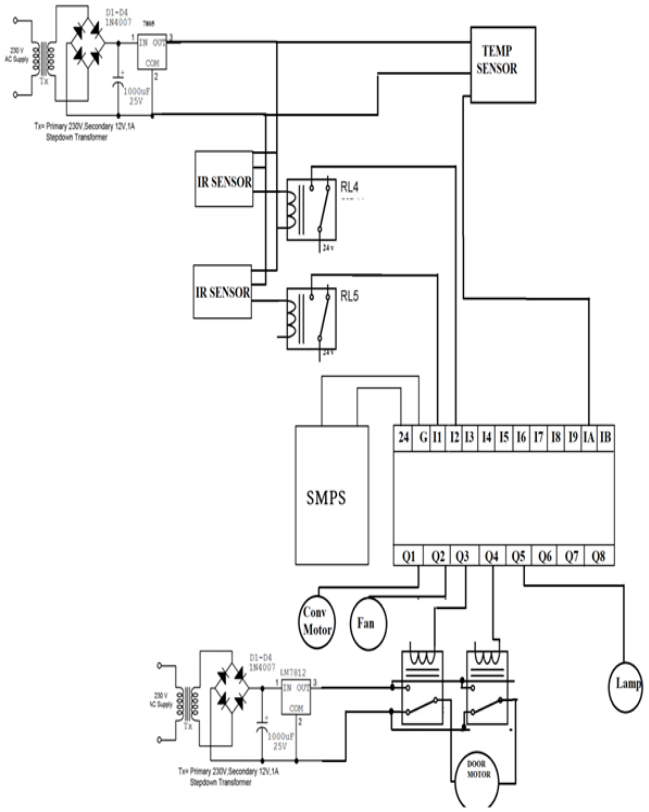

Fig No 2 Circuit Diagram

3.4 Flow Chart

Step 1:-Tray of dough will be placed on conveyor

Step 2:- Now IR sensor will sense the tray of dough.

Step 3:- As per signal from IR sensor (high/low) the conveyor will be move automatically if signal is high and conveyor does not move if signal is low.

Step 4:-Conveyor starts moving, tray of dough reached at oven and stops at that position.

Step 5:- Oven doors will closed

Step 6:- Now temperature starts rising and stop at preset temperature. Product is baked.

Step 7:- Oven doors open and conveyor start moving till the baked product is reached in front of cooling fan.

Step8:- Cooling fan turns ON and OFF after preset period of time.

Step9:- Cooling fan OFF and conveyor starts moving.

Step10:- Now the product is ready to dispatch.

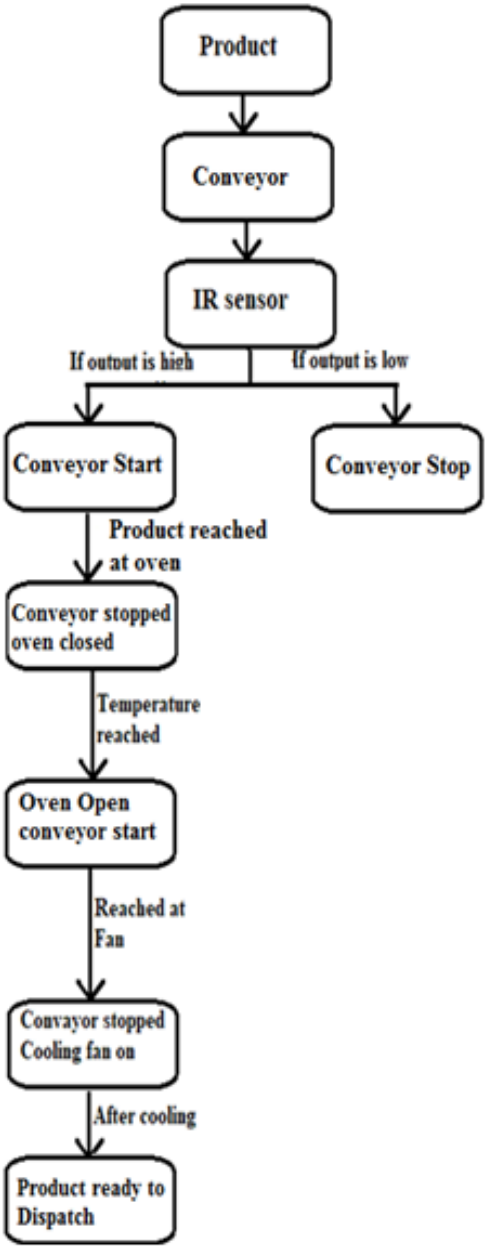

Fig No 3 Flow Diagram

4 IMPLEMENTATION DIAGRAM

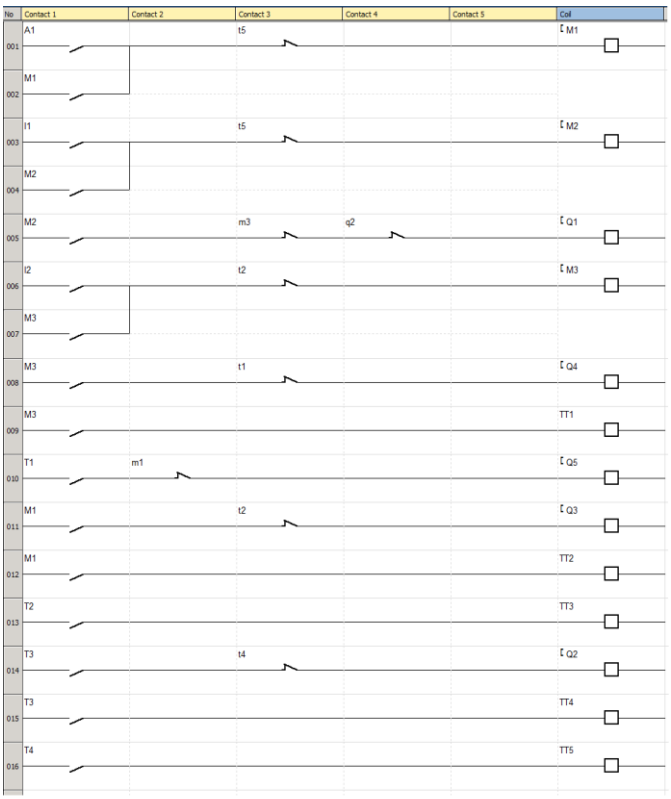

Fig No 5 Laddar Diagram

5 APPLICATION

- Can be used in Small scale as well as Large scale Food Industries and Bakeries.
- Reduces men efforts.
- Fast process.
- Safe operation.
- Accurate and efficient working.
- Good quality product

6 CONCLUSIONS

The aim of this paper was to develop a system that the PLC for automation of the food industries and bakeries. This can improve the result of system, productivity of system and increases system reliability, etc. Also it is strong way to work system under less accident and get more and more flexible system. As the function of PLC and components system makes more accurate. The project will save the energy comparatively to elevator, because of this project crossing of platform will be so easy. This project prevents the level of accidents. Peoples who have factures, leg cramps, chronic foot pains and etc.

ACKNOWLEDGEMENTS

Sincere thanks to all the anonymous researchers for providing such a useful and helpful opinion, findings, conclusions and recommendations. Also gives immense pleasure to thanks to guide Prof. P. S. Londhe, HOD Prof. R. N. Baji, Principal Dr. S. B. Bagal, and friends for their kind support and guidance.

REFERENCES

1. Yoda,k. Sakaue "Ubiquitous Stereo Vision for Controlling Safety on Platform Railroad Station," IEEJ Tr. on Electronics, Information and Systems Vol.124, No.3, pp.805
2. N.Keerthipriya, R.S. Lalithaa, S. Ramapriya, S.Sivaprakasam, "PLC Based Industrial Conveyor Automation and Monitoring," Volume 3 Issue III, March 2015
3. ISSN: 2321-9653
4. Francesco Basile, Pasqual Chiacchio, DigeoGerbasio, "IEEE Transactions on Automation Science and Engineering," Volume: 10, Issue: 4, Oct. 2013
5. Michael G J Fry, "Telecommunications Energy Conference, 1982. INTELEC1982. International"
6. http://www.ijraet.com/fileserve.php?FID=1937
7. Saab S. A "map matching approach for train positioning" part II: application and experimentation. IEEE T Veh Techno, 2000,492
8. www.google.com
9. https://m.indiamart.com
10. www.electrical4u.com
11. www.dgvcl.com
12. www.electricaltechnology.org
13. Wikipedia