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MODEL DESIGN AND SIMULATION OF AUTOMATIC COUNTING MACHINE USING PROXIMITY SENSOR

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Abstract: **The project deals with the designing a system which will monitor a different aspects of the juice machine, more particularly quantity, quality, and output t i.e. packet of juice to reach a final destination through an aid of conveyor belt. The system is designed with the ultimate object that a packet of juice will be filled automatically and the number of juice packet will be get counted automatically. In order to reach a definite conclusion a system is also designed with the aid of different type of sensors like inductive, capacitive, Infrared (IR). The system is designed in a such a way that the desired object i.e. juice packet will passed through metal detector test so that ultimately it will be in a pure condition means without any metal particles .**

Index Terms **– Inductive Sensor, Capacitive Sensor, IR Sensor, PLC, Solenoid Valve, Limit Switch, DC Motor**

I. Introduction

In the present era of globalization, the applications of PLC are emerging as a resourceful tool to reach an aim of generating a fully automatic system in a packaging industries. With the aid of PLC, Automatic counting system is designed to count the number of units produced in a particular system. The major advantages are seen in implementing of automatic counting system is, it reduces the chances of errors in counting, and it reduces labor cost, furthermore with the use of it, there will be less utilization of power. In a proposed System a Conveyor system which is mostly used in a material handling system is designed in a such way that when an empty packet on the conveyor belt reached a starting point, a particular quantity of juice is to be filled in the packet and thereafter the number of juice packet will be counted automatically at a final destination. This can be done by using a solenoid valve, which will be opened whenever a juice packet reached a filling station and get detected by proximity sensor. The IR sensor is used for automatic counting of juice packets. The Inductive sensor is used for metal detection purpose. This sensor detects metallic or conductive part in the juice. RENU FP4020MR –L0808P. PLC is used in the system. The quantity of juice in a single juice packet can be easily altered in between the process .In short, the automatic counting system is useful for increasing product manufacturing in a large scale as well maintaining quality control of the same.

II. Literature Review

Nathan Kirchner∗, Daniel Hordern, Dikai Liu, Gamini Dissanayake have proposed a work on the **"Capacitive sensor for object ranging and material type identification"** [1].This paper presents a system for object ranging and material type identification using a multifrequency approach for a capacitive sensor. It is shown through an experimental study that the deviation in the readings taken at different sensor drive frequencies and the variation in consecutive readings provide sufficient information to distinguish a range of material types commonly found in a number of environments. The capacitive based, Object penetrating, material type identification is targeted for use with an autonomous robotic system for steel bridge maintenance; significantly different interaction is required for each of the various materials present. Experimental results demonstrate that the information from the sensor is sufficient to range and identify the material type (via physical properties) of an object present in a scene where a bridge structure is being grit-blasted.

Yu Wu, Hongpeng Zhang have proposed a work on the **"Research on the Effect of Relative Movement on the Output Characteristic of Inductive Sensors".** [2]The metallic objects are commonly detected in the inductive sensors with relative movement including reciprocation and rotation. However the effect of the relative movement on the inductive sensors was not in consideration. In order to improve the sensitivity of inductive sensors in metal particle detection and other areas of application, the effect of particle movement on inductive sensor is studied. There are exactly defined requirements for industrial sensors, accuracy, reliability, hardness, resistance to fouling, water tightness, etc. Contactless inductive sensors are prime candidates meeting these requirements, especially in harsh environments. These sensors can eliminate the need for costly machine shutdowns for inspection. The structure of inductive sensor is simple enough to achieve the performance of long lifetime, easy installation, low manufacturing costs and compactness.

III. Ingredients of the proposed research Model –

There are various ingredients is used in the present system. They are summarized as under;

2.1 Automatic filling machine:

The automatic filling machine mainly consists of solenoid valve, timer, and juice tank and proximity sensor (inductive sensor). Solenoid valve is a electromechanically operated valve consisting two port valve which is used for making flow on and off. An inductive proximity sensor is a non-contact electronic proximity sensor. It is particularly used for positioning and detecting metal objects. The sensing range of an inductive switch is dependent on the type of metal being detected.

2.2Metal detection sensor:

Metal detection Sensor is a capacitive sensing technology and it is used mainly for noncontact detection of metallic objects. It is based on capacitive coupling that can detect and measure anything that is conductive. Here capacitive proximity sensors are used particularly for noncontact detection of metallic objects.

2.3 IR sensor:

An IR sensor is an infrared sensor. It consist of IR LED (light emitting diode. It works by using a specific light sensor to detect specific wavelength in the Infra –Red (IR) spectrum. When an object is close to sensor, the light from the LED bounces off the object and into the light sensor .This result in large jump in the intensity, which can be detected using a threshold.

2.4 Conveyor system:

The Conveyor system is a common piece of mechanical handling equipment that moves material from one location to another. Also DC motor is used to rotate the conveyor belt at a desired speed which is fully controlled by PLC software. The conveyors are especially used in applications involving transportation of heavy or bulky materials.

IV. OPERATION

The operation in the proposed system is demarcated in following categories namely.

1) Conveyor belt control unit.
2) Automatic filling unit.
3) Metal detector unit.
4) Barcode scanner unit.
5) Product counting unit.
6) Display unit.

Conveyor belt control unit is consist of DC Motor and belt. DC Motor is used to drive the conveyor belt. A juice packet is moved through a conveyor belt. Thereafter, Automatic filing unit is designed and it consists of solenoid valve and proximity sensor. Proximity sensor is used to locate the position of juice packet. A juice packet is get filled of a particular quantity of juice through the opening of solenoid valve.

Thereafter, a juice packet will be reached a metal detector unit. Metal detector unit consists of capacitive sensor and limit switch. If any metal particles is found in a juice packet, limit switch get activated and it reject the said juice packet.

If there is no metal particles in a juice packet it moves further forward and barcode system i.e. manufacturing date, time, and batch no. is stacked on the juice packet. Thereafter, the juice packet is moved forward and reached at Product counting unit. Product counting unit consists of IR Sensor. IR sensor calculates the number of juice packet generated in a particular duration. The last step is reached at Display unit. Display unit demonstrates the number of juice packets filled in a particular duration and thus total number of production.

4. PLC as system controller:

A programmable logic controller (PLC), or programmable controller is an industrial digital computer which is designed for automation processes in industrial environment. The PLC has input lines, to which sensors are controlled to notify of events and output lines, to which actuators are connected to effects or signal reactions to the incoming events. The PLC used is ReNu PLC FP4020MR-L0808P.

ReNu is brand soft contact lens care products produced by Bausch and Lomb.

Features:

It has 8 inputs and 8 outputs.

16*2 text multicolor backlight LCD

In build HMI

Support for digital I/O

High speed timers and counters

Ladder editor with powerful instruction set

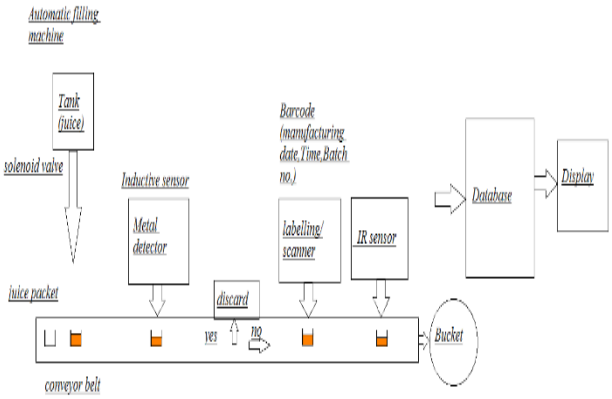
Working and simulation of system using PLC:

The system is mainly working on Automatic filing machine which is used for filing juice into packet. As stated earlier, the automatic filling machine consists of solenoid valve and sensor. The solenoid valve is designed in the

present research work is to open it for fixed duration of time. When packet comes on conveyor belt, it will be sensed by using sensor and through solenoid valve juice will be fill into packet. The next to Val.ve is Metal Detector which is an inductive sensors. This sensor detects metallic or conductive part in the juice. If the metallic particles are present in that juice then packet will be discarded. Thereafter the labeling system and barcode scanner came into operation. In labelling system, the barcode (manufacturing date, time and batch no.) of every product will attach to packet. The scanner is used to scan the information and data will be store into computer for future use. The last stage of system is IR sensor and counting system. IR sensor and counting system is connected to conveyor at juice section. The juice product will be pass through conveyor belt and IR sensor detects objects and counting system counts no. of products.

The working and simulation of system is further described with the help of block diagram, which is as under;

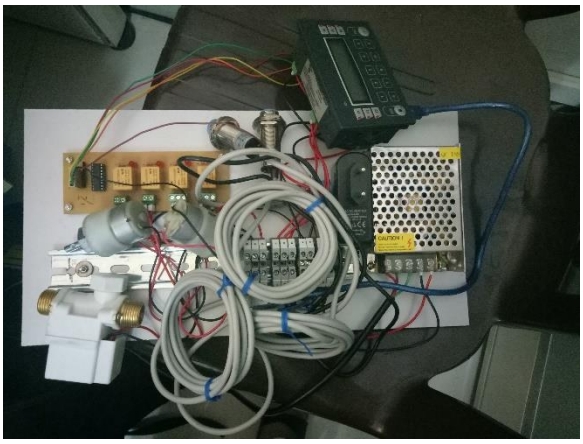
Block diagram:



6.Result:

Sensor testing

Hardware implementation



V. Conclusion:

This paper describes automatic counting system using proximity sensor. The project deals with the designing a system which will monitor a different aspects of the juice machine, more particularly quantity, quality, and output. The system is designed with the ultimate object that a packet of juice will be filled automatically and the number of juice packet will be get counted automatically. By using automatic counting system, during the counting after loading components in machine hopper, operator can utilize his time for other work like packing, dispatching etc. Counting by electronic sensor improved the accuracy than manual counting. The mechanism will help for improving and maintaining the productivity and profitability of company. Metal detector used to detect whether metal contain present in juice or not.

REFERENCES:

- Nathan Kirchner∗, Daniel Hordern, Dikai Liu, Gamini Dissanayake Capacitive sensor for object ranging and material type identification
- Yu Wu, Hongpeng Zhang, Research on the Effect of Relative Movement on the Output Characteristic of Inductive Sensors S0924-4247(16)31079-2DOI: https://doi.org/10.1016/j.sna.2017.10.004 Reference: SNA 10370
- Eka Cahya Primaa,*, Siti Sarah Munifahab, Robby Salamb, Muhamad Haidzar Azizb, Agustin Tia Suryanic Automatic Water Tank Filling System Controlled using ArduinoTM based Sensor for Home Application Engineering Physics International Conference, EPIC 2016
- DESIGN AND FABRICATION OF AUTOMATIC MONITORING AND CONTROL SYSTEM FOR THE OBJECTS ON THE CONVEYOR BELT ISSN(PRINT):2394-6202,(ONLINE):2394-6210,VOLUME-1,ISSUE-3,2015