**KTO KARATAY UNIVERSITY**

**FACULTY OF ENGINEERING**

**DEPARTMENT OF MECHATRONICS ENGINEERING**

**MEM620 COMPUTER AIDED DESIGN AND PRODUCTION**

**PROJECT REPORT**

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**SUMMARY OF THE PROJECT**

This project focuses on an automatic labelling system consisting of a conveyor belt, an object detection sensor, a motor, a valve, a pneumatic piston, a CPU PLC and a relay. The main aim of the project is to automate the process of detecting and labelling objects carried on the conveyor belt. The system can also be used in tile decoration.

The operation of the project starts with the movement of the objects placed on the conveyor belt. The moving object is detected by the object detection sensor and this information is transmitted to the CPU PLC. The PLC controls the steps required to print labels on the detected object. These steps include the activation of the motor, the opening of the valve, the labelling process of the pneumatic piston and the relay transmitting the appropriate signal. Since the project was carried out using school resources, alternative materials were used instead of real labels in the labelling process.

**1. INTRODUCTION**

Nowadays, automation of industrial processes plays an important role to increase production efficiency, reduce the error rate and save labour. Accordingly, this project aims to investigate how industrial processes can be optimised by building an automation system. The project designs an automation system using a conveyor belt, a material detection sensor, a motor, a valve, a pneumatic piston, a CPU PLC and a relay. The main purpose of this system is to start with the detection of an object on the conveyor belt and apply a process on it. This introductory part of the project defines the general aims and objectives of the project. This study aims to be a useful resource for anyone who wants to understand and apply the basic principles of industrial automation. This report describes in detail the design, implementation and testing phases of the project and explains the operation of the system. It also discusses the challenges encountered during the project, solutions and future improvements planned. This automatic labelling system offers a potential solution to increase productivity and optimise the workforce in industrial applications.

**2. WORKS CARRIED OUT AND MATERIALS USED IN THE PROJECT**

makine, Elektrik kabloları, elektronik donanım, kablo içeren bir resim

Açıklama otomatik olarak oluşturulduThe project is described in general terms in the summary and introduction section and shown in Figure 1. Both electronic and mechanical connections were made. In addition, the code was written in the Ladder diagram and loaded to the PLC device.

Figüre 1. General Project View.

**2.1 Materials Used in the Project**

**2.1.1 Button**

A pushbutton is a simple toggle mechanism that, when pushed, initiates and controls a process in machinery or software.[1]

**2.1.2 Fuse**

Electric fuses are opening elements that protect the devices used in alternating and direct current circuits and the conductors for these devices from overcurrents and save the circuits and devices from damage..[2]

**2.1.3 Connector**

The part that enables the electrical transmission cables, which are divided into two or more parts, to be connected to each other is called terminal block.

**2.1.4 Relay**

The relay is an electrically operated, electromagnetic switch. In other words, it is a circuit element that works when current flows through it. Relay; It consists of three parts: coil, pallet and contact. The coil part is the input part of the relay. The pallet and contact part has no electrical connection with the coil.[3]

**2.1.5 Proximity (Capacitive) Sensor (CR18-8DP)**

Proximity Sensor is a type of sensor used to detect the presence or distance of an object. They detect the distance to objects using different operating principles depending on environmental conditions. Proximity sensors play an important role in electronic devices, automotive industry, industrial automation systems, medical field and many other application areas.

Capacitive Proximity Sensor used in the project. Capacitive sensors detect electrical capacitance changes near objects. A nearby object changes the capacitance of the sensor and this change is used to detect the presence of the object. Capacitive proximity sensors are used in touch screens, automatic door opening systems and industrial applications.

**2.1.6 Pneumatic Piston**

The pneumatic piston converts energy (mostly pressurised air) into mechanical movement. Depending on the type of actuator, the movement is rotary or linear.[5]

**2.1.7 PLC (MITSUBISHI FX-3SA-30MT-CM)**

Unlike general use computers, PLCs are arranged to have many inputs and outputs and are designed to be more resistant to electrical noise, temperature differences, mechanical impacts and vibrations. PLCs are loaded with programmes suitable for the functioning of the system it will control. PLC programmes work in such a way that they scan the input information in milliseconds and respond to the appropriate output information close to real time.[6]

**2.1.8 Belt Conveyor**

Conveyor systems are mechanical means of transporting objects from one location to another, especially in production centres. In the project, the motor is used for the movement of the conveyor belt.

**3. CONCLUSION AND ASSESMENT OF THE REPORT**

This project takes an important step by focusing on understanding and applying the basic principles of industrial automation. Our automation system, which is created by integrating components such as conveyor belt, material detection sensor, motor, valve, pneumatic piston, CPU PLC and relay, has the potential to be used in automating many industrial processes.

With the successful completion of the project, the efficiency of industrial processes can be increased, labour savings can be achieved and the error rate can be reduced. In addition, the fact that the materials used in the project belonged to the school reduced the cost and allowed the students to practice. However, the project has certain challenges and areas for improvement. For example, technical details such as the sensitivity of the sensor or the efficiency of the piston could be further studied. Also, the reliability and durability of the system could be improved.

In conclusion, this project has provided a valuable experience for those who want to learn and apply the basic principles of industrial automation. Future work can lead the way to further develop the basic principles presented by this project and produce solutions for real industrial applications.

**4. REFERENCES**

1. Geri dönüşlü yaylı buton". 19 Eylül 2015 tarihinde kaynağından arşivlendi. Erişim tarihi: 5 Ocak 2011.

2. edn.com/archives/1996/092696 18 Haziran 2006 tarihinde Wayback Machine sitesinde arşivlendi. Len Lundy, "The fuse-selection checklist: a quick update" EDN Magazine 26 Sept 1996 p121

3. Arşivlenmiş kopya". 27 Şubat 2021 tarihinde kaynağından arşivlendi. Erişim tarihi: 13 Mart 2021.

4.Elektrik Blog official web site (2024). Retrieved from https://www.elektrikblog.com/proximity-yakinlik-sensoru-nedir/

5.Wikipedia official web site. (2024). Retrieved from https://tr.wikipedia.org/wiki/Pnömatik

6. PLC dökümanları (Grand Valley State University)[ölü/kırık bağlantı]