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 ijirset@gmail.com

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Automatic Operation Control System Using PLC Application in Production Line of Abo-Sleem's Factory

Hussin Al Elwani Abdussalam

Department of Computer science, Higher Institute for Comprehensive careers, Tarhuna, Libya

ABSTRACT: In this article, we propose to design a control system using PLC for Abo-sleem's factory. The factory is the national drinks company industry was established in the ninth of May 1979, Abo-Sleem bottling operations factory is one of this company's many factories. The main purpose of the national drinks company industry are bottling various types of drinks and marketing them inside and outside the country. There are almost 2073 workers (female and male workers) in this company and in the following factories. The scope of this project is to control production line automatically. In this project, a close-loop control system is applied.

The whole idea of the system is to simplify the infraction process for the factory through saving time and increasing the performance. Also to make it easier to the user and safer for the machines. Also we focused to design a control system for production line Abo-sleem's factory and to evaluate the design using a simulation system. For sure It is believed that to design a control system for production line Abo-sleem's factory is going to give a new system to increase the performance of the factory and make it easy for the user.

I. INTRODUCTION

Programmable logic control (PLC) is important because all production processes go through a fixed repetitive sequence of operations that involve logical steps and decisions. A PLC is used to control time and regulate the sequence (Barrett, 1997). The PLC is a robust industrial computer program which accepts input data, both digital and analogue, from switches and sensors and controls outputs to drive devices such as motors, pneumatic devices and status indicators (Hughes, 2005).

The need for low-cost, versatile and easily commissioned controller has resulted in the development of programmable systems based on hardware CPU (Central Processing Unit) and memory for the control of machines or processes. Originally designed as a replacement for the hard-wired relay and timer logic, PLCs (Programmable Logic controllers) provide ease and flexibility of control based on programming and executing simple logic instructions (often in ladder diagram form). PLCs have internal function such as timer, counters and shift registers, making sophisticated control possible using even the smallest PLC.

The idea of PLCs was developed for the first time in the General Motors Company in 1968 and put into practice in 1969 in response to the wishes of an automobile industry to develop an automated production line which could keep with technical evolution and with new production models. Since that time they have become firmly established as the most popular means of controlling the operation of plant and machines. In around 1974 microprocessor have bounced as "brain" of the PLC and this along with the advance in electronic circuits and components, has enabled cheaper, smaller, more powerful and more reliable units to be developed (Hughes, 2005).

In this project, we propose to design a control system using PLC for Abo-sleem's factory. The factory is the national drinks company industry was established in the ninth of May 1979, Abo-Sleem bottling operations factory is one of this company's many factories. The main purpose of the national drinks company industry are bottling various types of drinks and marketing them inside and outside the country. There are almost 2073 workers (female and male workers) in this company and in the following factories.



Abo-sleem's factory operator file factories:-

- Zamzam's factory for drinks.
- The national drinks factory.
- The bottling factory.
- Ben-geshir's factory for mineral water.
- Sebha's drinks factory.

The drinks production process undergoes several stages as follows:

- 1- The preparation process of the main drink.
- 2- The preparation process of soda-water by carbon dioxide in the treatment water.
- 3- Bottles washing, sterilization and inspection process.
- 4- The bottling operation of both soda-water and the main drink.
- 5- Closing the bottles and inspection them.
- 6- Filling the bottles into the boxes.
- 7- Analyzing a sample of the produced drink to ensure its validity and quality to computability.

The production lines of abo-sleem's factory:

The factory contains six (6) production lines

Line NO.1 is specialized for carbonated drinks bottling into glass bottle with 285 mille liter each.

Line NO.2 is specialized for carbonated drinks bottling into glass bottle with 285 mille liter each.

Line NO.3 is specialized for carbonated drinks bottling into glass bottle with 1 liter each.

Line NO.4 is specialized for carbonated drinks bottling into glass bottle with 285 mille liter each.

Line NO.5 is specialized for carbonated drinks bottling into tin cans with 330 mille liter each.

Line NO.6 is specialized for carbonated drinks bottling into cylindrical shape bottles with 18 liter each.

II.LITERATURE REVIEW

Without control systems there are could be no manufacturing, no vehicles, no computers, no regulated environment in short, and no technology. Control systems are what make machines, in the broadest sense of the term, function as intended. Control systems are most often based on the principle of feedback, whereby the signal to be controlled is compared to a desired reference signal and the discrepancy used to compute corrective control action. The goal of this book is to present a theory of feedback control system design that captures the essential issues, can be applied to a wide range of practical problems, and is as simple as possible (John Doyle, Bruce Francis, Allen Tannenbaum c Macmillan Publishing Co., 1990).

III.RESEARCH METHODOLOGY

This chapter describes the research method used in this study.

Process as shown in (figure 3.1) discussed. Research methodology is more than just collections of method to perform a research; it is a systematic way to solve the research problem. The research methods refer to the methods and techniques used by the researcher in performing the research for example data collection techniques, data processing techniques, and instruments.

- To design a control system for production line Abo-sleem's factory.
- To evaluate the design using a simulation system.

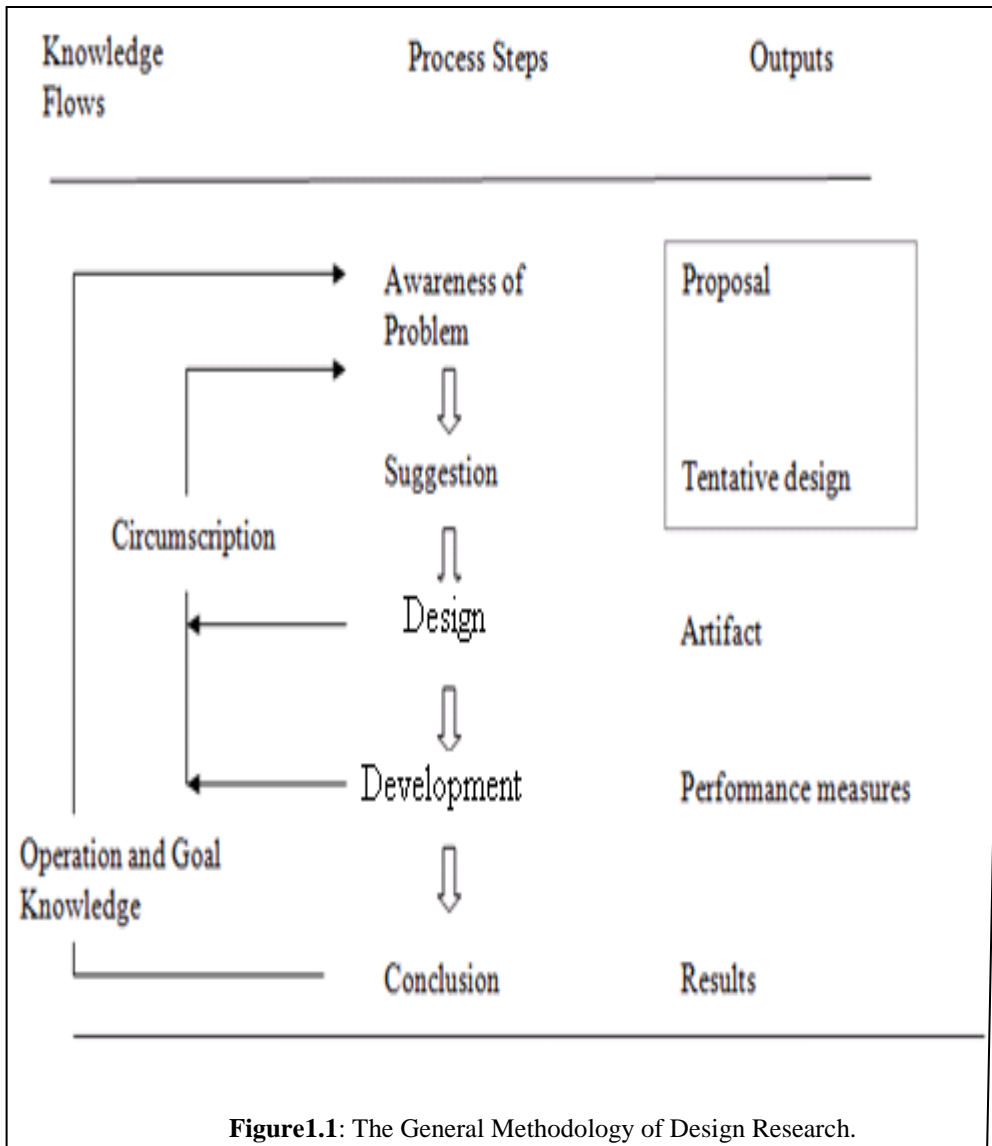


Figure1.1: The General Methodology of Design Research.

IV. LADDER DIAGRAM (LAD)

1. The bottle and boxes separation process

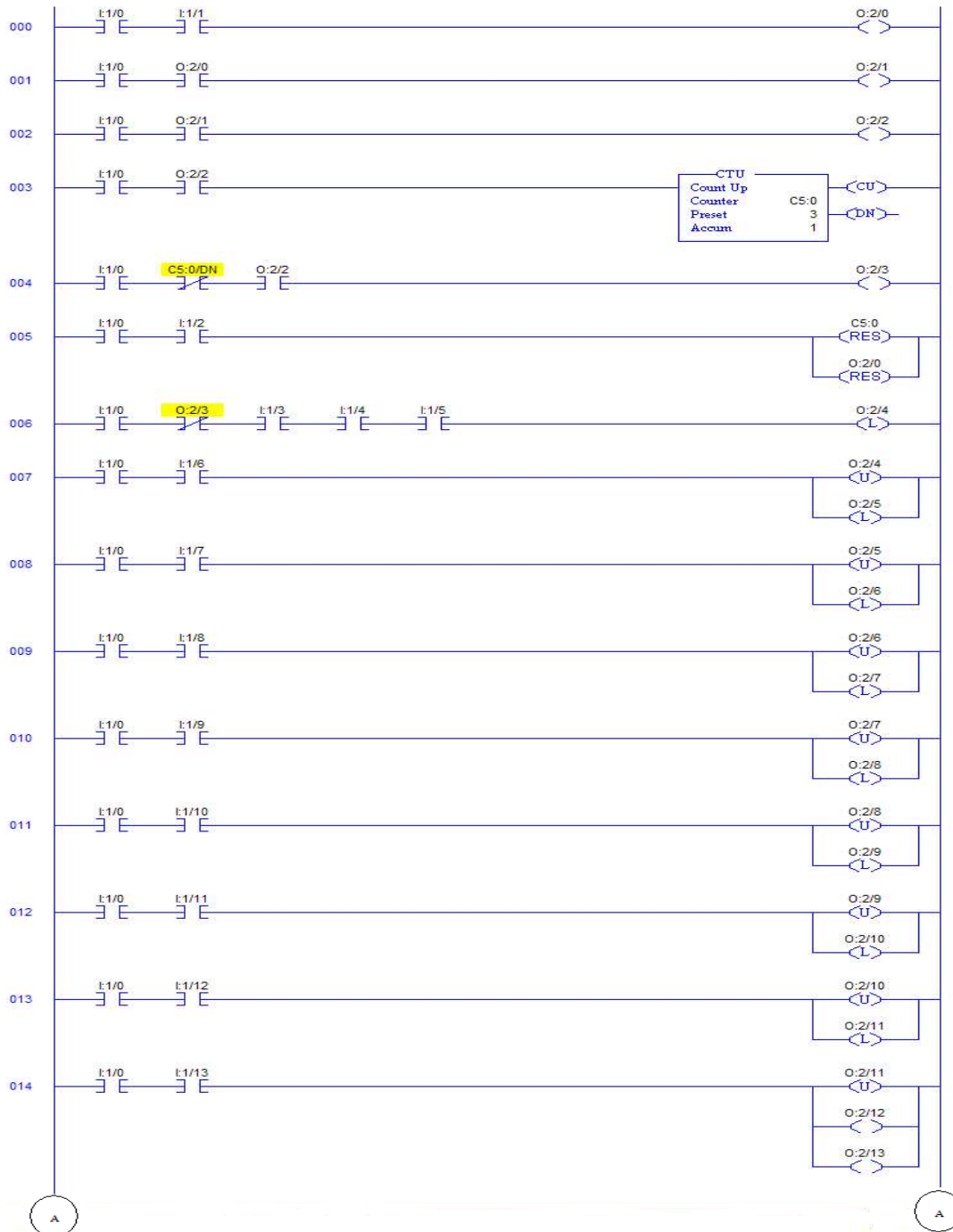


Figure 1.1: The simulation of bottle and boxes separation process.

2 .Bottles washing and sterilization stage

Figure 1.2 demonstrates the simulation process for the bottles washing and sterilization stage

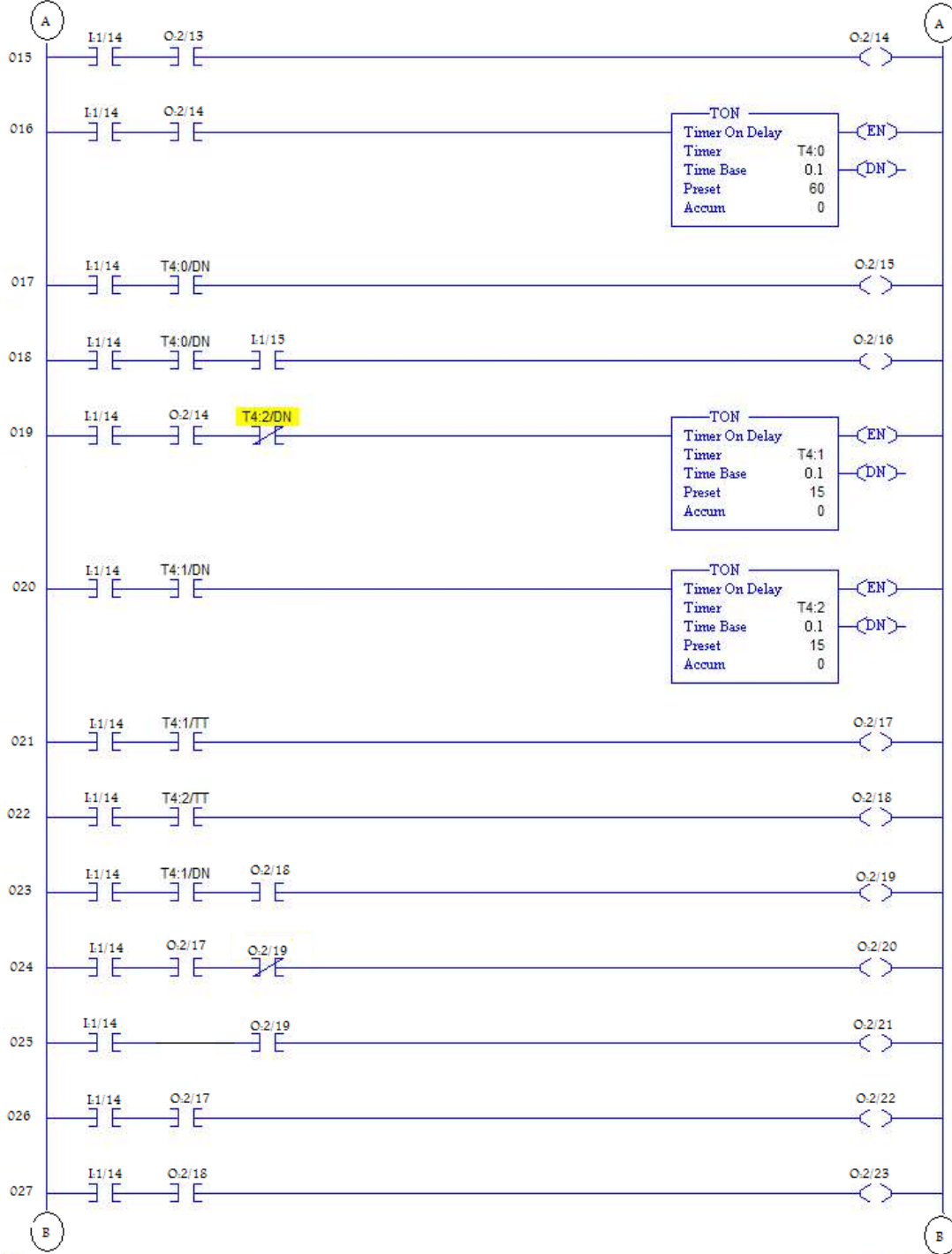


Figure 1.3: The simulation of bottles washing and sterilization stage

3. The bottling stage

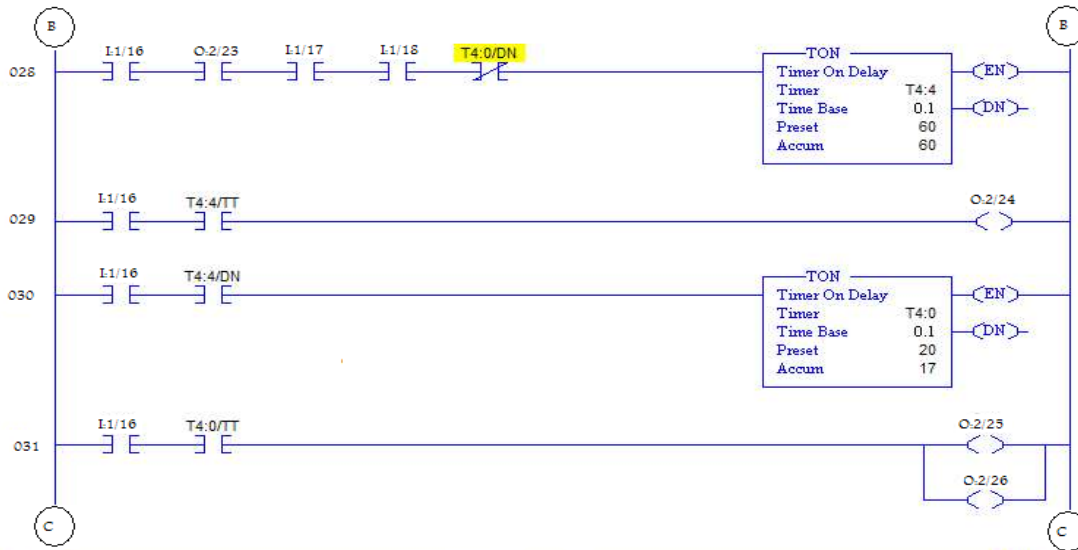


Figure 1.4: The simulation of the bottling stage

4. The bottles closing stage

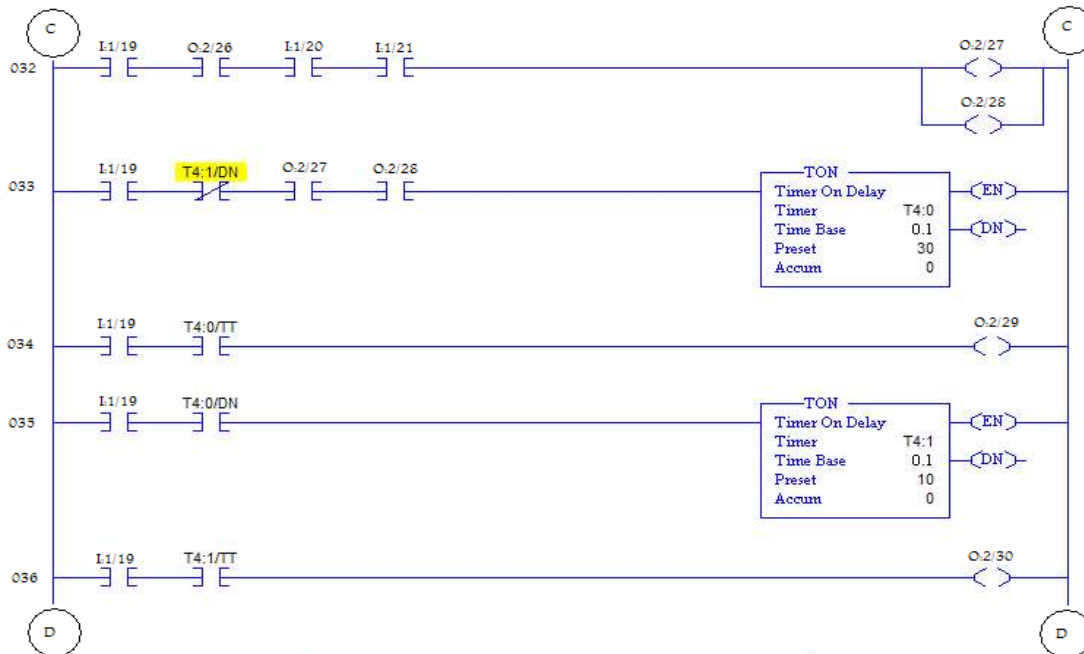


Figure 1.5: The simulation of the bottles closing stage



V. CONCLUSION

It is believed that to design a control system for production line Abo-sleem's factory is going to give a new system to increase the performance of the factory and make it easy for the user.

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