

# Control of Automatic Beverage Bottle Filling Process Using P and Team Viewer IoT

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## ABSTRACT

The development of an on-line process control system in the Industry is a major requirement in the context of the efficiency of machines and improving the quality of production during the Covid-19 period. As well as in the learning system and practicum students are required to be able to study independently, and lecturers must be able to develop themselves in on-line learning methods. The on-line learning process is not just to transfer learning modules to students, but must be able to guide students in an unlimited time, whenever students need an explanation of the material provided. TeamViewer is an application that provides a solution that is used to remotely control another PC or laptop. By knowing the ID and password are provided by TeamViewer on the PC that want to remote. Then, it just entered the TeamViewer application installed on the PC. The use of this team viewer was tested against the control of the beverage bottle filling process. The result is that by using Android the process of controlling beverage bottle filling. It turns out that, it can be operated to fill beverage bottles for different size, namely by setting the data delay on the program 3.2 seconds for the 120 ml bottle size, 4.0 seconds for the 200 ml bottle size, and 5.0 seconds for the bottle size of 300 ml.

**KEYWORDS:** *TeamViewer, Program Logic Control, Remote.*

## 1.0 INTRODUCTION

There are two things that are the background of this research,

which are related to the development of an industrial process control system, and the development of an on-line practical learning system in the Covid-19 era. On the company side, it always strives to develop machines in the context of efficiency and improve the quality of its production, among others. Remotely troubleshoot technical issues to reduce downtime and response time. It can reduce repair costs and downtime through remote operation and service intervention planning [1].

On the online learning side, students are required to be able to study independently, and lecturers must be able to develop themselves in on-line learning methods. On-line learning process is not just to transfer learning modules to students, but lecturers must be able to guide students in an unlimited time, whenever students need an explanation of the material provided, which is accompanied by showing directly and wherever the lecturer is [2]. The right solution to overcome the problem of on-line lectures is to use TeamViewer via smart phone or laptop media, for remote learning specifically on PLC (Program Logic Control) courses related to programming and its applications [3].

In the previous year, a number of lecturers had conducted research related to remote control, including the required learning environment, namely adequate infrastructure, lecturers as facilitators and motivators, effective learning models according to character, up to date teaching materials, and media for delivering material. The impact of the Coronavirus Disease (COVID-19) pandemic in Indonesia has an impact on various sectors of life [4]. Online learning is a learning process by utilizing the internet to connect with each other between lecturers and students. Lecturers and students carry out the online learning process using supporting media so that the process of delivering information can be carried out even though it is not implemented in schools. However, planning, implementation, and evaluation must still exist in online-based learning. Online learning is not just about transferring material through internet media, nor is it about writing assignments sent via links, but the real role of lecturers as when learning in class [5].

Online learning has a positive impact as well as a negative impact on the development of learning. Online learning can increase learning independence. In addition, online learning can

also make them less motivated due to the lack of interaction and direct intervention from the lecturer. Distance Learning emphasizes self-study, and uses special techniques in designing learning materials [6]. Media for delivering information virtually, teaching materials in the form of modules also have an important role in the implementation of PJJ (distance learning). This is in line with the opinion, that several factors influence the success of distance learning such as support for facilities, teaching materials must be prepared properly, student interests and the ability of lecturers to use various methods of interaction and feedback. Another opinion explains that what must be considered so that distance learning can run well, namely attention, pen confidence, experience, creative use of equipment, and interaction with [7].

The TeamViewer application is one application to perform remote surveillance or remote desktops. TeamViewer is a tool to remotely the desktop of another computer (control and take over control of another computer) [8]. TeamViewer can be used in remote desktop provided that both devices are connected to the internet. This is in line with the opinion of Doni & Lesmono [9] that the main function of TeamViewer is to remotely other computers, so they can operate other computers in different locations, provided that both computers are connected to the internet, then TeamViewer software has been installed. This application can be implemented in the distance practicum learning process, so that in this case the practitioner can carry out a series of practicums from home, and the lecturer can supervise, control, and communicate with the practitioner during the activity. Supervision is carried out so that skill assessment is carried out objectively.

From a number of studies above that have been carried out, it is limited only to the use of a TeamViewer in learning theoretical subjects. Therefore, it is necessary to do research so that TeamViewer can also be used for simulation functions and applied practicum and programming.

## 2.0 THEORY OF STUDY

The research is supported by components or equipment, including smartphones, PCs, PLCs as shown in Figure 1.



Figure 1: Diagram of a smart phone connected to PC

### 2.1 Smartphone

The smartphones are mobile phones that have the ability to use and function similar to computers and an example of the benefits of smartphones from the software side is the availability of data access services. This service can be used by every Smartphone to allow users to connect with internet connectivity at any time wherever they are. Data access services on smartphones are useful for browsing, email, chat and posting purposes. The next example benefits in terms of the number of applications available on a smartphone. The smartphones are devices that are not only used to make SMS,

receive and answer calls, the presence of an application center on every smart phone. Recently, the smartphone can be used as business support, learning facilities and entertainment facilities to industry.

### 2.2 TeamViewer Software

TeamViewer is a networking tool to remotely the desktop of another computer, or in other words we control, take over control of another computer. The main features of TeamViewer are: Remote Support, Presentation, File Transfer VPN. Remote Support (access the Client PC via the internet), this feature/benefit of TeamViewer is very helpful to access a PC that is far from someone position. Just connect to the internet and know the ID and Password of the PC in seconds, then it can access the PC remotely. It is in front of the PC directly. [10],[11].

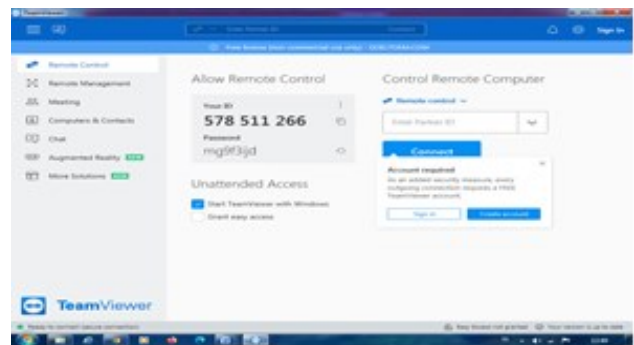


Figure 2: TeamViewer main menu display on pc

In addition to the remote desktop function, another benefit is "File Transfer". With this function it can copy files directly to the directory needed. The main difference that is felt when using this program with several programs for remote desktops is "fast and stable" even though internet access is only with a GPRS connection, but still able to remotely connect to other PCs [12].

The main requirements to be able to use TeamViewer are:

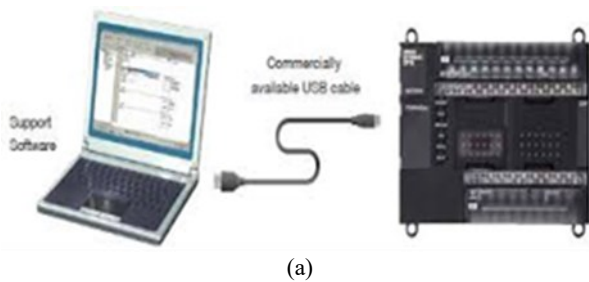
- Install TeamViewer 7(.APK) on your Android Smartphone.
- Install TeamViewer 7(.EXE) on PC.
- Connect to the internet on a PC or Android Smartphone.
- Get ID and Password to be able to connect between Android Smartphone and PC.

### 2.3 PLC

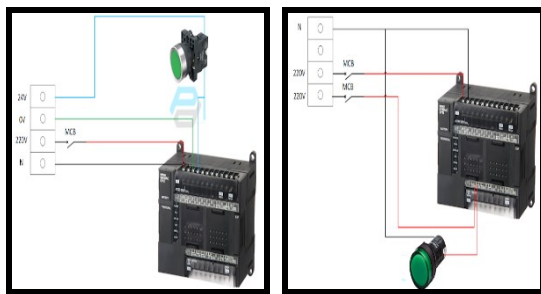
PLC is a programmable controller based on a microprocessor or micro-controller by utilizing memory as a place for processing programs and data, which works based on logic functions and is able to perform relatively complex arithmetic functions [13]. The example of wiring diagram of the CP-1E PLC and parts of the plc is depicted in Figure 3.

### 2.4 CX Programmer

Programmer is one form of software that is used to enter the program into the PLC. This software operates under the Windows operating system, therefore users of this software are expected to be familiar with the Windows operating system, among others, to run application software programs, create files, save files, print files, close files, open files, and exit from (close) the software program [14]. In Figure 4 is showed the CX programmer home screen.



(a)



(b)

Figure 3: (a) and (b) Wiring diagram of the CP-1E PLC and parts of the plc



Figure 4: CX programmer home screen

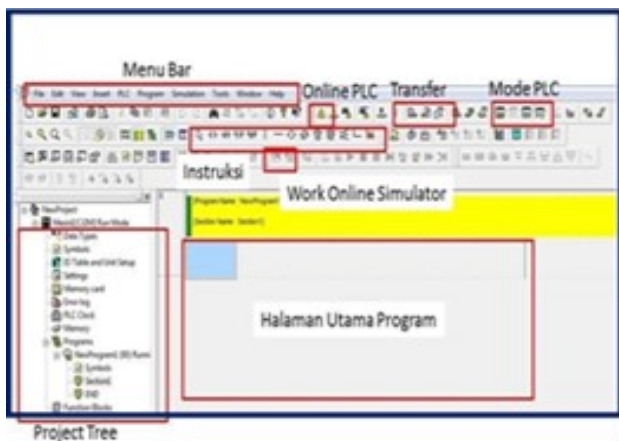


Figure 5: CX programmer's program page view

There are several minimum requirements that must be met to be able to operate cx-programmer optimally, namely:

- IBM PC/AT compatible computer
  - CPU Pentium I minimum 133 MHz
  - RAM 32 Mega bytes
  - Hard disk with approximately 100 MB of free space
- SVGA monitor with 800 x 600 Resolution.

To create a program with a ladder diagram, it can click on the contact symbol, coil, line or function as desired on the toolbars as shown in Figure 5.

### 3.0 EXPERIMENTAL METHOD

#### 3.1 Hardware Design

To simplify system design, schematic diagrams are used as the first step in making the system. The schematic diagram describes in general how the circuit as a whole works. Schematic diagram is one of the simplest to run the workings of a system and makes it easier to localize errors from a system. With a schematic diagram, you can analyze how the circuit works and design hardware that will be made in general.



Figure 6: Schematic design

Explanation of the Schematic Diagram of each function:

- Smartphone Function to control and monitor the bottle filling process remotely.
- Laptop/Computer Functions as a device monitoring tool in place.
- PLC Functions as automation of bottle filling process, Filling Process This process is controlled automatically by PLC.

#### 3.2 The design of the plc module to drive the water pump filling water into the bottle

In the hardware design above, the PLC input is connected to 220V AC current and the COM input and output of the PLC are connected to the power supply. The switch input is connected to I:0.00 to turn on the conveyor Q:100.00 and the proximity sensor is connected to the 5V relay and the 5V relay output is connected to the 24V power supply and PLC Input. When the proximity sensor detects a bottle, the NO relay output will be active so that the PLC input I:0.04 which is connected to the relay is in a HIGH state. The PLC output is connected to the 24V relay input and the 24V relay output is connected to the 12V supply to drive the DC pump.

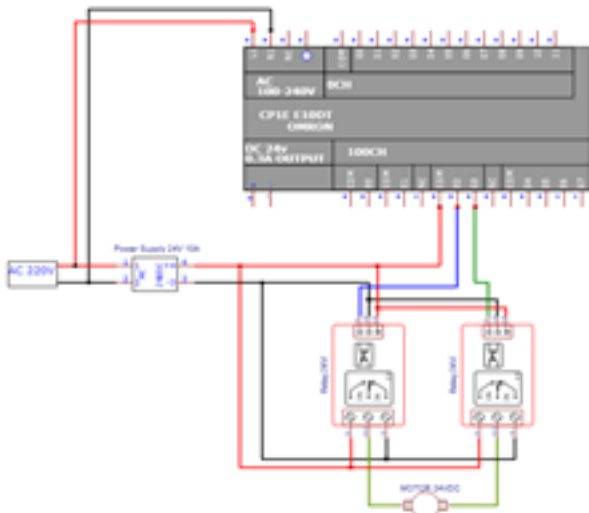


Figure 7: Wiring diagram connecting PLC with bottle filling water pump

In the hardware design in Figure 7, the PLC input is connected to 220V AC current. The COM input and output of the PLC are connected to the power supply. The switch input is connected to I:0.00 to turn on the conveyor Q:100.00. The proximity sensor is connected to the 5V relay. The 5V relay output is connected to the 24V power supply and PLC Input. When the proximity sensor detects a bottle, the NO relay output will be active, so that the PLC input I:0.04, which is connected to the relay in a HIGH state. The PLC output is connected to the 24V relay input. The 24V relay output is connected to the 12V supply to drive the DC pump.

### 3.3 Remote Bottle Filling Module Design

In Figure 8 shows the liquid filling module into the bottle. Where the bottle is moved using a conveyor and stops at the filling position after being detected by the proximity sensor.

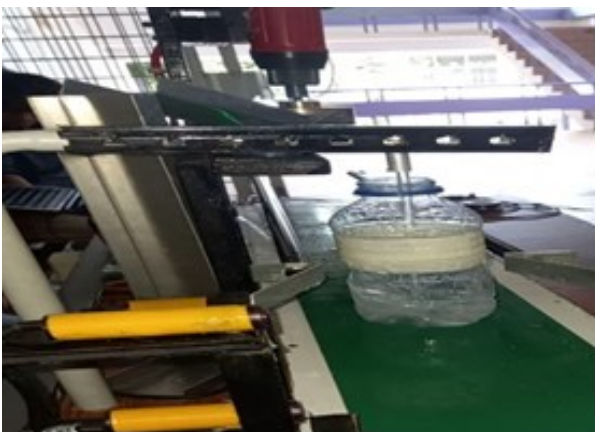
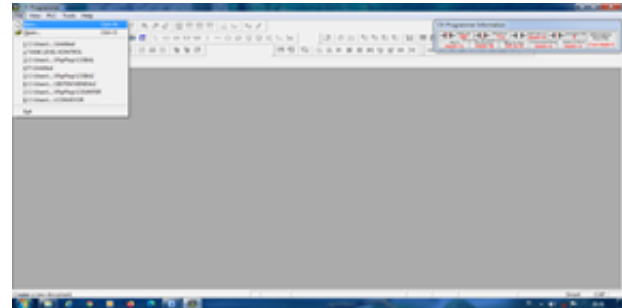


Figure 8: Filling water into the bottle

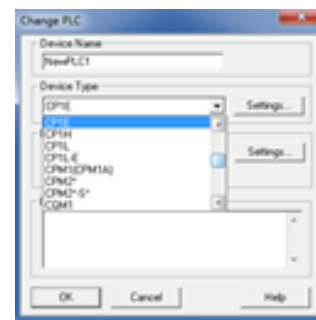
### 3.4 Software Design

In designing this software, it is divided into two parts, namely cx programmer software as the PLC control center and TeamViewer software as remote control and monitoring of tools controlled by the PLC. The CX programmer software design is as follow:

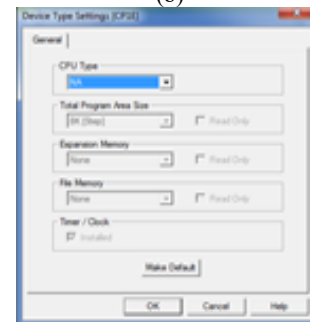
a) Open the cx programmer application and click New on the file menu.



(a)



(b)



(c)

Figure 9: Setting device type PLC

b) Make a PLC ladder diagram program according to the designed input and output circuit, and test the program.

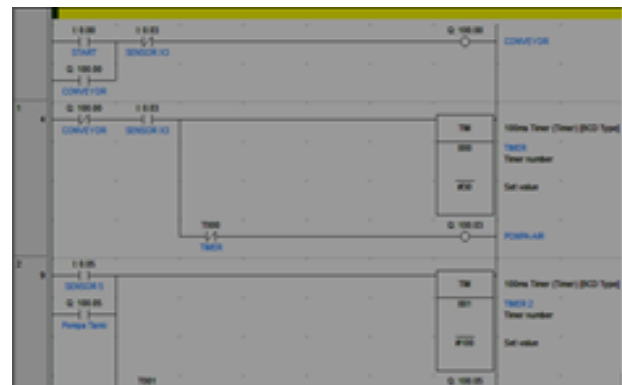
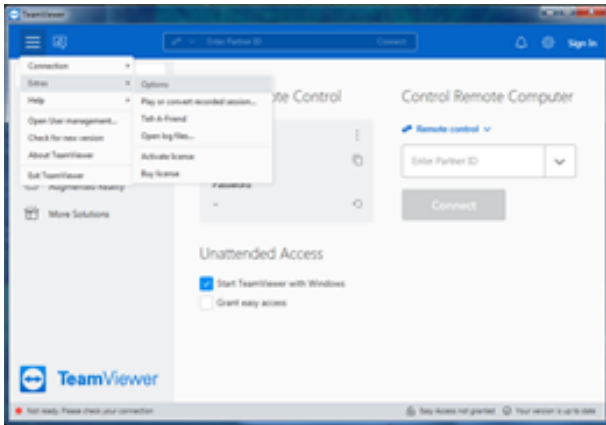


Figure 10: Ladder program



### 3.5 Research Preparation with TeamViewer Software

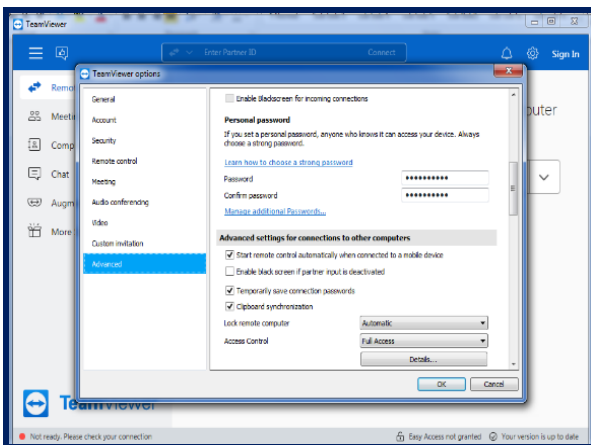
- Download TeamViewer software on computers and smartphones.
- Register a TeamViewer account by using an email account.
- If you want to create a permanent password on TeamViewer, you can do this by clicking Options on the Extras menu, clicking Advanced, then entering the desired password.



(a)



(b)



(c)

Figure 11: TeamViewer permanent password setting menu

- Connect the smartphone and computer using the ID and password in TeamViewer.

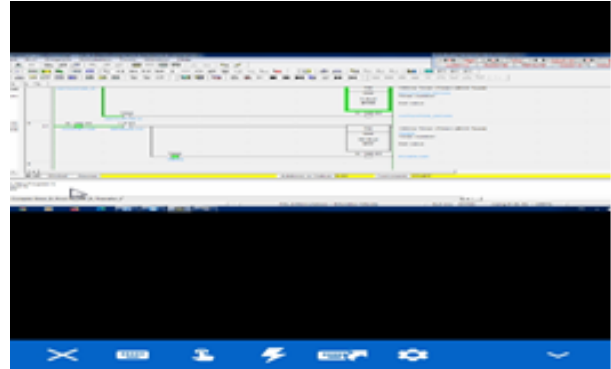


Figure 12: Control program display on smart phone

### 3.6 Test Steps Using Teamviewer

The following are the steps for connecting TeamViewer to a PLC device via the internet:

- Connect the PLC to the PC (interface) using the omron cp1e usb cable.
- Activate internet connection on PC and Smartphone.
- With an internet network that is already connected, then open the Teamviewer application on PC and Smartphone.
- Enter the Teamviewer PC id and password to the Smartphone (wait for a few seconds to connect).

### 4.0 RESEARCH MODULE TESTING

In Figure 13 shows the tested drinking water bottle filling research module equipped with a control panel. It consisted of a PLC, Relay, HMI, and Power Supply.



(a)



(b)

Figure 13: Drinking water bottle filling research module

#### 4.1 Stage 1 Testing

In Figure 14 shows the control program on a PC, the program is connected to a smart phone via TeamViewer, the bottle research module is filled with the result of a delay time of 3.2 sec for the size of 120 ml.



Figure 14: Display of stage I

#### 4.2 Stage 2 Testing

In Figure 15 shows the control program on a PC, the program is connected to a smart phone via TeamViewer, a bottle research module filled with a delay time of 4.0 sec for a bottle size of 200 ml.

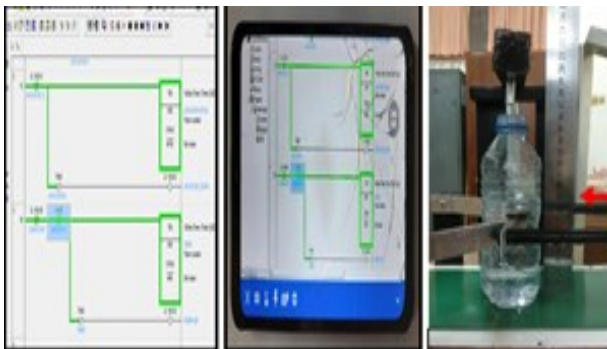


Figure 15: Display of stage II

#### 4.3 Stage 3 Testing

In Figure 16 shows the control program on a PC, the program is connected to a smart phone via TeamViewer, the bottle research module is filled with the results of a 5 second delay time for a bottle size of 300 ml.

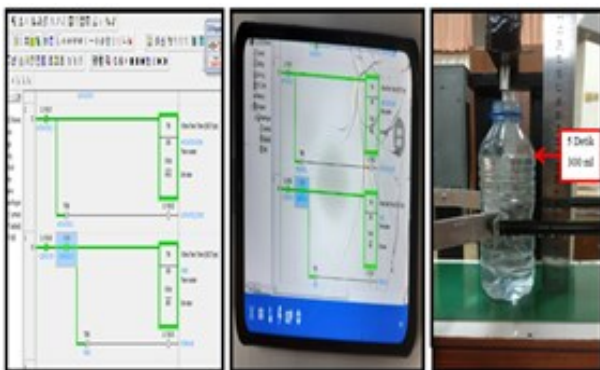


Figure 16: Display of stage III

## 5.0 RESULT AND DISCUSSION

The results obtained from this study are how to control the PLC remotely for the process of filling drinks into bottles. Tests carried out remotely using the Remote Desktop TeamViewer application. The devices used are android, laptop, drink bottle filling module. The laptop must first install the plc cx one application which is used to code the omron plc program and run it. In addition, for remote media, you must install the TeamViewer application on a smart phone using the Playstore [15][16].

### 5.1 Remote Control Steps

a) Download the TeamViewer for Remote Control app on playstore.

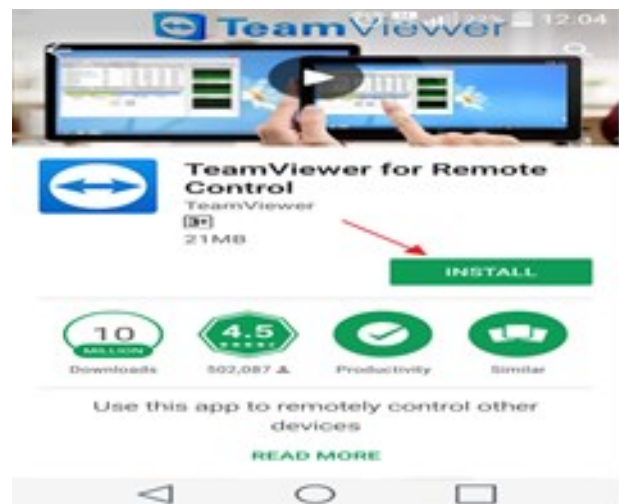


Figure 17: TeamViewer display

b) If it finished installing, please open the TeamViewer application. Just like before, in the Partner ID column, enter the ID of the PC or laptop that want to remote. Make sure the TeamViewer application on the PC or laptop to remote remains open. Then click Remote Control.



Figure 18: ID and Password

c) Enter the password for the laptop you want to remote. The password given by TeamViewer is yes, not a login password or any other password. Then click OK.



Figure 19: Insert password

d) Then, it can do remote PC or laptop directly through the android phone.



Figure 20: Display of remote control

The results of the process of filling drinking bottles that are monitored from a PC are the same conditions as those on smartphones. Likewise, the sensor detects and the object stops right in front of the sensor and the conveyor is off. All these processes can be monitored remotely while the PC and computer are connected with the Omron cp1e USB cable and between the smartphone and the PC have an internet network [17], [18].

### 5.2 Control Program on PC

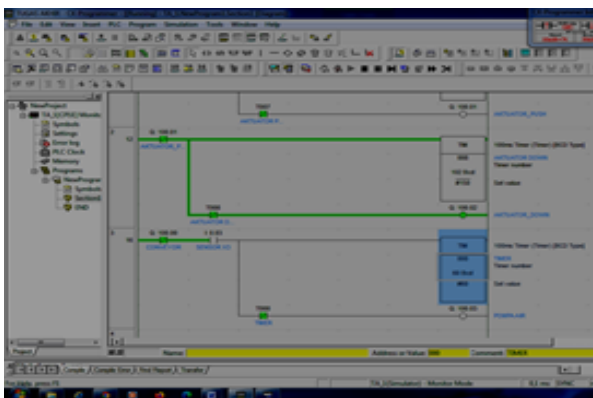


Figure 21: Display of control program on pc

### 5.3 Remote Control Using Smartphone

In this condition the smartphone is far from the location of the device. All filling processes are displayed via a smartphone by reading the ladder diagram of the drinking bottle filling process.

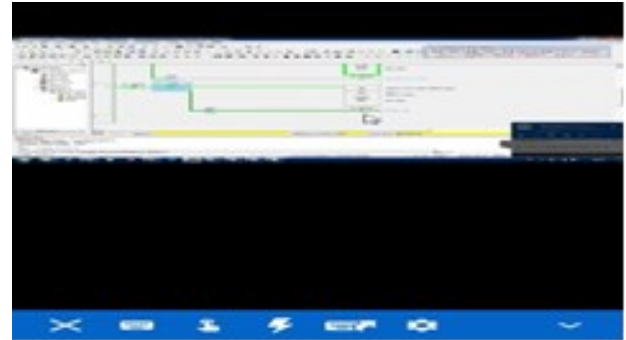


Figure 22: Display program on smartphone

Tabel 1: Results of remote control testing of beverage bottle filling using TeamViewer

Remote android	Seting Program plc Timer (second)	Result	Description
Bottle filling of 120 ml	3.2	120 ml	Succeed
Bottle filling of 200 ml	4.0	200 ml	Succeed
Bottle filling of 300 ml	5.0	300 ml	Succeed

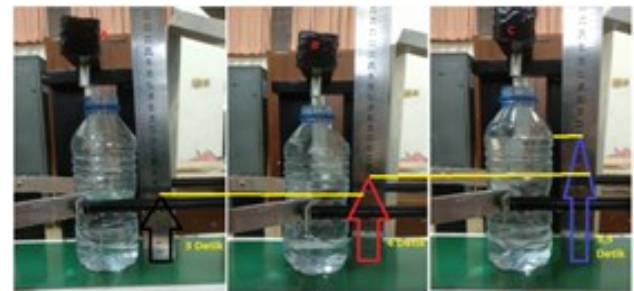


Figure 23: Level control for filling drinks into bottles

### 6.0 CONCLUSION

After completing the design and manufacture as well as testing and discussing the test results of this tool, it can be concluded that:

- The drinking bottle filling process is controlled directly by PLC, the cp1e usb omron cable connected to the PC displays all the processes.
- PLC and PC are connected using a usb omron cp1e cable, also used by TeamViewer to communicate with a PC with a smartphone. So that the smartphone can also display the entire process as it is on a PC.
- Control of the remote bottle filling system using a smart phone with a program timer setting of 2 seconds, 3 seconds or 3.5 seconds, filling 200 ml of water, 300 ml of 350 ml into the bottle was successfully carried out.



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