ENHANCEMENT CONTROL ROBOT PRODUCTION FOOD BASED ON MODULAR AUTOMATION PROGRAMMABLE SYSTEM (MAPS)

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***Abstract**: The purpose of the robot based on Programmable Logical Controller (PLC) in the process industry is to improve yield productivity and improve product quality. Can be achieved by using PLC automatic production process. PLC provides innovative solutions in the direction of industrial automation. These activities include the manufacture of electronic systems components, glass manufacturing, machine parts, quality textile production, metal finishing products, and many others. This paper describes research on robotics design and implementation of PLC-based visual inspection for an a the a production of Modular Automation Programmable System (MAPS) application. A production simulation and visual inspection process were attempted in Robotic Systems Laboratory University Pembangunan Panca Budi, where the results showed PLC-based visual inspection system to determine accurately, which products are acceptable at production speeds at 78 bottles per minute (bpm).*

***Keywords :** robotik, Programmable logical controlling (PLC), kualitas produksi.*

1. INTRODUCTION:

Nowadays, Industrial control systems are widely used in industrial automation, along with other technologies, such as control process control, supervision, distributed control systems, Control theory and Programmable Logic Controller (PLC) [1]. There is no clear boundary between these technologies and their applications. For example, SCADA systems and DCS systems more overlap, so that modern industrial control systems can not be called just an SCADA or DCS systems. The reason for that is that industrial systems are becoming more and more complex, and one that can not be implemented only one technology to meet all needs . also the new development, latency -free communications system, providing the possibility to monitor remotely and control even faster change process [2].

The market needs for new and improved products; industrial systems should be flexible in terms of changes in the production of rapid, on- line repair for life and consists of building blocks that can reuse can implement in other industrial control systems. Also, the control system should be easily scalable to any size of industrial systems [3]. When controlling the rapidly changing process, one of the main tasks is to ensure resilience through redundancy, decentralization, and loose coupling, which brings another set of problems when dealing with communicative IKASI and failure. To achieve all stated above, we have to implement and manage a variety of technologies in a single control system. It can be tedious task by many experts included, can restrict the user [4].

Programmable Logic Controller (PLC) is a special type of computer that is used to control machines or processes. Use of PLC provides various facilities for the manufacturing industry in conducting control on process automation, reduce production costs and increase the number and quality of the product. Always associated with PLC automatic control system in the industry. The main goal is the use of PLC to increase productivity, both to increase the amount of production, production quality, and precision production. On the automation of production systems, human work has been replaced by using machinery, in part or as a whole [5].

Definition of PLC according to the National Electrical Manufacturers Association (NEMA) is a digital electronic device that use memory and can be programmed to keep the direction of a particular function, such as logic, sequence, timing, counting, and arithmetic control a process [2]. Various studies have been done to incorporate PLC with a variety of other applications, such as the visual inspection systems and intelligent systems. Application visual inspection system with PLC -based automatic control system has been widely used in industry, such as the system of electronics component production, glass production, producing printed materials, the automotive industry, and so on [6].

Prior to automation systems implemented in industrial visual inspection systems mostly done manually by humans. Inspection of the human system has many flaws caused by many factors, such as operator fatigue, lack of motivation, experience, skills and others. A visual inspection system in the industry has been effectively replaced by an automated system [7]. This study examines the design and implementation of PLC -based visual inspection system, that is integrated with the bottling system Modular Automation Production System (MAPS). MAPS is a miniature production to bottling process used for the purpose of research, training and learning. Visual inspection systems are used to detect bottles that do not comply with the provisions of quality standards.

2. METHODE DESIGN HARDWARE:

Things to note in this study is the hardware and software used. The hardware consists of a built system:

1. laptop
2. OMRON PLC
3. robot arm
4. Camera Logitec Quick Cam Express.
5. Infrared sensors, magnetic, and retroreflective.

Figure 1 shows the design of the system and the hardware used. While software systems are developed using two types of programs, namely Step7Microwin32 ® and MS Visual C + +6.0 ®. Step7Microwin32 ® program is a platform for the purposes of making a ladder diagram was then used to control the bottling system MAPS (Kurniawan et al. 2006). While the program MS Visual C + +6.0 ® used for visual inspection application design and human-machine interface or Human-Machine Interface (HMI).

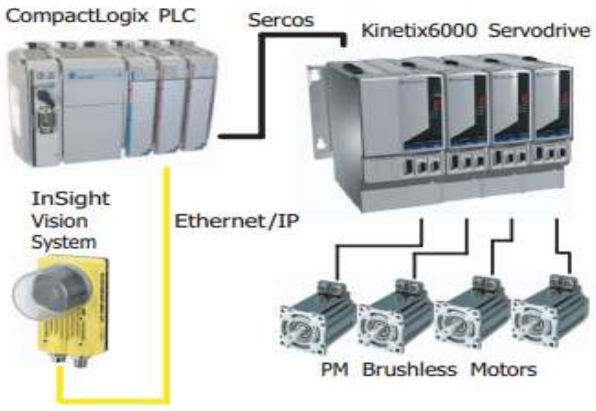

Figure 1. Hardware PLC

3. VISUALIZATION MODELLING SYSTEM:

The robotic vision system is a vision system that has a very complex mechanism. Moreover, if the mechanism is realized vision system into a computer system. In this study, a visual inspection system has been developed to detect defects on the bottle bottling production process. There are several stages in developing a visual inspection system . Figure 2 shows the framework of the software, which begins with the image capture part and going through some parts of the image processing before results can be used to determine the decision.

Catcher Imagery

In a system of visual inspection, image capture is part of the first stage and very important. If there are little imperfections in this section, it can lead to problems in the next stages. Camera type also affects the image of the catch to be processed.

Initial processing

Part of initial processing is the second stage that serves to reduce the noise present in the image of the object and improve the accuracy of the output.

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Figure 2. Design of System Visualization Robot

Computer Communications with PLC Various studies have been done to integrate automated control system using PLC with various other applications. This process can be done by knowing the memory map and the protocol used by the PLC. The protocol is a structure used in a communication system, which led to equipment can communicate with other devices. A protocol can also be interpreted as a set of rules that give the order to the exchange of data via a communication or network. Protocols used by the Siemens S7 - 200 PLC is protocol Point to Point Interface (PPI). PPI protocol establishes the rule that the communication between Siemens S7 - 200 PLC with other equipment using serial communication. Participated also explained that the process of sending data between Siemens S7 - 200 PLC with other equipment in the form of a sequence of bytes in the packet. Then the protocol will translate the data from each of these packages.

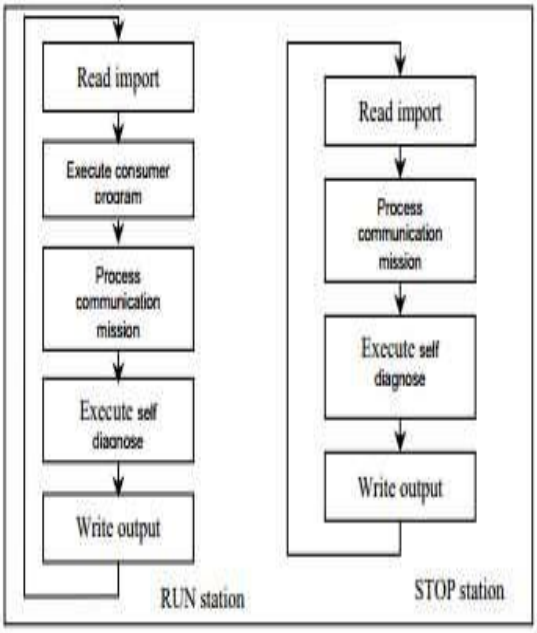

Figure 3. Flow systems design robotic visualization

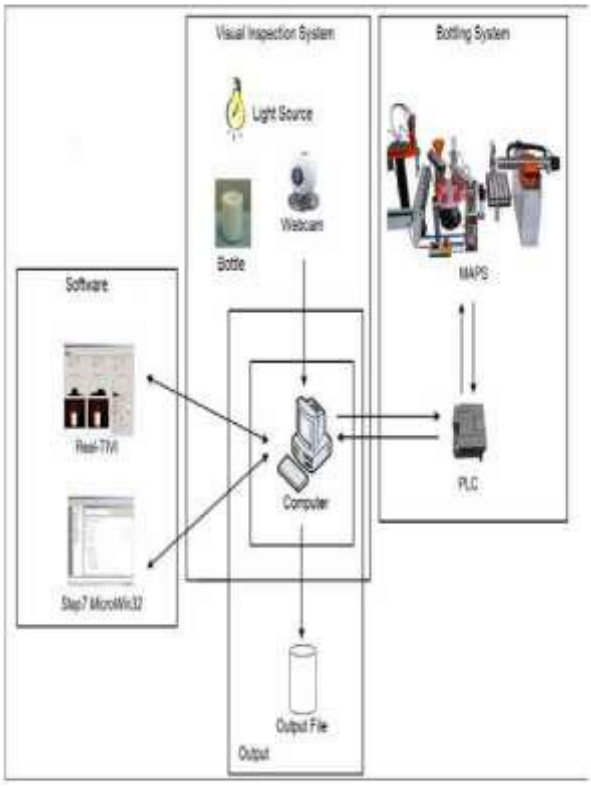

Figure 4. System for connection between PC to PLC

4. RESULT AND ANALYSIS :

Implementation and testing of visual inspection systems at MAPS bottling system has been carried out in the Laboratory Universitas Pembangunan PancaBudi Medan. A predetermined layout must make preparation and any hardware equalizer settings.

A web camera is a placed at a distance of 16 cm from the inspected object. While halogen lamp place at a distance of 30 cm from the object. Figure 6 shows the layout and arrangement of the hardware used in the test.

Object inspection using a bright white plastic bottle measuring 3.5 cm high and 3 cm wide. As background objects place dark construction paper (black). If established standards inspect the bottles, then the bottle is passed to the next process. If the size of the bottle does not conform to the standard, then the PLC will respond by moving the actuator to reject the bottle.

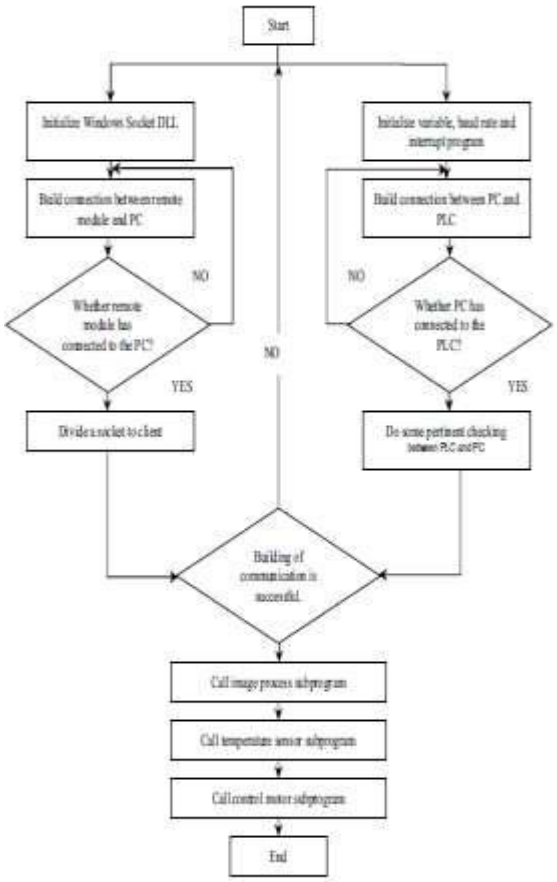

Figure 5. Procedure testing program

Once the layout and system settings are implemented then, the testing phase can be implemented. Table 1 shows a summary of the results of the reading test visual inspection system

.**Table 1.** Value of item research

Value (piksel)	leght (piksel)	Notification
75	85	Accept
78	84	Accept
77	86	Accept
77	86	Accept
76	86	Accept
75	85	Accept
76	84	Accept
78	86	Accept

75	86	Accept
66	95	Reject
88	99	Reject
90	100	Reject
85	98	Reject
89	97	Reject
73	95	Reject
79	95	reject
88	97	reject

In this study has been conducted testing of the system with sample 1040 plastic bottles. The test results showed that the overall visual inspection system that was developed to detect objects at speeds 185 bottle per minute (bpm) and 96.7% accuracy inspection.

5. CONCLUSION AND FUTURE RESEARCH:

This paper has presented technical analysis for the implementation of robot control system, can be applied in the food industry. This system has realized use commercial components, especially using PLC with integrated motion control functions, drive servo system for brushless PM motors and intelligent vision systems based on the concept of integrated camera with PLC design of this system can also be modified and implemented for quality control in the production process, such as automotive manufacturing , electronics industry, drug processing , and many other applications. And further research may be able to increase the future by looking at the following issues:

• obstacles to using Programmable Logic Controllers (PLC)
• minimization of costs: PLC preferred cheaper and more powerful systems;
• the openness of the architecture: end - user should be able to modify the control program, using specific modification PLC and Integrated Development Environment (IDE) is always possible.

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