Modification of Cycle Time Setting System from Over Head Conveyors Using the PLC

Syahril Ardi, Widya Pramudya Hartantyo
Manufacturing Production and Process Department
Politeknik Manufaktur Astra, Jl. Gaya Motor Raya No. 8, Sunter II, Jakarta 14330, Indonesia
Email: syahril.ardi@polman.astra.ac.id

Abstract

Conveyors are used to distribute components or modules of components from one place to another. On the line assembling PT XYZ means used to set the cycle time of the conveyor, by changing the frequency contained in the inverter, while the time is calculated by using a stop watch. This situation resulted in setting it up can only be done by certain people and requires a relatively long time. In addition, the cycle time that is set can not be recorded. With this issue, we modify the system to adjust the conveyor cycle time by using the programmable logic control (PLC). Modifications to the conveyor system by adding a thumbwheel switches are used as input of the PLC, and add modifiers output from the PLC to turn into the form of Resistance. With this modification is changing the value of the desired cycle time becomes easier, faster and cycle time can tell who is being operated.

Keywords: cycle time, programmable logic control, conveyor, inverter

I. INTRODUCTION

PT XYZ is a company engaged in the manufacturing industry, namely the two-wheeled motor vehicle industry. PT XYZ has been producing several products with different types. In order to meet production demands, then the PT XYZ seeks to produce components that are used locally in order to reduce procurement costs. Each component is produced has undergone several processes. The processes contained in PT XYZ covers the process of casting, plastic injection, painting, plating, welding, machining, PPC, assembling and other processes.

In this research, we took the themes contained in section process, especially in the process assembling the frame assy. The Assembling section is a center or the delivery destination of the previous sections to be assembled into a single product. So assembling section is a section that governs all activities of the assembly of components or modules of components into a unified product. The assembly of these components carried on a conveyor with tools that most of the amount of impact.

Cycle time is the interval of time specified by the work area of each station. The size of cycle time is controlled by the conveyor system. Therefore if we want to know the size of cycle time, we should be able to regulate or control the conveyor [1].

On the line assembling XYZ means used to set the cycle time of the conveyor, by changing the frequency contained in the inverter, while the time is calculated by using a stop watch. These circumstances lead to the setting that uses a specific inverter can only be done by certain people and requires a relatively long time. Addition of the cycle that has been setup time is not recorded. Looking at the context, we make modifications to the system to adjust the conveyor cycle time by using the programmable logic control. Formulation of the problem in this study is how to modify your system setting over head conveyor cycle time using the PLC, and the benefits after using a modified system setting over head conveyor cycle time.

II. METHODOLOGY AND DESIGN

Cycle time conveyor control system serves to control the course of conveyors that have an impact on controlling the cycle time of the conveyor. In the control system of cycle time, the limitation which have made between 15 seconds until 30 seconds. Why be limited 15-30 seconds? These are because:

- Lower limit (15 seconds), because the maximum capacity of a mechanical conveyor system cycle time is 15 seconds.
- The upper limit (30 seconds), the upper limit of 30 seconds due to the conveyor always runs under 30 seconds cycle time.

Conveyor control system cycle time can be used on two conveyors in the conveyor PT XYZ, i.e. over head conveyor line A and over head line B. This is because its structure and mechanics of the two conveyors are electrically the same.

Work flow of the system as a whole is a thumbwheel input device switch, to provide input data to a binary number to the PLC. Then the PLC process data in accordance with the existing program in the PLC then provide output to the system modifier in order to form resistance to change which is then used as input by the inverter.

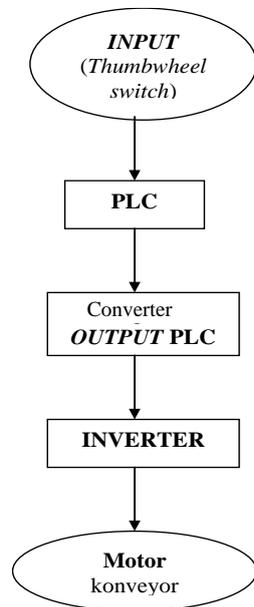While the inverter serves to control the conveyor motors. Figure 1 shows the workflow of this system.

Figure 1. Flowchart of cycle time setting system

From Figure 1 above can be seen that the thumbwheel switches provide input to the PLC. Then the PLC process data in accordance with existing program it. Output from the PLC is used as the input of the converter output as the input of inverter PLC. Output from the PLC to be converted into a form of resistance due to the input of inverter one of them is in the form of resistance (10 kΩ). The inverter is a device that controls the motors on the conveyor path [5].

Thumbwheel Switch

Thumbwheel switches produce output in the form of hexadecimal numbers 0-9. The PLC input device used to have 12 bits, and then use 3 pieces of a single thumbwheel switch thumbwheel switch is has 4 bits. Output from the thumbwheel switches are used as input device by the PLC to the source data. The output of the BCD thumbwheel switches in the form [3, 6].

PLC

The input device of the PLC in binary form, then after getting input from the thumbwheel switches, in order to remain in the form of BCD numbers to be converted back into BCD form. This is because all the programs in the PLC using the BCD form.
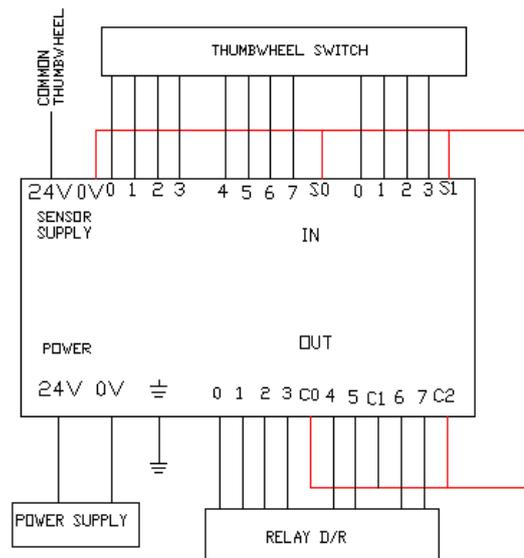

Figure 2. Wiring of PLC Festo FEC-20-DC

Process Flow of PLC Statement List for the Cycle Time Setting Conveyor System

Figure 3 shows flow process of statement list. From this it is known that PLC input device in binary form is converted into BCD form. Then the data or the value derived from the input into the limit or limits specified, if the value provided by the thumbwheel switches into these limits, then the value will go into a mathematical formula derived from the data output device and then into the PLC.
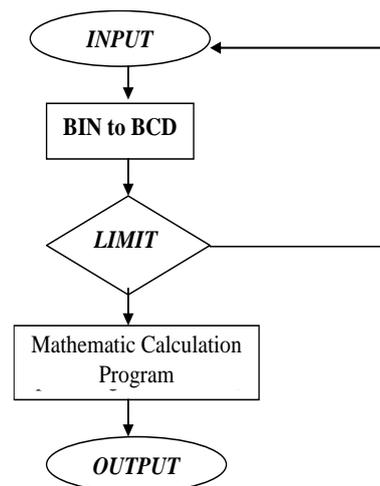
Gambar 3. Flow process of statement list

Statement List PLC for Conveyor System Cycle Time Setting

In the PLC can not read the numbers behind the comma, so the data derived from the input multiplied by 10. For example, 15.0 points converted to 150. This is because the ability of PLC maximal reading is from 0 to 65535 (PLC specification). Graph of cycle time and the voltage is divided into 3 different arithmetic formulas [2, 4]. Figure 4 shows the list of program flow statement cycle time on the conveyor system over head.
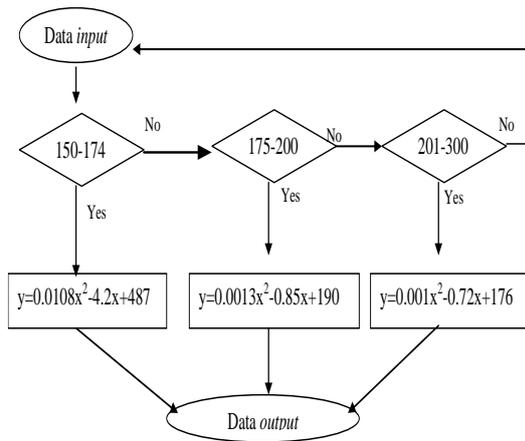

Figure 4. STL (statement list) program flow diagram

From Figure 4 on the STL was then made in the program in the PLC. Here is the STL of cycle time on the conveyor system over head.

III. RESULTS OF TESTING

The results of the manufacture of conveyor systems setting the cycle time in the form of electrical panel, then in testing on over head conveyor line B PT XYZ. Table 1 shows the data the system test results are taken manually using a stopwatch. Error tolerance is given for the trial of this system is ± 1 second.

Table 1. Trial data control system cycle time (CT) over head conveyor line B

$CT_{setting}$ (second)	CT actual (second)				
	I	II	III	Averages	*error*
15.0	15.06	15.07	15.2	15.11	0.11
16.0	16.15	16.16	16.21	16.17	0.17
17.0	18.28	17.36	17.13	17.59	0.59
18.0	18.18	18.13	18.97	18.43	0.43
19.0	19.44	19.36	19.25	19.35	0.35
20.0	20.3	20.07	20.85	20.41	0.41
21.0	21.33	20.98	21.45	21.25	0.25
22.0	22.25	22.21	22.01	22.16	0.16
23.0	23.22	23.13	23.49	23.28	0.28
24.0	24.52	24.12	24.25	24.30	0.3
25.0	25.13	25.05	25.45	25.21	0.21
26.0	26.37	26.05	26.25	26.22	0.22
27.0	26.99	27.15	27.25	27.13	0.13
28.0	28.35	28.1	28.15	28.20	0.2
29.0	29.13	29.19	29.98	29.43	0.43
30.0	30.02	30.33	30.15	30.17	0.17

The results of trial data shown in the Table 1, it is known that the average yield of three experiments carried out an error or deviation of 0.59 seconds is the largest and smallest deviation of 0.11 seconds. The results are as expected for a given tolerance for error is ± 1 second. This tolerance is given to keep the total distortion produced by a conveyor system and the system cycle time setting.

From the above data cycle time setting can be recorded on a thumbwheel switch. In addition, to changing the cycle time of the cycle time of the cycle time to another is easier and faster. To change the cycle time just change the value indicated on the thumbwheel switches to the limit applies.

IV. CONCLUSIONS

Modification of cycle time setting system from over head conveyors has done by adding thumbwheel switch as input PLC, in which the PLC output is converted in the form of resistance. After testing on over head conveyor, producing the largest average error is 0.59 seconds and 0.11 seconds the smallest error. This error is still within the given error tolerance is ± 1 second.

Modification of cycle time setting system in changing the value of the desired cycle time becomes much easier and faster cycle time and can figure out who is being operated.

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