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Implementasi Sistem Kontrol Level Transmitter Pada Tangki FA-150

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ABSTRAK

Instrumentasi merupakan alat yang sangat penting dalam sistem pengukuran, salah satunya adalah untuk mengukur ketinggian permukaan cairan. Alat ini harus dapat berfungsi dengan baik sesuai dengan persyaratan instrumentasi dari pabrik. Alat instrumentasi ini merupakan salah satu penentu hasil produksi, yang digunakan untuk mengukur, mengontrol, mengenali dan menganalisa baik secara manual maupun otomatis. Alat yang digunakan pada penelitian kali ini yaitu *Diferential Pressure Type* (DPT). PT Sintas Kurama Perdana menetapkan nilai Range harus berada pada range 0% - 100%, input 4-20 mA, input pressure adalah tekanan yang dihasilkan (incH20), input terendah rentang adalah 0, rentang input di area kerja pemancar, rentang output harus 100% tekanan yang dihasilkan (incH20), rentang output terendah adalah 4 mA. sistem kendali pada FA-150 di PT. Sintas Kurama Perdana pada *Level transmitter* pada tangki FA-150 yang digunakan di PT. Sintas Kurama Perdana menggunakan sistem loop tertutup yaitu pada *feedback.*

Kata Kunci : **Transmitter, Kontrol, Tangki, Tekanan.**

IMPLEMENTATION OF TRANSMITTER LEVEL CONTROL SYSTEM ON FA-150 TANK

ABSTRACT

Instrumentation is a very important tool in the measurement system, one of which is to measure the height of the liquid surface. This tool must be able to function properly in accordance with the instrumentation requirements of the manufacturer. This instrumentation tool is one of the determinants of production results, which are used to measure, control, recognize and analyze both manually and automatically. The tool used in this research is Differential Pressure Type (DPT). PT Sintas Kurama Perdana sets the Range value must be in the range of 0% - 100%, input 4-20 mA, input pressure is the resulting pressure (incH20), the lowest input range is 0, the input range is in the transmitter work area, the output range must be 100 % of the resulting pressure (incH20), the lowest output range is 4 mA. control system on the FA-150 at PT. The Kurama Perdana Syntasy on the Level transmitter on the FA-150 tank used at PT. Kurama Perdana Syntasy uses a closed loop system that is on feedback.

***Keywords* : *Transmitter, Control, Tank, Tekanan*.**

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I. INTRODUCTION

Instrumentation is a very important tool in a measurement system, one of which is measuring the height of the liquid surface, this tool must be able to function properly according to the instrumentation needs in the factory. This instrumentation tool is one of the factors that determine production results, where instrumentation tools measure, control, detect, analyze, both manually and automatically. Electrical differential transmitter is one of the control process instrumentation found in a factory [1]. The electric differential pressure transmitter is a sensor that is used to measure the level of the liquid level (level in the tank) as a tool to be read to the controller to the final setting. Every process always has an ongoing state. In order for the desired state to be the same as the current state, control must be carried out by requiring a measuring device.

The description of the problems obtained before designing the instrumentation measuring the level of the liquid level in the tank using an electric differential transmitter and the installation of measurement instrumentation in each position. In order to obtain accuracy or accuracy in providing the desired results. The importance of controlling the role of measuring the height of the liquid level in a tank using an electric differential transmitter in the process system, it is necessary to take steps so that the measurement of the liquid level in the tank is in accordance with the actual situation, by knowing the high level of the liquid in our tank. can control it to suit the needs [2].

This research was first conducted at PT. Sintas Kurama Perdana. PT Sintas Kurama Perdana is the first and only producer of formic acid in Southeast Asia, built with the aim of meeting the needs of the domestic formic acid market which previously depended heavily on imported products. PT. Sintas Kurama Perdana produces formic acid using advanced technology so that it is able to produce high quality products to supply the needs of the world and industry in Indonesia, such as the leather, textile, rubber, cleaning materials, pharmaceutical and others industries.

II. RESEARCH METHOD

The method used in making the system transmitter level control on Tank FA-150 is:

1. Manufacture of measurement and control system design FA-150 tank.
2. Measurement and control system design
3. FA-150 tank in instrumentation diagram form as shown in figure 1. Determining the engineering unit scale for temperature and all transmitters (level, flow, and pressure transmitters). Input analog signal on the PLC will be calculated and converted into digital data according to the working range of the scale engineering unit used. This stage too calibration of the I/O module PLC with a standard calibrator and multimeter.
4. Designing alarm system and safety interlock system on tank FA-150 with ladder diagram program.
5. Designing the working principle of level measurement, cooler temp., heater temp. control mode and Configure start-stop system with program ladder diagrams.

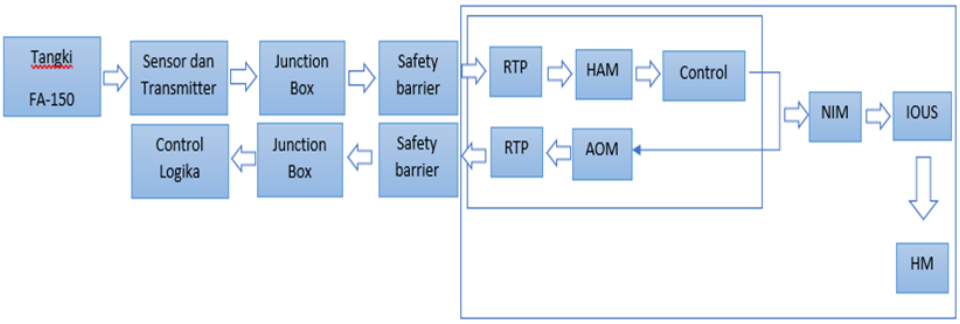

Figure 1 Control System Diagram

This method acts as a reference of experimental data and experimental data, and data collected based on direct observations in that area. From simulation data, data is processed and analyzed to complete the result of the star delta experiment. If the start strip value is still relatively high, it is still possible to find an efficient value, and then the data calling step is performed again.

III. RESULT

A. Transmitter Level On Tank FA-150

At PT. Sintas Kurama Perdana uses a closed loop system in the operation of the level transmitter control system on the FA-150 tank. The closed-loop system has feedback based on the basic theory, from the closed-loop system the feedback is obtained as information that can be obtained, the information is in the form of current, the current here belongs to an analog signal, from that current we can know the state of the level that occurs in the FA-150 tank. The FA-150 tank has a diameter of 2.5 meters and a height of 5 meters, this tank is a storage place for methanol from the AT-460. From the tank which contains the final chemical liquid that has been previously processed, the liquid has a level that must be maintained in its height or range.

The level that must be maintained in this tank is a maximum limit of 60% in a running process state, a maximum limit of 80% in a shutdown or stopped process, and has a minimum limit of 30% of the liquid in it. The level in the tank must be maintained so that it does not exceed the maximum liquid limit and does not exceed the minimum liquid limit, if one of these occurs it will damage the instrumentation tools and disrupt the production process.

B. Transmitter level performance analysis

The level transmitter system on the FA-150 tank works in a closed loop way, a closed loop system is used in the control process at PT. Prime Kurama Survival. How the level system works is described in figure 2 below:

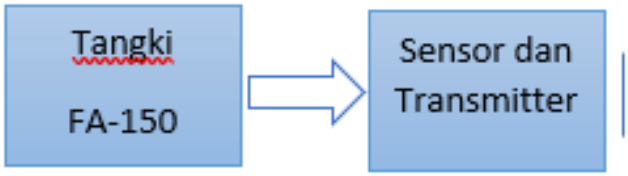

Figure 2 Tank Block Diagram to Sensor and Transmitter

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The level transmitter contained in the FA-150 tank, serves to maintain the level range of the methanol liquid contained in the FA-150 tank, the level uses a Differential Pressure Transmitter (DPT) sensor. The DPT sensor works by using pressure, this pressure occurs because of the vacuum in the FA-150 tank. The tank used is closed and produces air pressure as input to the DPT sensor.

The DPT sensor will produce an analog signal, the signal is used as an input to the EJA 100E transmitter, the transmitter has a CPU assembly component that functions to convert analog signals into currents. The current generated by the transmitter is 4-20 mA, if the output current is 4 mA, it indicates the liquid level range in the tank is low or within the specified minimum limit and 20 mA indicates the liquid tank is full or the maximum limit has been determined according to Figure 3.

Figure 3 Input to the EJA 100E Transmitter

The current generated from the transmitter will pass through the Junction Box (JB), Junction Box (JB) as a terminal for instrumentation cables, the cable carrying the transmitter output current is protected with a Safety Barrier (SB) so that the current carried if it is affected by interference is not affected or remains stable . Cables that carry analog signals after passing through the Safety Barrier (SB) then to the Process Manager (PM) in this stage, the current will be processed and will be selected from noise. Analog currents and signals that have been processed by the Process Manager (PM) will enter the Network Interface Module (NIM) in this component, the function of which is to convert analog signal currents into digital signals.

After changing the NIM signal, it will be processed into a percentage by the Universal Open Station (IOUS), the IOUS shown in figure 6 will display on the monitor the percentage of the FA-150 liquid in the field. After the percentage level data in the field appears on the monitor, the data will be stored in the History Module (HM). The function of HM is to store the previous level percentage data, when the data contained in the HM wants to be used only calls through IOUS.

Figure 4 IOUS Display Monitor

On the monitor screen there is the role of a production operator who is in charge of running the control system and also determines the Set Point (SP) or process limit of 60%, lower limit of 30%, and very low limit of 10%, upper limit of 67% and 70% by setting an alarm. , checks on the monitor in the state of the level that occurs in the FA-150 tank. If there is a percentage on the monitor screen that there is liquid at a predetermined low limit, then DCS automatically gives input to open the control valve slowly adding liquid to the FA-150 tank and DCS always keeps the level within safe limits. The liquid must not exceed the minimum limit, if it exceeds the safe limit or the minimum limit, if it exceeds and is less than the specified limit it can damage components and disrupt production.

C. Determining the Transmitter Level Range

In determining the range, you must first determine the maximum height and minimum required range. After that, look for the density of the liquid to be calculated. When all is known then enter it based on the pressure formula. At PT. The Kurama Perdana range required to calculate the maximum level of liquid required is 60% when production is on, 70% when production is shutdown, and 30% is the minimum level of liquid in it. The liquid in the tank is methanol, the density of methanol is 7.92 kg/cm³. The following steps to determine the range in the level based on the pressure formula, equation (1) is used

D. $P = \rho\ g\ h$.....(1)

Then based on calculations using this formula, the FA-150 100% full tank limit value is 1.559 inH20, the FA-150 tank empty limit is 0% 0 inH20, the maximum limit when on process 60% is 0.932 inH20, the maximum limit when the shutdown process is 70 % of 1.089 inH20, the minimum limit of liquid in the tank 30% is 0.466 inH20 and the minimum limit of liquid in the tank 10% is 0.152 inH20.

E. Pressure conversion

Vision and Mission are important for a company because it is the first step to realize the ideals and hopes of a company, therefore PT Sintas Kurama Perdana decides and sets the company's Vision and Mission as follows: Where the Range value must be in the range of 0% - 100%, input 4-20 mA, pressure input is the resulting pressure (incH20), the lowest input range is 0, the input span is in the transmitter work area, the output span must be 100%

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pressure generated (incH20), the lowest output range is 4 mA. The data obtained from the pressure formula are as follows:

Table 1 Indication to Transmitter Input

DCS Indication	Input Transmitter (incH20)
0%	0
10%	0,152
30%	0,466
60%	0,932
70%	1,089
100%	1,559

If based on the data above where when the current is 5 mA, the DCS indication of the existing liquid level is 0%, when the current is 5.55 mA, the DCS indication of the existing liquid level is 10%, when the current is 8.78 mA, the DCS indication of the existing liquid level is 30% , when the current is 13.56 mA, the DCS indication of the liquid level is 60%, when the current is 15.17 mA, the DCS indication of the liquid level is 70%, and when the current is 20 mA, the DCS indication of the liquid level is 100%.

IV. CONCLUSION

From the results of the discussion about the implementation of the level transmitter control system on the FA-150 at PT. Sintas Kurama Perdana, several conclusions can be drawn, namely the control system or control system is a system consisting of several system elements that have the aim of regulating or controlling a process to obtain a desired amount. The level transmitter on the FA-150 tank used at PT. Sintas Kurama Perdana uses a closed loop system that relies on feedback.

The sensor used at the FA-150 tank level transmitter uses a Differential pressure transmitter (DPT) sensor. The specified range in measuring the transmitter level is 30% in the minimum limit, 60% in the on production limit and 70% in the shut down production. The current generated by the transmitter is 4-20mA, the minimum limit is determined by the current 4 mA and the maximum limit is determined by the current 20mA.

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