ISSN : 1978-774X

EMS-SCADA DESIGN OF AC USAGE ON A BUILDING

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ABSTRACT

Energy Management System (EMS) is the page to limit use of energy in conjunction with the possibility more investment toward Building Automation Control. In the management technology application automation is intended to restrict use of energy electricity in a building so that there was no waste. This time the Supervisory Control and data acquisition (SCADA) is used to monitor, control and store data to the database is real. Along with the growing needs as well as reporting process to data, so it would be needed SCADA system that is able to make reporting data regularly and automatically. On the paper work is designed as EMS-SCADA using Active Factory and Generic Data Grid. Design result will be able to help the succession in an attempt to find a data on a real and historical. This system has saving electricity power of 360 KW or around 28.57 percent every day.

***Keywords**: EMS, SCADA, Active Factory, and Generic Data Grid*

1. INTRODUCTION

Currently automation system not only played a role that is very important in the world industry, but also in the management system electricity (Groover, 2007). Energy Management System (EMS) is the page to limit use of energy in conjunction with the possibility more investment toward Building Automation Control (Santoso, 2013). Demand of the EMS from year to year is very increasing. This is due to rising demand electricity and government's desire to save energy. To restrict use of electricity in a building required the use of automation technology for the management electrical energy so that there was no waste (Doukas, 2007). SCADA is control system computer-based that are used to controlling a process such as industrial processes on manufacturing, production and power generator (Deshpande, 2014). To increase the data reporting to need EMS-SCADA that has the ability to report on data regularly and automatic which is useful for decision-making? This can be realized with the Active Factory as software to process the reporting data regularly both real and historical and with Wonderware Generic Data Grids to process the reporting data automatically. Design like this has already done by Suryanjaya (2010), but reporting data has not been done regularly and process data is not automatically (auto-print). This design has done as device of EMS-SCADA of Air Conditioner (AC) in a building. The implementation of this design could be reducing the electricity power usage and to save reporting process data with easily and quickly so that it help to the management.

2. EXISTING SYSTEM

The existing system still manual and it is not exist the limitation electricity usage. There are currently 42 AC which are divided into 14 rooms that are still using manual system to switch on and off. There are three types of air conditioner used, namely 1PK, 3PK, and 4PK (see Table 1) and sketch building can be shown in the Figure 1. Based on the survey found that the total of power electric needed for all the buildings are 90 kW and use AC in system is 14 hours from 07.00 am - 21.00 pm.

Table 1 Estimation Power all AC

No.	Type	Number	Power (kW)	Power (kW)
1	1PK	12	0.75	9.00
2	3PK	12	2.25	27.00
3	4PK	18	3.00	54.00

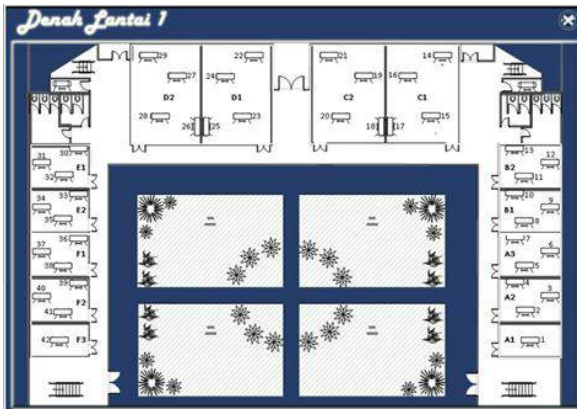

Figure 1. Sketch Building

3. RESEARCH METHOD

Scenario process in existing system can be shown in the Figure 2. In general scenario process is as follows:

1. Supervisor or operator open SCADA pages where there are already multiple interfaces that can help to monitor and control the system operations.
2. Supervisor or operator login username and password before entering the system. If the username or password is entered incorrectly then they cannot enter the system.
3. Supervisor or operator can enter the system by pressing the Enter key on the HMI and they can choose manual or automatic modes. In the automatic mode must enter the room on the floor, after which it filling the form each room with range of time that you want to run the AC. The manual mode is the process of controlling and setting the AC directly on the panels are already available without any time input to turn it on.
4. In the manual, supervisor or operator to turn on and off the AC by pressing the switch on and off in the HMI.
5. In the automatic, the supervisor or operator can turn on and off the AC by entering the time use of the room on each group and temperature sensor will detect the room temperature. If the time on the PLC according to the time the input, then the PLC would wait for the results of the temperature measurement by temperature sensors. If the temperature is more 23^0C then it turn on, if both of these conditions are not met then it will not turn on.

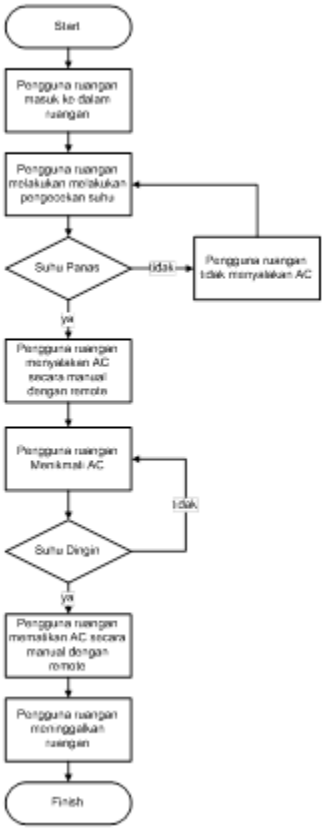

Figure 2. Scenario Process in Existing System

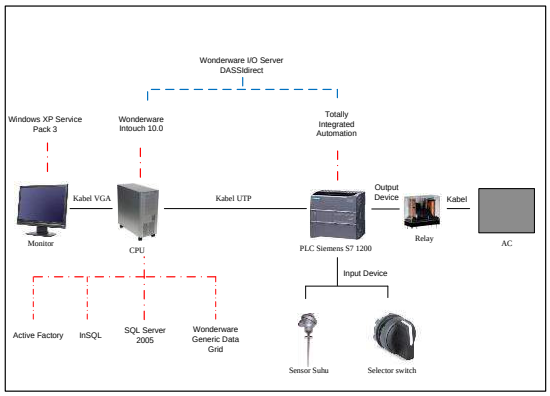

Figure 3. Identification System Requirements

Figure 3 demonstrate identification system requirements. The design of automation systems is inseparable with a need for some components. The design of the system on this research requires automation components such as sensors, actuators and PLC and personal computer equipped some software. The temperature sensor is used to detect the room temperature in the building while the actuator is used to relay that

serves to pass on or disconnect the current to the AC. The Sensor and actuator are controlled by PLC. The PLC used was Siemens PLC S7 1200 that will be given by the software program of Totally Integrated Automation. System monitoring would be done by utilizing the Human Machine Interface (HMI) that will be created by using Wonderware In touch 10.0. In the design of this system required a computer with Windows XP SP3. It also required software for the design of the Wonderware In touch 10.0, Active Factory 9.2, Active X Wonderware Generic Data Grid, Wonderware, SQL Server 2005 I/O Server DASSI direct, and Totally Integrated Automation (TIA). All hardware that is used as a conduit transmission needs between devices. UTP cable required with RJ 45 for liaison between switches with the server computer, the client computer and PLC. Sensors and actuators connected to a PLC by using cables. The flowchart of the EMS-SCADA that is designed can be seen in the Figure 4. First stage design begins with a scenario process setting AC based on program logic that was planted in a PLC. Then made the SCADA design that consists of the design HMI, tag name program PLC, simulations plant, and database. Design is divided into two systems, i.e. monitoring and controlling. Monitoring system will be done by a computer with the help display HMI. Simulation plant that connected directly with PLC and database that can monitor the happened process in real time. Control system will be done by the program in PLC which has been adapted with scenario process and can be done on display HMI that has been integrated with PLC. Figure 5 shows a model conceptual design. Active Factory is software from Wonderware which is designed to present the data process quickly and accurately. Data process could be shown in Microsoft Word and Excel with the configuration each of them. This data can be obtained from HMI and PLC, and then put into the database SQL Server automatically through SQL. Figure 6 is the EMS-SCADA scheme process. Figure 7 shown structures HMI in the EMS-SCADA.

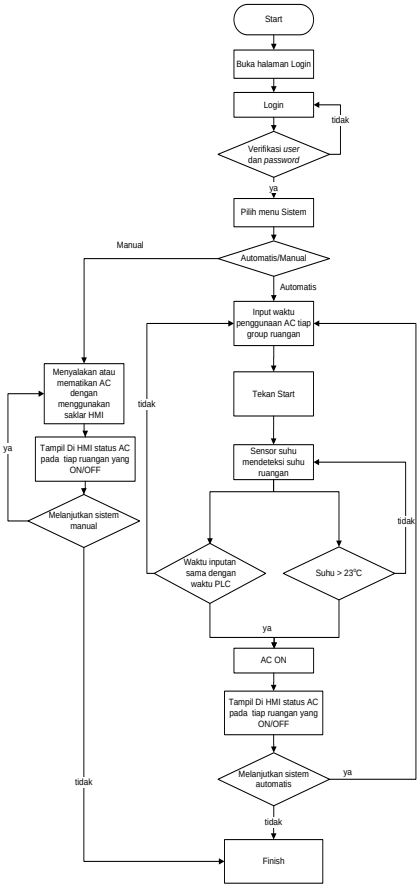

Figure 4. The flowchart of the EMS-SCADA that is designed

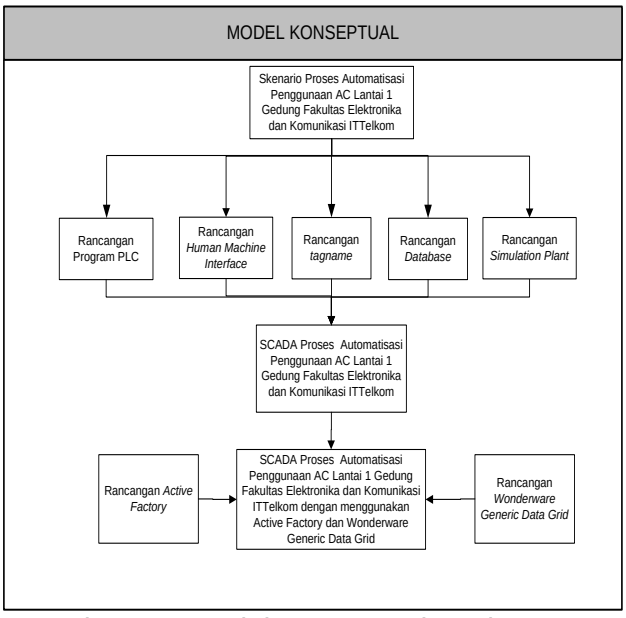

Figure 5. Model Conceptual Design

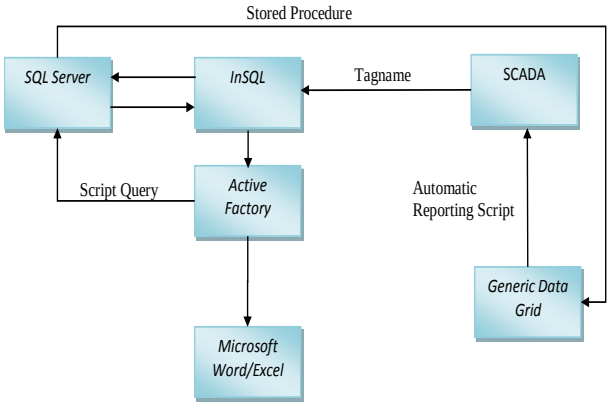

Figure 6. EMS-SCADA Scheme Process

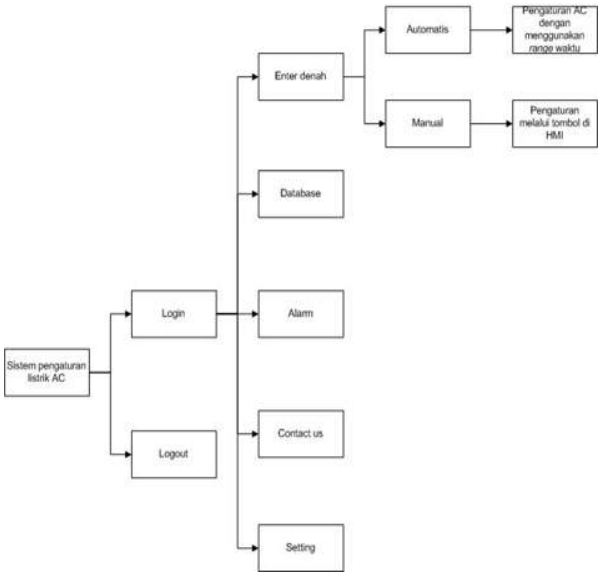

Figure 7. Structure HMI in as EMS-SCADA

4. RESULT AND DISCUSSION

Program PLC has been made contains four functions, namely Convert, Group, Temperature and Pause. Function Convert containing about conversion program from type of data that is defined. In Function Group there are some programs which defined, such as compare time PLC with input from each session, logic In touch each program for the group and room, the conversion censorship analog and logic program to AC automatically or manually. Function temperature explained about the process of conversion value of sensors integer values to analog. The value is produced, namely tag temperature read is a logic, which is used as feedback when AC will switch off. Function Pause explained about break time between Group 1 to 6. Calculating process interval was traveling between groups when one of the markers group active. The interval started to count from Group 1 until 6 during each 10 seconds, and then Users can monitor and control all activities through a computer to the menu window HMI as shown in the Figure 8.

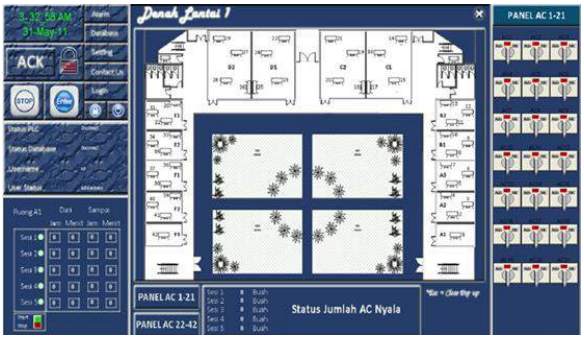

Figure 8. Sketch HMI Look on as EMS-SCADA

Figure 9 shows an example design result reporting data of the AC usage in the EMS-SCADA. Variable Tag name is used as triggers to display a database with a method custom query. Database using method custom query will be more complicated because there were too many script that must be made. But, with the software is a problem of making script can be addressed. Because this software can make a script himself after we configure tag name that were selected and of course database SQL Server has connected with SCADA. This is made some benefits from the Active Factory.

Figure 9. Reporting Result Data on EMS-SCADA

In reporting process data is as follows:

1. The decision-making can be done in software Microsoft Word and Microsoft Excel.
2. Can produce script query with easy, because the process of making script only to configure tag name who were selected.
3. Data process taken is flexible, because a database only relies on tag name which is used.
4. Do not have to make a database table one by one, because a database will be formed in Active Factory.

But some weaknesses that owned are as follows:

1. The process of the formation of query need done in SQL Server because the Active Factory can only be implemented in database SQL Server.
2. The data acquisition with type Delta. This data stored based on each of the changes and possibility still has flaws that there are double data and there is a mismatch the value of tag name when the data was changed. This incident can be interpreted as a sign tag name was changed.

5. CONCLUSION

Based on the result design can be concluded that the EMS-SCADA which are designed has ability that can monitor and control the AC in a building. By using this system will be able to help the supervisor to get real data and to report the data as well as historical that is regularly and automatically. Besides that, after applying this system has reduced electricity power in the AC usage are 360 KW or around 28.57 percent every day.

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