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Development Of Simulation Control Two Water Supply Pump Using *Relay Change Over* And *Floatless Level Switch*

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Abstract. System of water supply pump must be installed in a building. The purpose of this research is to create the practical module for system of water supplay pump for building. So the students' competence on the utility of the building, especially in the field of water supply pump system can be achieved more easily. This practice module uses 2 pumps, 2 water tanks, 1 as tank as underground tank and 1 again as tower tank. Using WLC (water level control) to control on-off the pump, based on the water level in the tower tank. Using Relay Change over to automatically convert the pump on duty. In addition it helps to control the water reservoir automatically so that no empty or empty water holding tanks will be available and maintain the stability of the water distribution in the water holding tank
Key words : *system pompa supplay, water level control, relay change over.*

1. Introduction

The pump is used to move the fluid from lower place to the higher level, as in the supply of clean water in the building. While the other function is to circulate fluid liquid, as in a swimming pool system.
In the application, the pump is not always installed single pump in serving a system. Pumps can be installed more than one pump in parallel to serve a system. Chilled Water Supply System uses more than one pump to circulate cold water to serve the AHU and FCU in the building. Fire fighting system uses 3 types of pumps in accordance with its function ie Jocky pump, Electric Pump and Diesel Pump
In the hotel's swimming pool water system, using pumps more than one pump. Because the pond water must continue to circulate continuously to maintain the condition of the pool water is always in clear condition and free from dirt. If only one pump is installed and there is damage that takes a long time, it will adversely affect the image of the hotel. Because the pool can not be used by Guest. Clean water supply system in buildings using more than one pump to keep clean water needs fulfilled for occupants in the building, avoid system failure to meet the needs of residents of clean water, in case of damage to one of the pumps. The pumps operate on the basis of the control system made and needed.

2. Experimental apparatus

2.1 .Mechanical Komponen
Figure 2.1 shows the mechanical image to be created. Consisting of 2 tanks, the first tank as an underground tank, as a reservoir of water from taps or underground water. While the second tank, is as a tower tank, a tank of water supply that will be distributed to outlets in gravity. Before the pump is installed suction pipe with foot valve, which serves to keep the water in the suction pipe always there

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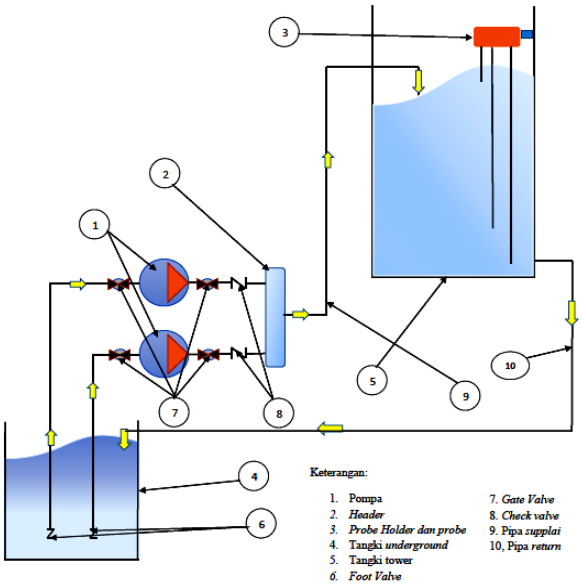

Figure 1. Mechanical schema

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If there is no footvalve, the pump will not be able to pump water into the tower, because the suction pipe is not filled with water. Each pump will be filled with gate valve and check valve. Check valve serves to block the pipeline installation when the pump requires repair, while the check valve serves to close the flow if the pump
next to it is on duty. Header serves to collect water before heading to the tower tank.
The way this installation works is, 2 pieces of pump that will be on duty alternately. When Pump 1 on duty, pump 1 will multiply the water to the tower tank from the underground tank. When the tower tank is full, by installing a WLC (Water level Control) sensor, Pump 1 will automatically shut off. Furthermore Pump 2 will be automatic as on duty. When the WLC sensor indicates the tower tank is reduced due to water flowing into the underground tank, Pump 2 will automatically live water to the tower tank. Thus next pump 1 and pump 2 will alternate its life.

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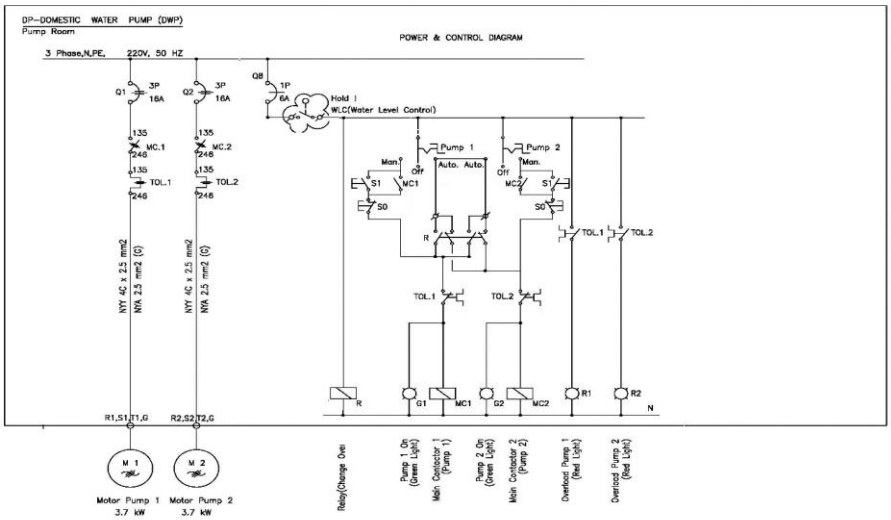

Figure 2. Electrical schema

2.2. Electrical Component

Figure 2. The above installation consists of power and control installations, each power installation comprising MCB 16 A, contactor and thermal overload as a safety. The pump will not live if the water tower condition is full, because of the WLC as a water level controller in the tower. The pump can be turned on manually or automatically as long as the water level of the tower is not full. By rotating the selector switch each Pump, manual, off and automatic. If selected manual mode, then we need to press the Push button On to turn on the pump. If you select the auto mode then the pump will live on auto. The relay change over will move the pump on duty automatically, after the tower tank is full. When the 1 on duty pump transfers the water from the underground tank to the tower tank, once the tower tank is full, the pump 1 dies, the change over relay will instantly move the on duty pump from pump 1 to pump 2. So on.

Indicator lights will live according to operational conditions. If pump1 is live, then pump lamp 1 will be green pump 1 light will live. If there is a problem with pump1, then pump 1 red light will be on.

3. Design of the Practice Module.

This type of research is a design simulation for the students of Refrigeration and Air conditioning Program Study , in the course of Utilization of Building and BAS practice. This module of practice is divided into 2 parts, mechanical and electrical parts.

The student's mechanical part will describe the piping and answer the function of each section installed on the installation.

The student's electrical section will redraw the electrical installation and reinstall the power and control installation cabling from this module of practice

4. Results Of Designs

The result of this research is Product Simulation Control 2 clean water supplay pump using Relay Change over and Floatless Level Switch. This product is divided into two parts, namely:

1. Mechanical Part.

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Form of pipeline piping from underground tank (foot valve, charging valve part, suction pipe then pump), tank tower piping (check valve, valve and discharge pipe).

2. Electrical Parts.
   In terms of electrical and control, this section consists of MCB, Contactor, Thermal Overload, switch over relay, floatless level switches and cables.

4.1 Mechanical section.

4.1.1. Underground Tank Section

This section consists of a water tank, suction pipe, foot valve at the end of a suction pipe and a suction pipe water filling section.

Figure. 3. Underground Tank

1. Foot valve serves to hold water on suction pipe so that water dipipa suction is not empty. If the suction pipe does not contain water, but contains air, the centrifugal pump will not work (can not suck water). In some pumps, the air containing on the suction pipe will be sucked by the pump out and finally the water will be pumped. For this pump, the suction pipe must be filled with water.
2. Water filling valve, this section serves to fill the suction pipe with water, once filled with water, the valve must be in closed condition.
3. Water tank, serves as a place of water to be pumped.

4.1.2 Tower Tank Section

This section consists of water tanks, pump discharge pipes, probe holder and probe.

Figure 4. Tank Tower

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1. This discharge pipe is the outlet pipe from the pump coming from the underground tank to the tower.
2. The probe holder is where the probe binds as a water level sensor.
3. Probe is in the form of 3 pieces of stainless steel rod of different length that serves to sensor the water level.

Probe no. 1 serves as a cummon.
Probe no. 2 serves as a low level sensor.
If the water level no longer touches the no. 2, then the pump will live on, because the water has reached the lowest level.
Probe no. 3 serves as an upper level sensor. If the water has touched the no.3 probe feeding the pump will be off / 0ff. because it has reached the highest permissible level.

4.1.3 Water pump.

Figure. 5 Water pump.

This pump is in charge of moving water from the underground tank to the tower tank. On duty 2 pieces of this pump alternately. If the first on duty Pump 1. When the low-level tower tank Pump 1 will be on, and in charge of meeting the tower tank, after the tower tank is full, Pump 1 will Off. Next on duty is Pump 2 automatically if the tower tank reaches low level. After Pump 2 on duty and tower tank has reached Upper Level and Pump 2 will Off. After that Pump 1 will be on duty, and so on.

4.2 Electrical Suction

Electrical circuit is divided into 2 section , namely the power circuit which is the power circuit to the main load, the pump. And the control circuit that keeps the 2 pump control system running according to plan. Overall the electrical circuit is as below.

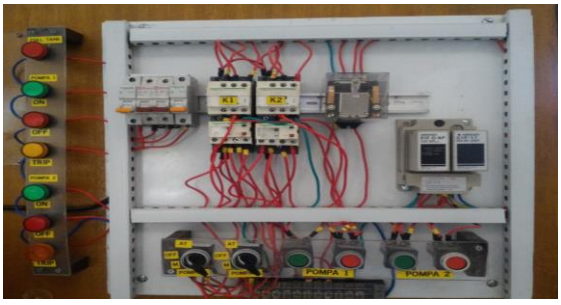

Figure. 6 Electrical system

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4.2.1 MCB (mini circuit breaker)

Gambar. 7. MCB

There are 4 MCBs attached, the leftmost MCB 1 serves as main MCB, main MCB receives power from outside and distributes to other MCB. MCB 2 as power for Pump 1, MCB 3 as Power for Pump 2 and MCB 2 right to MCB for Control.

4.2.2 Contactor and Thermal overload

Figure. 8. Contactor and Thermal overload

Contactor functions to pass Power from MCB to Pump 1 and 2 based on control command. While the thermal overload is functioning as a safety pump If the pump has a problem, and cause the motor pump heat and overload, then the thermal overload will cut the current to the Contactor. So the problematic pump will Off.

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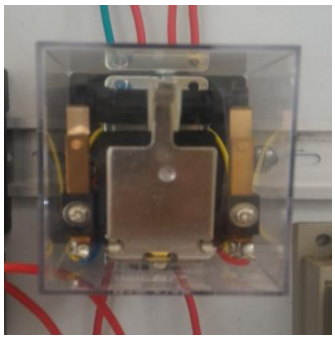
4.2.3. Switch over relay.



Gambar. 9. Swich over relay

This relay works to move the on duty pump automatically. After Pump 1 on duty and Off, then Pump 2 will be the on duty.

4.2.4 Floatless Level Switch probe

Gambar10 Floatless level switch dan probe

This section serves to set the water level ditangki tower. So the tower will never be over flow as long as the part is working properly. The FLS will be connected to a probe that acts as a water level sensor.

4.2.5 Control Switch Manual – Automatic

This section works for the operator choosing whether the pump is run automatically or manually? If Auto mode is selected, the pump will operate automatically, meaning that the pump will live and die based on the water level in the tower tank. And will alternate on duty it. If manual mode is selected, the live pump based on the operator chooses whether Pump1 or Pump 2 will be turned on by pressing the existing push botton switch

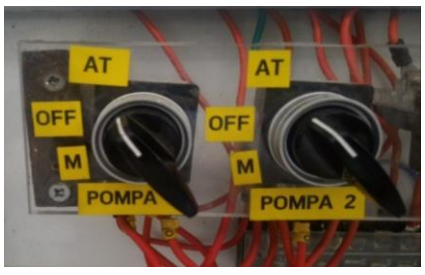


Figure 11 ***Control Switch Manual - Automatic***

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Keep in mind: if the water level in the tower tank has reached the upper level, the pump will not be able to On, either manual or Automatic mode is selected.

4.2.6 Push button switch.

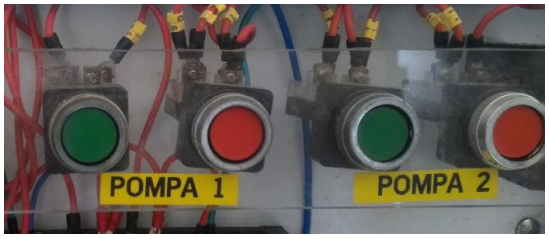

Figure. 12 ***Push button switch.***

This section is required if manual mode is selected operator. This is used if one needs maintenance and aoutomatis mode can not be run, then other pumps can be turned on manually to fill the tower tank. To turn on the pump pressed the green button, if you want to turn off the red button pressed.

4.2.7 Indicator Light.

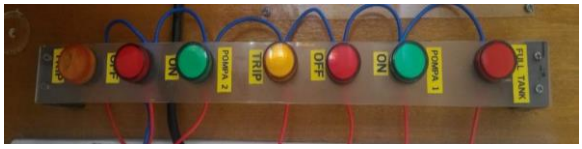

Figure 13. Indicator Light.

This section shows the status of this system. The top lamp indicates the tower tank is already full, the pump will not live, although manual or automatic mode is selected.
the status of Pump 1, if Pump 1 On or Off the lamp is on, if Pump 1 has problems, Trip lamp will be on.
The status of Pump 2, if Pump 2 On or Off light is on, if Pump 2 has problem, Trip lamp will live.

Figure 14 Tampak depan simulasi

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5. Test Simulation Tool

This simulation tool has been completed assembled, the next step is to test the reliability of the control system, whether the pump installed can alternate his life to serve the tower tank.
For this test, a valve mounted between the tanks, opened halfway, so that the water pumped into the tower tank does not stay in the tower tank, but directly partly into the underground tank.
With the valve condition of the tower tank tank and the underground tank open halfway, the live pump alternates, as shown below.

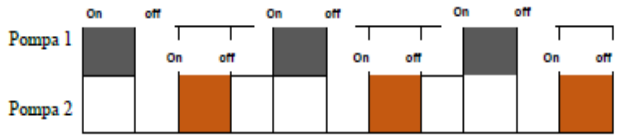

Figure 16 Figure of two pump simulation tools

6. CONCLUSIONS

6.1 Control Simulation Equipment 2 clean water supply pump using Relay Change over and Floatless Level Switch when tested Pump 1 and Pump 2 work alternately as planned. After Pump 1 works to fill the tower tank, Pump 1 will stand by, Pump 2 that works when tower tank level reaches low level.
6.2 Control Simulation Equipment 2 clean water supply pump using Relay Change over and Floatless Level Switch, ready for practice practice in Building Utilities and BAS

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