IoT Based Measurement of Water Conductivity Analyzer to Minimize Water Losses at PT. PJB UP. Gresik

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Abstract: *In order to realize PT PJB UP Gresik commitment as a green and clean power company, the management perform water conservation program. On the other hand, PT. PJB UP Gresik has a commitment to maintain the reliability of the unit. During plant operation, the quality of water at outlet WTP depend on the WTP process it self and also incoming water to WTP. The incoming water may be contaminated by water impurities such as oil, corrosion material, foulant, etc. and enter to 500 KL make up water tank. The contaminated make up water tanks will be disposed to maintain the reliability of the power plant production process. To prevent this occurrence, additional measurement as protection system to prevent water pollution enter the make-up water tank is necessary. This paper will describe the success story about implementation IoT based measurement of water conductivity analyzer to minimize water contaminant at PT. PJB UP. Gresik. Conductivity analyzer has been successfully implemented proven and provide 500 m^3 water saving and pollutant reduction in water.*

I. Introduction

The total volume of fresh water in the earth is estimated only 3%. Moreover, 2% of water are ice in earth pole and only 1% of the water can be used for domestic and industrial fresh water purposes. Water conservation aims to increase 1% of soil water by retaining rainwater or minimizing surface and seawater [1,2]. In order to realize PT PJB UP Gresik commitment as a green and clean power company, the management perform water conservation program [3].

On the other hand, PT. PJB UP Gresik has a commitment to maintain the reliability of the unit. Reliability of power plant unit can be maintain from availability of good quality feed water [4]. The feed water quality is determined by the standard conductivity value, which is below 1 microsimens (x <1μs). It aims to prevent corrosion in equipment especially on steam turbine blades and HRSG (Heat Recovery Steam Generator) tube. Treatment process is carried out on WTP (Water Treatment Plant) to maintain feed water in accordance to standard. Ion exchanger in a mixed bed polisher WTP used to treat feed water, and then feed water accommodated in a make-up tank with a capacity of 500 KL.

During plant operation, the quality of water at outlet WTP depend on the WTP process it self and also incoming water to WTP [5]. The incoming water may be contaminated by water impurities such as oil, corrosion material, foulant, etc. and enter to 500 KL make up water tank. The contaminated make up water tanks will be disposed to maintain the reliability of the power plant production process. To prevent this occurrence, additional measurement as protection system to prevent water pollution enter the make-up water tank is necessary. This paper will describe the success story about implementation IoT based measurement of water conductivity analyzer to minimize water contaminant at PT. PJB UP. Gresik

II. Material And Methods

This research was carried out on PT PJB Gresik Power Plant, Gresik, Indonesia at regeneration water management plant. The research start from adding a protection system for the conductivity of the make-up tank to prevent water pollution in the make-up tank.Conductivity analyzer placed on make up tank inlet and on outlet of water from regeneration process.Valve and piping system modification should be preformed. Control valve placed on outlet of water from regeneration process, when conductivity from this process was exceed limit, this valve will be closed and water from this process will be disposed. The logic of process modification isnormal, if water conductivity meet the normal criteria the water will be flowed to make up tank.If water conductivity out of range will be thrown to WTP.

III. Results and Discussions

Implementation of IoT based measurement of water conductivity analyzer to minimize water contaminant enter to make up water has been installed successfully at PT. PJB UP. Gresik. The result of this implementation show in Table 1. Water savings after the implementation of the PLTGU tank make-up protection program can be calculated as follow:

Amount of Pollution Load (ton/year) = Amount of water saved (m^3/year) x
total concentration of pollution load per parameter (mg / L) x
1000 L/m^3 x 10^{-9} ton/mg

Example of calculating the amount of TSS saved from 2017
= Amount of water saved (m^3 / year) x TSS concentration (mg / L) x 1000 L / m^3 x 10^{-9} ton / mg
= 500 m^3 / year x 312.6 mg / L x 1000 L / m^3 x 10^{-9} ton / mg
= 0.15630 tons / year

Table no 1 shows water saving after implementation of this program. Table no 2 shows pollutant reduction in water after implementation of this program.

Table no 1: Water Saving

Year	2016	2017	2018
Losses polluted make up tank (m^3)	500	0	0
Water saving (m^3)	0	500	500

Table no 2: Pollutant Reduction in Water

Parameter	Pollutant (Ton)/ year	
	2017	2018 (until June)
TSS	0,15630	0,02500
Oil	0,06245	0,03000
Cl2	0	0
Cr	0,00137	0,00130
Cu	0,00040	0,00088
Fe	0,00247	0,00136
Zn	0,00072	0,00116
PO4-	0,00848	0,00658

Conductivity analyzer is a device for measuring conductivity in a solution. Conductivity analyzer was placed in inlet of make up tank in PT PJB UP Gresik power plant. By using conductivity analyzer, water conductivity can be measured early. Water conductivity used to determine quality of water. Modification of logical process based on this process was done. Water conductivity which meet the criteria flowed to make up tank, water with conductivity out of range will be thrown away.

Before implementation of this research, water from regeneration process can enter directly to make up tank sothat make up tank water became polluted. To ensure reliability of system, polluted water must be disposed. By using this technique, water saving can be achieved. From the result, 500 m^3 water saving and decreasing of pollutant amount in water can be achieved.

IV. Conclusion

Conductivity analyzer has been successfully implemented and provide 500 m^3 water saving and pollutant reduction in water.

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