Reuse Accu Low Performance Ex-battery PLTU for Solar Photovoltaic Energy Storage in PT. PJB UP Gresik

Moch. Shoheh, Imroatul Fadlilah, Berta Ryza Harsativa, Naindar Afdanny, Totok R. Biyanto

***Abstract*— Waste management is important thing in the industry. Waste management is required in order to mitigate the losses. Moreover, good practice waste management will provide benefit from waste. The purpose of waste management is to utilize the waste into something useful in economical and environmental point of views. In this paper, waste battery management in PT. PJB UP Gresik was began in mid-2015. Before performing battery waste management, PT. PJB UP Gresik spend additional cost to dispose waste battery. Under battery waste management, the additional cost not required, moreover PT. PJB UP Gresik provide savings from utilization of waste battery.**

***Index Terms*— Waste Battery, Waste Management, Solar Photovoltaic panels, PT. PJB UP Gresik.**

I. INTRODUCTION

Process in the industries always produce waste. Waste of the industrial process is residue from the production process, used equipment, drift apparatus, etc [1]. Waste in the industry can be categorized into two types, the first type is non-hazardous and non-toxic waste, the second type is toxic and hazardous waste [2]. Both types have different ways of waste management. In PT. PJB UP Gresik and others companies, the second type of waste must be reuse as new purpose, or separated between the recyclable material and non-recyclable material. For materials that cannot be recycled, it can be stored in a storage medium or used as a blend material to create a new product [3].

The process of production, services and office system in PT. PJB UP Gresik produce two types of waste. The PT. PJB UP Gresik non-hazardous and non-toxic waste, i.e. plastic waste and paper waste etc. And the toxic and hazardous waste, i.e. engine oil, glass wool and battery waste etc.

This paper will discuss regarding the applied method by PT. PJB UP Gresik in conducting waste management of used batteries. Battery is used as secondary or redundant power in electronic system, especially control and safety system [4]. Battery are categorized as a waste, if battery performance decrease by 20% from the design specification of battery. It mean the decrease in performance equal to the decrease in the capacity of the battery storage [5]. Waste battery can not be used in power plant due to the requirement standard applied in PT. PJB UP Gresik.

Manuscript received Aug 22, 2016

Moch. Shoheh, Imroatul Fadlilah, Berta Ryza Harsativa, PT. PJB UP Gresik, Gresik, East Java, Indonesia.

Totok R. Biyanto, Naindar Afdanny, Process Design, Control and Optimization Laboratory, Department of Engineering Physics, Institut Teknologi Sepuluh Nopember (ITS), Surabaya

Waste battery as hazardous and toxic waste must be store in special container or reuse in lower requirement standard, such as an electrical power storage media on a solar photovoltaic power plant. Those batteries are used for storage system to serve non-process system such as lighting in gas engine power plant (PLTMG) Bawean island.

II. WASTE MANAGEMENT OF USED BATTERIES

A. Review of site location

Gas engine power plant (PLTMG) use compressed natural gas (CNG) as a fuel to generate electricity power [6]. This PLTMG-CNG is located in Bawean island, Indonesia as a subsidiary of PT. PJB UP Gresik. Maximum output that can generate from PLTMG-CNG is 3 MW. Figure 1, show PLTMG-CNG Bawean area.

Figure 1. PLTMG-CNG Bawean site view.

B. Solar photovoltaic plant

Lighting source on PLTMG-CNG use photovoltaic panel as shown in Figure 2.

Figure 2. Solar photovoltaic panels at PLTMG-CNG Bawean.

Photovoltaic panels in PLTMG-CNG Bawean had a 1.3 kW maximum watt peak. There are 3 photovoltaic panels with a maximum peak power of 435 W, each panel use

SPR-435NE-WHT-D. Efficiency of each photovoltaic panel by 20% according to the specifications of datasheet [7].

Photovoltaic panel systems had a two types, i.e., off grid and on grid. Off grid system is not connected with other electrical power generator, and on grid system is connected with other electrical power generator i.e. steam power plant, CNG power plant, diesel power plant. Type of photovoltaic system that is use in PLTMG-CNG is off grid system.

To store a power that generate from photovoltaic panel, used 14 batteries assembled in series circuit. Batteries that is used are from PT. PJB UP Gresik waste. The specification of baterry is BEA SECURA SgiV with each maximum capacity of 500 Ah [8]. Assume the waste battery has 80% of maximum capacity, the used battery remain has maximum capacity of 400 Ah, hence, the total maximum capacity of 14 waste batteries are 5600 Ah. The batteries is shown in Figure 3.

Figure 3. Batteries used for power storage from photovoltaic panels

The photovoltaic panels is used to generate power that use as lighting in PLTMG-CNG Bawean site. Light bulb is shown in Figure 4.

Figure 4. Light bulbs in PLTMG-CNG Bawean.

III. Data and Analysis of Battery Waste Reduction in PT. PJB UP Gresik

Tabulated data to find out a reduction of battery waste in PT. PJB UP Gresik is shown in Tabel 1. Battery waste management in PT. PJB UP Gresik, began in mid-2015. As seen on Figure 5, waste battery from 2014 is 5.46 Ton, with percentage of waste reduction is 0 %. From early 2015 to June 2015, battery waste in PT. PJB UP Gresik is 10.59 Ton with a reduction of 1.02 Ton can improve percentage of waste reduction up to 9.63 %. With the battery waste management, PT. PJB UP Gresik can obtained a savings from reuse of hazardous and toxic waste.

Tabel 1. Data of battery waste reduction

No.	Year	Battery waste without reduction (Ton)	Sum of battery waste reduction used as a solar power plant batteries (Ton)	Sum of battery waste after reduction (Ton)	Percentage of reduction (%)
1	2012	0	0	0	0
2	2013	0	0	0	0
3	2014	5.46	0	5.46	0
4	Up to June 2015	10.59	1.02	9.57	9.63

IV. Conclusion

Battery waste management in PT. PJB UP Gresik was began in mid-2015. Before performing battery waste management, PT. PJB UP Gresik spend additional cost to dispose waste battery. Under battery waste management, the additional cost not required, moreover PT. PJB UP Gresik provide savings from utilization of waste battery.

Acknowledgements

Author thank to PT. PJB UP Gresik for providing facilities to conducting this research.

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Author

Moch. Shoheh, Imroatul Fadlilah, Berta Ryza Harsativa, PT. PJB UP Gresik, Gresik, East Java, Indonesia.

Totok R. Biyanto, Naindar Afdanny, Process Design, Control and Optimization Laboratory, Department of Engineering Physics, Institut Teknologi Sepuluh Nopember (ITS), Surabaya.