Proceedings World Geothermal Congress 2020+1
Reykjavik, Iceland, April - October 2021

Sustaining Gold Standard Achievement in Environmental Management and Innovation Based on PROPER Criteria (Study Case: Pertamina Geothermal Energy Area Kamojang)

Kharisma Prasetya and Widyantoro Bagus

Kamojang, Bandung Regency, West Java Province

prasetya.kharisma@pertamina.com , bagus.widyantoro@pertamina.com

Keywords: Environmental Management, Kamojang, Innovation

ABSTRACT

Pertamina Geothermal Energy (PGE) Kamojang is one of the geothermal sites under the PGE Corporation with a capacity of 235 Megawatts. It is built in proximity to the forest and mountain of Kamojang and near Cikaro Lake. PGE Kamojang requires integrated environmental management and an innovative approach to sustainably maintain its environment while maintaining the operation of the 235 MW Geothermal Power plant. In terms of achievement, PGE Kamojang has achieved excellence in its environmental management with a Gold rank for 8 years in a row and labelled as having the best environmental management in the geothermal industry using in Company Performance which is a Rating Program in Environmental Management (PROPER) organized by Indonesia's Ministry of Environmental and Forestry. PGE Kamojang PROPER's result in 2014 – 2018 in energy efficiency accounted for roughly 71,170.89 GJ, emission reduction roughly 2,142,124.32 tCO_{2e}, hazardous waste reduction roughly 5.505 ton, non-hazardous waste reduction and recycle ~8.93 tons, water efficiency ~ 18,714.8 m^3, water pollution load reduce ~12.32 tons. PGE Kamojang also requires updated a environmental management system (ISO 14001:2015), updated technology, endless innovation from all aspects and harmonization with society around PGE Kamojang to maintain the GOLD rank. PGE Kamojang lists approximately more than 50 innovations contributing to operations and to society. All of the innovations will contribute to how PROPER's scoring is calculated. The use of the PROPER standards results in significant improvements in environmental management and environmental quality in PGE Kamojang.

1. INTRODUCTION

Pertamina Geothermal Energy (PGE) Kamojang is a subsidiary of Pertamina Corporation (PERSERO) which manages geothermal businesses in Indonesia. PGE Kamojang has been in operation since January 29th, 1983 with the commencement of its Kamojang Geothermal Power Plant Unit 1 (55 MW). PGE Kamojang requires integrated environmental management and innovations to maintain sustainable environment around it and maintain sustainable operation of 235 MW Geothermal Power plant. The purpose of this paper is to give some insight into the environmental management of PGE Kamojang based on PROPER rating sustem.

2. ENVIRONMENTAL MANAGEMENT SYSTEM

2.1 Environmental Management System Status

PGE Kamojang has been successfully fulfilled and certified with ISO 14001:2015 in 2018 by **TÜV Rheinland** with the which is valid until **6 June 2021**.

2.2 Environmental Management System Scope

The scope of certification EMS ISO 14001:2015 is "Exploitation and Steam Supplying for Geothermal Power Plant and Supplying Electricity into the Grid" covering corporates main activity, sumplemental activity also includes environmental management such as Energy Efficiency, Emission Reduction, Water Pollution Load Reduction, Water Conservation, 3R of Hazardous Waste and Non-Hazardous Waste, Biodiversity Protection, and Community Development.

3. ASPECTS OF NATURAL RESOURCES

3.1 Energy Efficiency and Emission Reduction

3.1.1 Status

PGE Kamojang energy usage in 2017 required production processing and support facility about 116,334.2 GJ, consists of 111.043,5 GJ for production processes and 5,290.7 GJ for supporting facility. PGE Kamojang's energy efficiency was ~ 21,274.55 GJ in 2017. PGE Kamojang emitting roughly 36,526.36 toeCO_2 equivalent a reduction of GHGs emmisisons and Conventional Gas in 2017 about 619,779.87 toeCO_2. For 5 years, PGE Kamojang already reducing emission in the amount of 2.58 million ton CO_2 or equal to 961.72 million liters of fuel fossils.

3.1.2 Innovation and Additional

In 2018, PGE Kamojang had 2 new innovative developments in energy efficiency and emission reduction, by improving Cooling Tower Filler with Image Processing Application and Using Picohydro as a Main Power Source in Kamojang Nature Tourism Park.

IMPROVING SUCCESS STRATEGY IN CHANGING COOLING TOWER FILLER WITH IMAGE PROCESSING APPLICATION

This program increasing the effectiveness of filler material by changing the condition from TBM (Time Based Monitor) into QBM (Quality Based Monitor) by using image processing application. This program also has an important effect because of the electricity supply it provides and it connects the textiles industry to the South Bandung grid mainly in Leuwi Gajah and Majalaya which use accounts for up to 12 MWh or equal to 6,394 ton CO_2 equivalent.

This program won a “Platinum Award in APQA 2018” and “Platinum Award in UIIA 2017”.

Figure 1: Certification ISO 14001 : 2015 by TÜV Rheinland (reference?)

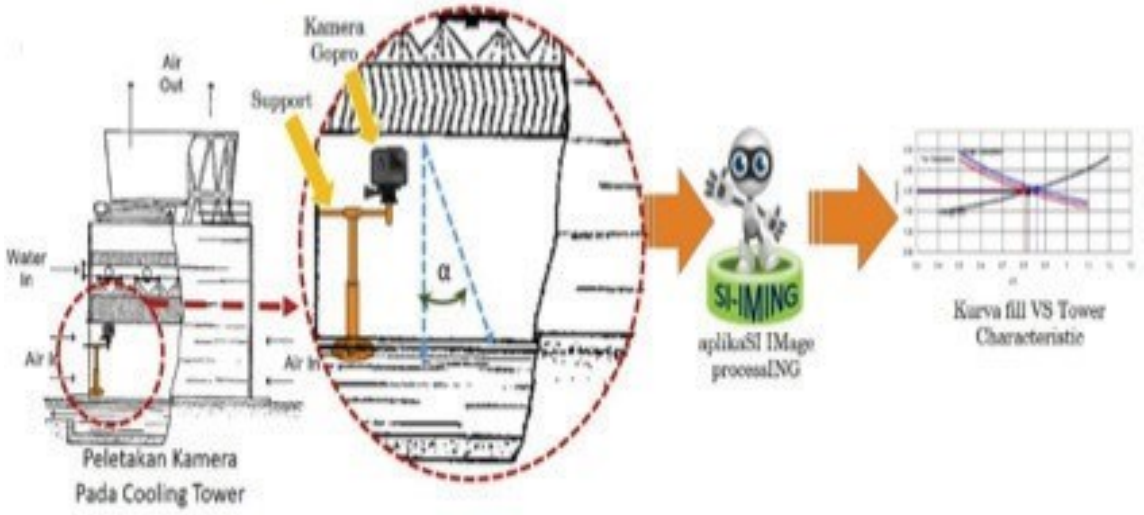

Figure 2: Flow Diagram of Improving Success Strategy in Changing Cooling Tower Filler with Image Processing Application (reference?

USING PICOHYDRO AS A MAIN POWER SOURCE IN KAMOJANG NATURE TOURISM PARK

This program utilizes potential energy from rivers by using picohydro for electricity generation for use in the Kamojang Nature Tourism Park. River flow is utilized by turning a turbine and generator so it can produce ~1000 Watt of electiricy, and it can save up to 31,464 GJ or 19.44 ton CO_2 equivalent. The electricity will be used for lighting, pumping and other domestic needs.

Figure 3: Picohydro Installation in Kamojang Nature Tourism Park (reference?)

3.2 3R of Hazardous Waste and Non-Hazardous Waste

3.2.1 Status

PGE Kamojang generated hazardous waste in the amount of 2.088 ton in 2017 and generate non-hazardous waste in the amount of 2.26 ton in 2017. PGE Kamojang reduce the hazardous waste generation ~1.456 ton and have 3R ratio in 2017 ~69.7%. PGE Kamojang also reduce the non-hazardous waste generation about 2.26 ton in 2017 and have 3R ration ~ 58%.

3.2.2. Innovation and Additional

In 3R of hazardous waste and non-hazardous waste, PGE Kamojang implementing 2 new programs in 2017. There are **Method Changing of Analyzing Total Non-Condensable Gas with Portable Non-Condensable Gas Super Fast** and **Using Application SAMS (Seamless Asset Management System) in Operation Activity in PGE Kamojang.**

METHOD CHANGING OF ANALYZING TOTAL NON-CONDENSABLE GAS WITH PORTABLE NON-CONDENSABLE GAS SUPER FAST

This program changes the conventional method where the analysis will take about 7.5 hours per sample reduced to 15 minutes per sample and decrease the activity of laboratory analysis, therefore decreasing the generation of hazardous waste produced in a laboratory, 19.5 kg in 2017.

This program won “Silver Prize in Seoul International Invention Fair (SIIF) Forum” and rewarded as “Excellent Achievement from Malaysian Association of Research Scientist (MARS)”.

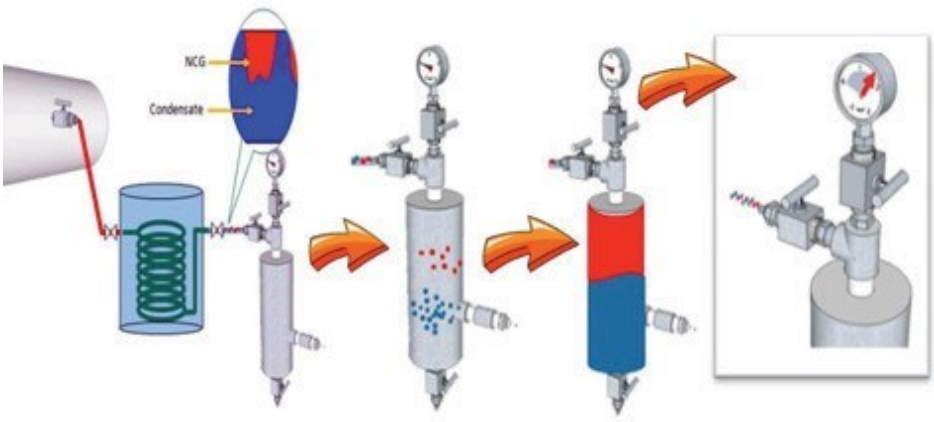

Figure 4: Changing Method of NCG Sampler (reference?)

USING APPLICATION SAMS (SEAMLESS ASSET MANAGEMENT SYSTEM) IN OPERATION ACTIVITY IN PGE KAMOJANG

PGE Kamojang already uses asset integrity management practices that integrated in SAP Plant Maintenance (PM) Module as a enterprise asset management system but still constrained by manual works that uses paper. This program changes the manual works that usines paper into automation of works and paperless. This program reduces the usage of paper about 0.014 ton papers in 2017 or it can save about 10 trees per year.

This program won 1st position in Pertamina Paper Competition (DIGITALISIOUS) in 2018. This program is decreasing the usage of paper about 51 rim of paper per year.

Figure 5: SAMS Application

3.3 Water Conservation and Water Pollution Load Reduction

3.3.1 Status

PGE Kamojang water usage in 2017 is about 14,721.2 tons and produces wastewater from drainage, and oil catches is about 54 ton. PGE Kamojang used a closed system in production process so there is no wastewater discharged.

3.3.2 Innovation and Additional

In water conservation and water pollution load reduction, PGE Kamojang applied many programs, for example, it is changing sealing CCWP pump from gland open sealing with a mechanical seal to conserve water and to prevent leaking in the CCWP pump, and modifications of reservoir tank containing condensate for condensate injection to reinjection well.

CHANGING SEALING CCWP PUMP FROM GLAND OPEN SEALING WITH MECHANICAL SEAL

This program changes the sealing of CCWP Pump from gland open sealing to a mechanical seal. Using a Mechanical seal can prevent losses of water due to leaks. It can reduce water loses up to 353.16 m^3 per year.

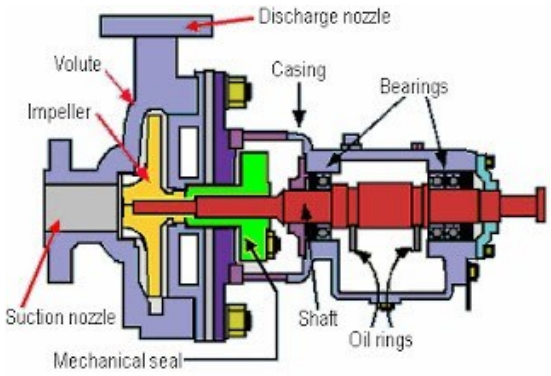

Figure 6: Mechanical Seal (reference?)

MODIFICATION OF RESERVOIR TANK CONTAINING CONDENSATE FOR CONDENSATE INJECTION TO REINJECTION WELL

This program modifies the reservoir tank of condensate so the level of the reservoir tank is higher than the level of condensate. This program can prevent 2.94 tons of Ammonia discharged into the Cikaro River.

4. BIODIVERSITY PROTECTION

PGE Kamojang committed to protecting the biodiversity around Kamojang, such as Made Conservation Centre of Kamojang Eagle and eagle monitoring around the Kamojang Area which increases the population of eagles up to 152 in 2018 and became the first eagle conservation in Indonesia with biodiversity protection. In flora biodiversity, PGE Kamojang are breeds Kondang Tree as a endemic tree in Kamojang, this helps prevent landslides by acting as a barrier using artificial vegetation, this program already planted 60 Kondang Tree and a total of37,261 endemic trees in Kamojang.

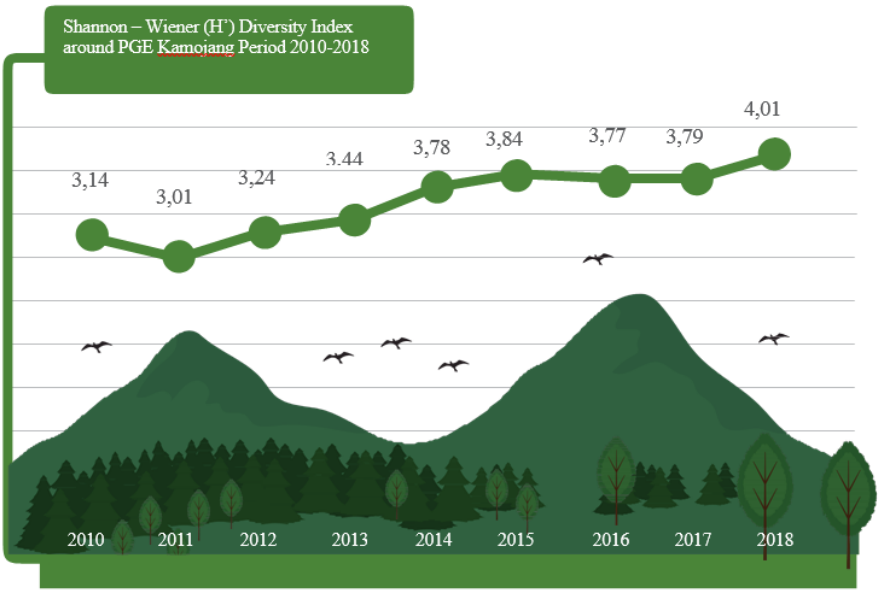

Figure 7: Shannon – Wiener Diversity Index in PGE Kamojang Periode 2010 – 2018 (reference?)

5. CONCLUSION

The Company Performance Rating Program in Environmental Management (PROPER) organized by Indonesia's Ministry of Environmental and Forestry were arranged by government to increase the environmental quality and value in every company in Indonesia using innovative initiatives.

PGE Kamojang PROPER's result in 2011 – 2018 are achieved GOLD Standard with energy efficiency about 71,170.89 GJ, emission reduction about 2,142,124.32 ton CO_2, hazardous waste reduction about 5.505 ton, non-hazardous waste reduction and recycle about 8.93 ton, water efficiency about 18,714.8 m^3, water pollution load reduce about 12.32 ton.

Besides innovation in efficiency energy, hazardous waste, non-hazardous waste, and water conservation, PGE Kamojang also had innovation in biodiversity protection that increase the Shannon-Wiener (H') Index up to 4.01 in Area around PGE Kamojang.

6. REFERENCES

Indonesia's Minister of Environment Regulation Number 3 Year 2014 about Program Rating of Company Performance in Environmental Management (PROPER)

Indonesia's Minister of Environment Regulation Number 32 Year 2009 about Environmental Protection and Management