wayang windu

starenergy

WALK THROUGH ENERGY AUDIT

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Executive Summary

This is a report of walk through audit in Star Energy Geothermal (Wayang Windu) Ltd undertaken by PT. Dian Insan Lestari. The team was carry out walk through energy audit in Star Energy Geothermal Unit I and Unit II on May 2012 in Pangalengan. The work was conducted in close cooperation with the plant personnel. Because the level of energy audit is walk through energy audit so there was no measurements performed during the audit period. An energy balance, plant and equipment performance has been calculated and determined based upon the information received from the plant management and plant engineer.

The first power generating station of Star Energy Geothermal at the Wayang Windu was commissioned in 2000 for unit I, and for unit II commissioned in 2008. The plant comprises of 110 MWe – unit I, and 117 Mwe of unit II. The plant production is 8760 hour in 2011,and power generated are 949.957 MW for unit I, and 997.191,87 MW for unit II. Net production of power plant are 97,03 % for unit I and 96,81 % for unit II. This figure are rather good compered to geothermal power plant in general where 3-5% of the turbine output is needed for all the parasitic loads.

The plant steam consumption (2011) are 6565975 and 7423000 ton/mouth respectivelly for unit I and Unit II. The energy intensity of unit I during a period of 2010-2011 is about 6.9 tons of steam / MWh production, and for unit II the energy intensity is about 6.8 tons of steam / MWh production. For the unit I energy intensity is tends to increase and fluctuate, but for unit II the energy intensity relatively constant. This energy intensity of unit I indicate performance derating, and potential improvement for energy efficiency.

Best practice relating to the operation of the operating parameter settings and the wet bulb temperature at the outlet cooling tower is one that have significant influential in to the power production. Regression equation indicates that every 0.47 degree wet bulb increase would increase production output by 1 MW. As for the outlet CT, each 1.2-degree drop in temperature will increase the production by 1 MW. The outlet tmperature of cooling tower varies with the wet–bulb temperature and the heat load of the cooling tower. As the wet-bulb temperature drops, the cold water temperature also drops. But actual and design water circulation ratio are also determine factors for CT heat load and effectiveness of cooling tower. The operating parameter that effecting the CT heat load and effectiveness are water circulation and approach. Based on the data analysis the approach of CT are water circulation ratio CT unit 1 and unit 2 are : 88,06 % and 89,22 % respectively. In design condition, the expected CT approach are 5.5 C , but from operating data the approach are 7.2 C. Cold water temperature from performance curve of CT of wet-bulb temperature (16,3 C) is 22,2 C, but calculated from actual operating data, the cold water temperature is 25,09 C, and CT effectivenes is 73,69 %. As operating conditions of CT shown cold temperature 1-2 C less than design condition, and for effectivenes 3-5 % less than design condition. It means that there are potential for increaseng power production by improving the cooling tower effectivenes.

Elasticity are a tool that indicate how the response of steam consumption to the power production. Data analysis for unit 1 shown the elasticity is still above 1 (no elastic). It means that improvement in energy management is needed for more respond on change of energy consumption due to the production (elasticity <1). For Unit 2, the average elasticity <1, but at the end of the year showed elasticity > 1. In depth energy audit is needed to reveal what does really for the cause, since the power production tends to decrease.

Although energy policy and organizational of energy management have been made in the plant structure, but so far it not formally become a routine part of activities in the corporate organizations. Energy management reporting has not been made yet, management already realized that energy efficiency has relation to the performance of production or other plant performance as well as to the averall efficiency of the company. The plant performance seems to be reliable as indicate in plant key performance factors of unit I and unit II shown in table below :

Plant Performance Factors	Unit I	Unit II
Grid Availability Factor (%)	99.98	99.95
Plant Availability Factor (%)	100.00	99.92
Plant Availability Factor (%)	95.78	97.07
Plant Availability Factor (%)	95.81	96.91
Load Factor (%)	95.31	96.95

To support a positive tendency of plant mangement for implementing energy saving programs, the things that need to consider in Energy Management System are improving energy management organization functions according to the standard ISO 50 001. Standard operating procedure of energy management for planning, operation and maintenance activities need to be prepare. There is an interest in energy conservation activities among the manager and engineers but they need to be trained in spesific topic such as energy conservation and energy audit techniques in order to be able to maintain reduced energy consumption after energy management and energy saving measures implemented at the plant. It also important that the interest of the management in energy saving activities is shares by operators and related energy management officials. This can be achieved by information campaign where all personnel are informed of the need for energy conservation and on how to act in an energy saving manner. A five day training course for enggineer in energy conservation and energy audit tecniques need to be held. The cost of training are very low compared with the amount of the money that can be saved by improving the awareness of energy situation among the all related personnel

Others thing that need to consider and develop are :

- Tracking monitoring and reporting system by comprehensive system sets targets, monitor, identifies faults, quantities savings and product budget tracking
- Staff awareness/training and promotion by marketing the value of energy efficiency and the performance of energy management both within the organization and outside it.
- Investment program by positive discrimination in favour of energy saving schemes with detailed investment appraisal of all new equipment and system and refurbishing opportunities.
- Staff motivation by energy committee used as main channel together with direct contact with major users
- Organizing the energy management by assign the accountable energy manager to energy committee representing all users, chaired by a member of the managing board.
- Energy management policy and action plan and regular review have commitment of top management as part of corporate strategy. Energy management fully integrated into management structure.
- In the process side, there are two option :
    - Implementation of absorption chiller for extended cooling of the outlet water from cooling tower. The extended cooling will decrease the water wet bulb which directly will increase the capacity of electric production in turbine.
    - Implementation of Binary Power Plant. Binary system is more efficient than flash system. Most geothermal binary plants are constructed from a number of smaller modules, each having a capacity of 1 to 12 MW net.

In the early stages of program, sophisticated and complicated data analysis are probably not necessary, but a graph of energy intensity and evaluation of energy balance and energy performance as well as the the related factors to energy efficiency presented in the form of table and in the form chart or grafic will suffice. It is always necessary to break down the energy consuming areas of the plant or operating equipment to smallest practical units in order to better pintpoint where deviation from plan are occurring.

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