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Audit Energy for Electricty Saving at PT XYZ

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ABSTRACT

PT XYZ is an integrated multinational engineering, procurement, construction, and installation company service provider. Production activities of PT XYZ require a very large amount of electrical energy. In 2022 electricity consumption will reach 35,459,867 kWh. The Commissioning Building + Deck erection area (Tr. 6D) Division is the area with the largest consumption, namely 8,720,628 kWh. The amount of electricity consumption has an impact on the increasingly expensive production costs. So, it is necessary to save electrical energy through an energy audit. Determination of Energy Saving Opportunities (PHE) in this study uses two calculations, namely Energy Consumption Intensity (IKE) and Specific Energy Consumption (KES). The data in this study is in the form of quantitative data obtained directly from PT XYZ which includes data on electrical energy, area, human resources, electrical installations, total energy consumption and total production in 2022 and during research from February 2023 to April 2023. After an energy audit was carried out and data on IKE and KES values obtained, then identify potential energy savings, which aims to determine the potential for Energy Saving Opportunities (PHE) electricity in the Division of Commissioning Building + Deck erection area (Tr. 6D) PT XYZ. Data analysis was carried out based on the results of energy audits and IKE and KES values. Saving electrical energy in the Division of Commissioning Building + Deck erection area (Tr. 6D) PT XYZ can save up to 15.14 % of electrical energy, so that it will have a significant impact on reducing production costs at the company.

KEYWORDS: Energy Audit, Electricity, Energy Saving Opportunity (PHE)

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1. INTRODUCTION

PT XYZ is a company engaged in the constructor industry or provider of production equipment for offshore oil drilling based in Batam. PT XYZ field of work is offshore oil construction services with 5 (five) sub-sectors namely: project management, engineering, fabrication of production activities, material procurement and offshore installation.

PT XYZ need for electrical energy in 2022 is very large, reaching 35,459,867 kWh. The Commissioning Building + Deck erection area (Tr.6D) Division is the area with the largest consumption, namely 8,720,628 kWh. The large use of electrical energy has an impact on the addition of production costs. One of the efforts to reduce the use of fuel oil is to save electricity. An energy audit is carried out to identify potential energy savings in all facilities and equipment that use energy, energy audit activities are carried out to determine patterns of energy use and energy saving potential. The results of the energy audit will becompared with existing standards and then look for solutions to save energy consumption if the level of energy consumption exceeds existing standards (Kresnadi, 2020).

Another study conducted by (Lestari et al., 2018) shows that companies that have ISO 50001: Energy Management certification have implemented energy management well. Evidenced by better management commitment, energy knowledge, and energy audits compared to companies that do not have ISO 50001: Energy Management certification. Research by (Raharjo et al., 2014) shows that energy auditing and energy saving efforts in this industry are carried out on motor loads, lighting and air conditioning. From the results of the analysis found savings on electric motors of 26.84% or 6,038,628.14 kWh/mill, in lighting is 75.0% or 261,152.67 kWh/mill, and in air conditioning is 28.0% or 11,203.03 kWh/mill. Recommendations for saving on motors are carried out by installing frequency inverters, for lamps by replacing energy-saving lamps or LEDs and for air conditioners with AC with inverter technology.

Saving electricity is needed as an effort to save costs in the company. Energy saving measures can be carried out through the implementation of an energy audit, so that potential energy savings can be identified in all facilities, facilities and equipment that use energy. Energy audit activities are carried out to determine patterns of energy use and energy saving potential. Electrical energy efficiency is done by "doing things right" (doing things right), and effectiveness by choosing the best action, namely "doing the right thing" (Pratama et al., 2017a). Referring to the research results of (Pratama et al., 2017a) and (Anagra, 2020), it is hoped that the implementation of an energy audit will target electricity savings at PT XYZ to reach 15.14%.

2. LITERATURE REVIEW

The intensity of energy consumption in non-production buildings is IKE 87.412 kWh/m2 and knowing the specific energy consumption for the overall calculation is because it is a production company of 887.62 kWh/tonne. Energy Saving Opportunities that can be applied atPT. Soejasch Bali, namely by setting operating hours which results

in 15.14% saving of energy consumed in the Study of Electrical Energy Management in Meat Processing Companies PT. SOEJASCH BALI (Pratama et al., 2017b)).

The use of electrical energy at PT. Daiking Air Conditioning Makassar is 111.3 kWh/m2/year and still below IKE standards and can save around 44kWH/month for the lighting system. The recommendation is to carry out load balancing for each phase, turn on the light and air only when needed Energy Audit and Analysis of Energy Saving Opportunities at PT. Daikin Air Conditioning Makassar (Purwito et al., 2018).

In a company that does not have a clear energy program, opportunities for improvement will decrease due to organizational barriers. These barriers may be created due to a lack of communication between divisions, a weak understanding of the importance of energy efficiency in a company, and the company's limited financial condition. However, even though they know that energy has a significant effect on the company, there are still many companies that ignore this due to a lack of strong commitment to running this energy management program.

Source: Lestari *et al, 2018*

FIGURE 1. Main Elements of the Energy Management Program

Figure 1 above shows the main elements in carrying out a strategic energy management program. The success of this energy management program begins with a strong commitment by an organization/company to sustainable improvement related to energy efficiency. To support this commitment, several activities must be carried out, namely (Ramezani et al., 2020):

- Making energy policy in the organization/company
- Form a cross-functional energy team
- Conduct regular assessments of significant performance energy. An organization/company can set its own energy baseline based on existing

data and then set goals and objectives to be achieved. Having goals and objectives will help the company to develop and implement the action plans that have been made.

- Benchmarking, an important aspect that must be considered to ensure a successful action plan is implemented is the personnel involved. Every personnel at all levels of the office must be aware of energy issues and goals of energy efficiency. Staff must be given training in both skills and understanding related to energy efficiency practices in the field. Then the results of the implementation of these activities must be evaluated regularly and communicated to all personnel involved. Evaluation of progress is carried out regularly on energy and activity data which is part of the action plan. Information gathered during this evaluation process will assist in setting goals and objectives to be achieved. Creating a strong communications program will help create support and momentum that will benefit future activities.

3. METHODS

This study uses a quantitative approach. This study uses two calculations of electricity consumption at PT XYZ, namely Energy Consumption Intensity (IKE) and Specific Energy Consumption (KES). The data in this study is in the form of quantitative data obtained directly from the current state of PT XYZ, in the form of an initial energy audit, total electricity consumption, area and total production in 2022 and during research from January 2023 to March 2023. After the data – the data is processed by calculating IKE and KES, then identifying Energy Saving Potentials (PHE), which aims to determine patterns of energy use and the potential forsaving electricity at PT XYZ.

4. RESULTS

In this study, primary data collection has been carried out during the specified time. This research and data collection was carried out from October 2022 to April 2023. The author collected data in the Building Commissioning Division + Deck erection area (Tr. 6D) building of PT XYZ. The results of the research can then be analyzed to find out the management of electrical energy, so that an analysis of energy-saving opportunities can be carried out, namely by comparing the potential for energy-saving gains with the costs that must be paid for implementing the recommended energy-saving plans. Energy savings in buildings cannot be obtained simply by reducing occupant comfort or productivity in the work environment.

The initial energy audit aims to measure productivity and efficiency in energy use and identify possible energy savings. Initial energy audit activities include collecting data on energy use and costs over a certain period. The consumption of electrical energy for each division varies each month, depending on the use of electricity consumption each month. PT XYZ electricity consumption in 2022 will reach 35,459,867 kWh. The Commissioning Building+Deck erection area (Tr. 6D) Division is the area with the largest

consumption, namely 8,720,628 kWh. The Commissioning Building+Deck erection area (Tr. 6D) division of PT XYZ has an area of 63,000m2 with the largest electricity consumption compared to other divisions. Machinery and electrical equipment in the area of the Commissioning Building + Deck erection area (Tr. 6D) PT XYZ can be seen in the following table.

TABLE 1. Machinery and Electrical Equipment in the Building + Deck Commissioning Division erection area (Tr. 6D) PT XYZ

No	Equipment	Electrical Power (kW)	Quantity	Total Power (kW)	Working Time (time/month)	Total Electrical Consumption per month
1	Electric Compressor	200	4	800	600	480.000
2	Electric Equipments	100	2	200	600	120.000
3	Welding	15	16	240	462,5	111.000
4	Pump	10	5	50	300	15.000
5	Transformer	60-80	1	60-80	600	48.000
6	Light	0,2	600-700	120-140	300	42.000
Total						816.000
Average						473.512

Source: (Results of Primary Data Processing, 2023)

After carrying out an energy audit and making savings, the data obtained fromelectricity consumption and the output of the Commissioning Building + Deck erection area (Tr.6D) Division of PT XYZ in the period January 2023 to March 2023 are below table 2 asfollows.

TABLE 1. Electrical Energy Consumption and Output of the Commissioning Building + Deck erection area (Tr. 6D) Division of PT XYZ

No	Month	Electrical Energy Consumption (kW)	Output (MT)	Mark KES
1	January 2023	504.752	3.000	168,251
2	February 2023	564.128	3.000	188,043
3	March 2023	350.576	3.000	116,857
Total =		1.419.456	9.000	473,152
Average =		473.152		157,717
Mark IKE (kWh/m2/month)		8,449		

Source: (Results of Primary Data Processing, 2023)

Based on the data above, it shows that the highest electricity consumption was in February 2023, namely 564,128 kW and the lowest electricity consumption was in March 2023, namely 350,576 kW. The average consumption of electrical energy is 473,152 kWh and the IKE value is 8,449 kWh/m2/month which is in the efficient category. The total electricity consumption of PT XYZ Building Commissioning + Deck erection area (Tr. 6D) Division during the period January 2023 to March 2023 was 1,419,456 kW.

The output of the Commissioning Building + Deck erection area (Tr. 6D) Division of PT XYZ in January 2023 to March 2023 is 3,000MT. So that the total production output is

9,000MT. The highest Specific Energy Consumption (KES) value was in February 2023, which was 188.043 kWh/month, while the lowest KES value occurred in March 2023, which was 116.857 kWh/month. The average value of KES is 157.717 kWh/month.

Based on the description of the data above, it can be seen that there has been a decrease in the value of IKE, from 9.957 kWh/m2/month for the period January 2022 to December 2022 to 8.449 kWh/m2/month in the period January 2023 to March 2023. If consumption savings are calculated electrical energy is. 9.957 - 8.449 = 1.508. Or there is a savings of 15.14%.

5. CONCLUSIONS

From the discussion and calculations in the previous chapter, the results of the energy audit and analysis of energy saving opportunities in the Division of Commissioning Building + Deck erection area (Tr. 6D) of PT XYZ, the following conclusions can be drawn:

- Management of electrical energy in the Division of Commissioning Building + Deck erection area (Tr. 6D) of PT XYZ is still carried out conventionally.
- There was a decrease in the value of IKE, from 9.957 kWh/m2/month for the period January 2022 to December 2022 to 8.449 kWh/m2/month in the period January 2023 to March 2023. If the savings in electricity consumption are calculated, it is 15.14%.
- Opportunities that can reduce the consumption of electrical energy in the Commissioning Building + Deck erection area (Tr. 6D) Division of PT XYZ are focused on optimizing the operating hours of production machines. Production machines that are not used for production are turned off, during breaks production machines are also turned off. Replacing TL lamps with LED lamps which are more energy efficient. The lamp replacement is large enough so that it is categorized as low cost. For each room, a different type and cooling capacity of the airconditioner is used according to their needs so that waste does not occur.

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