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Solar power plant simulation for Tabriz Refinery

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1. ABSTRACT

In this research, the simulation of a solar power plant connected to the 220 kW electrical grid to produce at least 20% of the energy consumption of Tabriz Refinery's official buildings through renewable energies, was studied using PVsyst software. In this regard, to maximize the amount of output, researchers employed single-axis moving structure for sun oriented situating framework beneath closed-loop control. Power utilization partitioned between tracker and controller, with exceptionally low rates. The impact of moving structures into the over framework was explored. The comparison of movable structures in east-west heading with those structures having a settled point and slant showed that the electrical vitality delivered in mobile structures is 25% more and provides 129.8 megawatts of power to be infused into the official units per year. As a result, the authoritative division of Tabriz Refinery varies from a customer to a maker/producer. This achievement, moreover restricts outflow of 8,247.7 tons of carbon dioxide over 30 years, which could be a positive move in the course of diminishing greenhouse gases and maintainable improvement.

Keywords: Simulation of Solar Power Plant, Tabriz Refinery, Type of Structure.

2. INTRODUCTION

The Tabriz Oil Refining Company was established in 1974 and its construction was completed in 2016, with a capacity of 80,000 barrels per day [1]. The production capacity increased to 110,000 barrels per day in 1992 due to its expert efforts [1]. The refinery contributes about 7% to the country's crude oil refining capacity, focusing on producing Euro4 gasoline and Euro5 diesel [2]. Investments in renewable energy projects and energy efficiency are part of the company's strategy for sustainable growth.

Solar power plant structures are plate-like at specific angles facing the sky. It needs durable, windproof materials to maintain efficiency.

To confirm the solar power plant providing 20% of Tabriz Refinery's electricity, check its construction first. The 220 kW capacity plant is crucial for efficiency, with batteries needed for energy storage at night. Optimization methods are necessary.

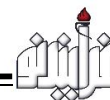
2.1. Environmental Analysis

The designed power plant needs a 1429 square meter area near Tabriz Refinery in a dusty desert environment. The average annual temperature is 15.2 degrees Celsius, suitable for maximum performance of b-29P250YL solar panels [3]. Temperature affects panels efficiency, so that output voltage would be reduced at with higher temperatures [3]. Contrary

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to the belief, higher temperatures negatively impact solar panel efficiency due to semiconductor sensitivity. Dust and humidity even at low amount affect production capacity.

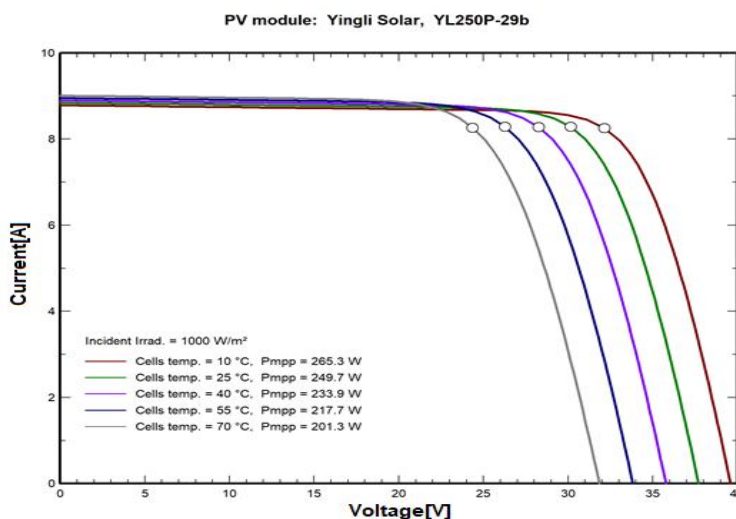


Figure 1. The effect of temperature on the used solar panel maps [3].

Solar power plant design involves connecting panels in series and parallel in structures called solar arrays to optimize energy absorption. Panel angle must be perpendicular to sunlight for maximum efficiency. Efficiency decreases if panels are not properly oriented to the sun. Design considerations include inverters, shading, and panel movement tracking. Solar power plants use fixed or mobile structures to optimize the panels' angle for sunlight direction. Fixed structures maintain a constant optimal angle, while mobile structures can increase output power by up to 40%. Mobile structures can be single-axis or two-axis moving, with biaxial structures it has maximum efficiency but higher costs. Single-axis structures adjust panel angles from east to west [4].

2.2. Equipment

To provide the 220 kW power plant in this project, 880 250 watt solar panels are utilized. Two 100 kW inverters are utilized in this work. Solar Yingli brand model B-29P250YL is the panel used in this study, and the GrowATT brand model 100CP GROWATT is the inverter being used in this regard, to maximize the amount of output.

3. Structure

The optimal angle of solar panels is set by system which is installed once a year, either at the start of each season, or each semester. The panels track vertical sunlight throughout the day and adjust their position accordingly. Single-axis movable structures continuously follow the sun's movement, providing reliable and efficient performance [4]. Research shows that choosing the right structure can significantly improve power plant output and efficiency.

Consumption by tracker systems and division controller for power plant structures can impact energy output. Single-axis mobile structures can increase energy output significantly without major changes to maintenance or capital requirements [4]. Monthly output measurements show the importance of sunlight intensity and direction in affecting power plant performance. Moving structures can have a noticeable impact in cloudy areas with sufficient sunlight, enhancing power plant output.

4. RESULTS AND DISCUSSION

Changing the structure of a solar power plant positively impacts output power. Single-axis mobile structures enhance energy production significantly, keeping up with industry advancements. Monthly output varies with sunlight availability, affecting power plant performance. Moving structures are effective in cloudy areas, where sunlight is still present. Adjusting panel angles increases efficiency, highlighting the importance of radiation in energy production [4].

5. CONCLUSION

The research has led to several conclusions:

- 1- A decree has been announced to supply 20% of administrative departments' energy consumption through a solar power plant connected to the 220 kW grid with a movable structure.
- 2- The amount of energy can be increased with a single-axis mobile structure.
- 3- Administrative units can transit from consumers to producers by construction of solar power plants.
- 4- Tabriz Refinery is shifting towards green and clean energies production & consumption to strengthen its infrastructures.
- 5- Net profits from refinery commercial activities can support administrative unit progress.



6- Emission of polluting gas, carbon dioxide, can be reduced and controlled in fossil fuel industries conclude your work incorporating your most important finding as well as future works (3-4 lines).

6. REFERENCES

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