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솔라셀을 적용한 보안등의 특성 분석에 관한 연구

강병복*, 지운석*, 임중열**, 유창우***, 김석종***, 차인수*
*동신대학교 전기전자공학과, **남부대학교 컴퓨터전자공학부, ***모인에너지(주)

CHARACTERISTIC ANALYSIS FOR GUARD LAMP USING SOLAR CELL

Byung-Bog Kang*, Woon-Seok Ji*, Jung-Yeol Lim**, Chang-Woo Yu***,
Seok-Jong Kim***, In-Su Cha*

*Dept. of Electrical & Electronic Eng. Dongshin Univ.
**School of Computer & Electronic Eng. Nambu Univ.
***More-in energy incorporation

ABSTRACT

A guard lamp system has been installed at the PV positive center, located at Gwangju in Korea. Digital environment that is represented to internet is displacing business way of industry and business achievement way with the fast speed being giving great change on life whole, improve existence business process utilizing internet and Web connection technology, information superhighway to tradition industrialist manufacture and e-transformation's propulsion that wish to maximize productivity and administration efficiency is spread vigorously. In this paper, we wish to accomplish generation equipment's heighten stability and believability through remote monitoring and control of guard lamp system. This paper describes the design of the monitoring system for the sensing data and indirect controlling of the guard lamp system. Most of the conventional monitoring systems depend on the special hardware and software. The essential design of monitoring system is to provide the convenience for the user and the portability for the system. In order for the system to fulfill its requirements, it was designed using Labview GUI facility based on the Windows 2000 environment of IBM PC compatible and Add-on card based on the TCP/IP protocol. Advantage of the monitoring system are a personnel expenses curtailment effect,of the place restriction and unmanned system of the generationplants, etc..

1. INTRODUCTION

The development of the solar energy is necessary since the future alternative energies that have no pollution and no limitation are restricted. Since there is such an advantage in these energies, they are being studied and developed consistently. The photovoltaic generation have an advantage of unlimited and unpolluted amount of energy resource. The photovoltaic system is regarded as the main electricity supply and is connected in parallel to the supply from the local gride. Sunlight falling on the photovoltaic components creates electricity.

In this paper, we wish to accomplish generation equipment's heighten stability and believability through remote monitoring and control of guard lamp system. This paper describes the design of the monitoring system for sensing the monitoring data and indirect controlling of the guard lamp system.

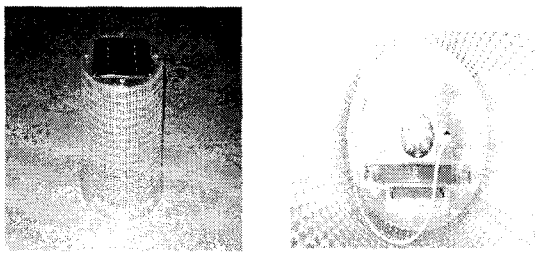
The string monitoring is connected directly to the inverter via an RS485 bus and allows for current measurement and monitoring of each string in our gurad lamp system. By connecting a radiation sensor and a temperature sensor directly to the field point and acquisition card it is possible to acquire not only electrical data but also the corresponding meteorological values measured. A web server and a LAN was installed inside Field server. This allows to monitor BIPV system via the internet the most convenient of possibilities to communicate.

2. SYSTEM STRUCTURE

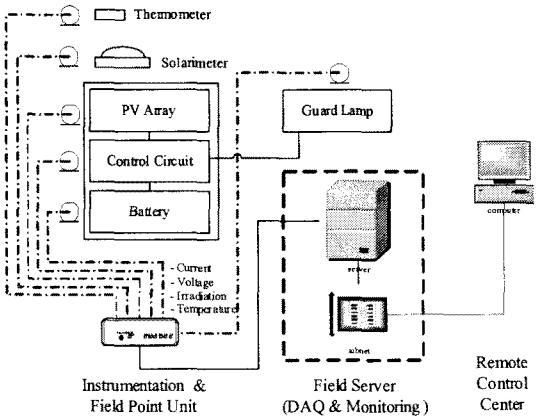
Basis structure of the system is same with figure 1. It is consisted of the guard lamp system become target of the monitoring, the monitoring system that can bring and control to their state. Figure 1 shows the structure of guard lamp system. The monitoring system is consisted of the Add-on card that translate information and transducer measurement voltage, current, temperature etc.. Software for monitoring designed using LABVIEW. In the add-on card, bring information that is measured in PV system through serial communication or pass established information by administrator.

Field server is consisted of HTTP server and system that collects and store and analyze monitoring data.

The specification of guard lamp system is as follow



(a) Photography of Guard Lamp



(b) Block diagram of guard lamp system

Figure 1. Basic schematic of guard lamp system

- Power of PV cell : 1.2 [W]
- Light source : 4EA Extra bright LED
- Battery : Rechareable Ni-Mh Battery
  Operating time : 8Hr
- Brightness : 12,000 [mcd]

3. WEB BASED MONITORING SOLUTIONS

In order for the system to fulfill its requirements, it was designed using Labview GUI facility based on the Windows 2000 environment of IBM PC compatible and add-on card based on the TCP/IP protocol. The transmission control protocol (TCP) is intended for use as a highly reliable host-to-host protocol between hosts in packet-switched computer communication networks, and in interconnected systems of such networks. The internet datagram provides a means for addressing source and destination TCPs in different networks. The internet protocol also carries information on the precedence, security classification and compartmentation of the TCP segments, so this information can be communicated end-to-end across multiple networks. To read data from various sensors or data measuring device, remote data processing module need that serve to convert analog signal to digital signal. Figure 2 shows the measurement unit that is included Transducer, Transformer andPoint, etc..It measures data(voltage, current) value of the PV system and send to the Field Server. Figure 3 shows the program flow chart by Labview. And it means that control method of the monitoring element.

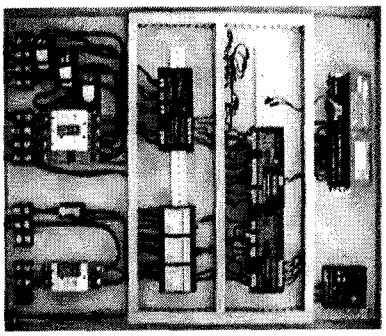


Fig. 2 Measurement unit

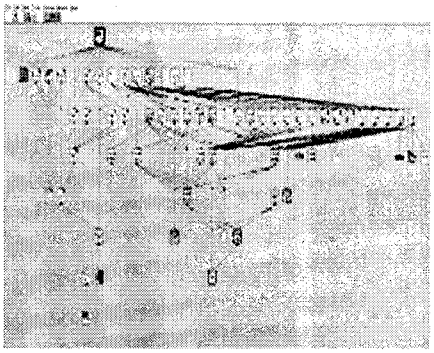
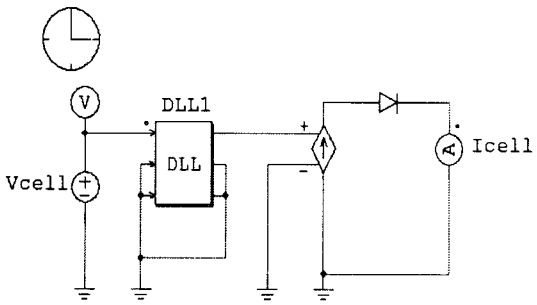


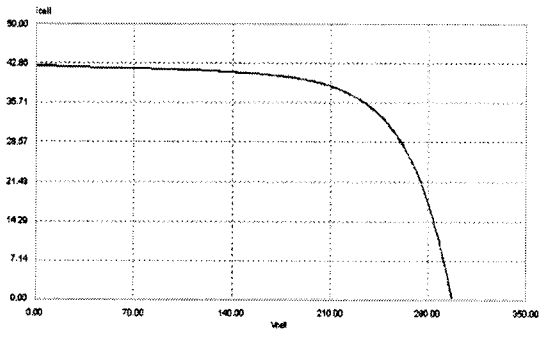
Fig. 3 Program flow chart

4. SIMULATIONS AND EXPERIMENTS

The current-voltage characteristic of the photovoltaic array can be modeled by the equation 4.1, and simultaion model shows figure 4 by PSIM.



(a) Schematic circuit



(b) Characteristic curve of voltage-current [mV/div, mA/div]

Fig. 4 PSIM module of solar cell

$$I = I_{ph} - I_D = I_{PH} - I_O\left[e^{\frac{qv}{nKT}} - 1\right]$$

$$I_D = N_P \cdot I_O\left[e^{\frac{q(V+I\cdot R_s)}{AKTN_s}} - 1\right]$$

$$I = I_{PH} - N_P \cdot I_O\left[e^{\frac{q(V+I\cdot R_s)}{AKTN_s}} - 1\right] - \frac{V + I\cdot R_s}{R_{SH}}$$

$$I_{PH} = [I_{SC}\cdot S_N + I_T(T_C - T_R)]\cdot N_P$$

$$I_O = I_{OR}\left(\frac{T_C}{T_R}\right)^3 e^{\frac{qE_G}{Bk}\left(\frac{1}{T_R}-\frac{1}{T_C}\right)}$$

$$S = 100\sin(12\times SH - 90°)$$

(4.1)

Where, I_{PH} : Photoelectronic current, I_D : diode current , I_O: reverse saturation current, q: elementary charge, K : Bltzmann's constant, N_P: parallel modules, N_S: serial modules, S_N: unit irradiance, R_S: serial resistance, R_{SH}: parallel resistance, I_T: surface temperature, T_C: cell surface temperature, T_R: cell standard temperature, E_G: energy band gap, A, B: product constant

Figure 5 shows the schematic diagram and output characteristic of PV array at real time. The result is equal with result by characteristic curve that gives simulation for the panel. The maximum power point will be form in the voltage 2.3V and current 0.35[A].

Figure 6 shows the main screen that is displayed power, voltage, current, irradiation and temperature (outside, solar cell surface). When compared remote control center data receiving speed with field server, remote control center is indicated delay time about 10 [sec] thanfield server. Because of the data translation speed of field point and field server is faster than communication speed of field and remote control center. In additional, because of the field server and remote control center are far away about 5km. Also, it can control the guard lamp system through this panel. Also, this shows the trend screen that is displayed power, voltage,

irradiation and temperature. It is displayed graphic of acquisition data by the monitoring system. Figure 7 shows the output characteristic of guard lamp system and this waveforms can be plotted by accumulated data of data acquisition system. Where, x axis is converted by minute.

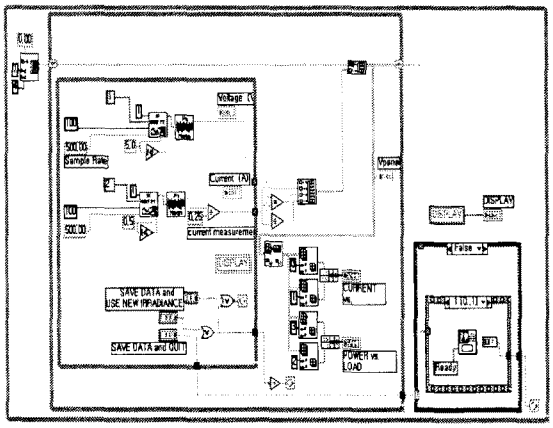


Fig. 5 Schematic diagram of monitoring system

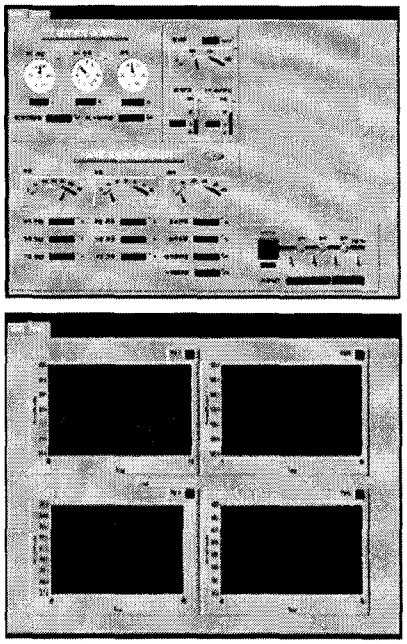
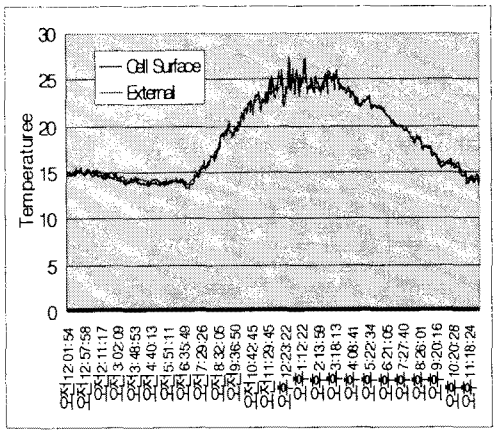
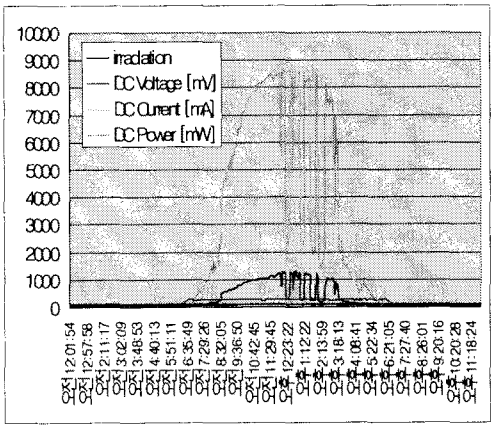


Fig. 6 Monitoring basic & trend screen



(a) Temperature characteristics



(b) Output waveform

Fig. 7 Output characteristic by acquisition data

5. CONCLUSION

In this paper configured and analyzed remote monitoring system for man less and independent operation of guard lamp system using photovoltaic. Through this, we wished to minimize stability, reliance, time, spatial restriction. To supplement problem of locality, compatibility, extensity, we embodied Web-based monitoring and control system. We composed hardware for monitoring system, design and drove considering user interface for MGDC that can do monitoring and control with this. But, it will necessary research about error etc. that application of web technology occur problem of security by network protocol and emergency situation of equipments.

In additionally, we wish to compose photovoltaic

that independent operation strengthen considering voltage variation and problem of system using construed data through monitoring system influenced to supply of electric power system.

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