Temperature Monitoring and Control of Large Photo Voltaic Farm

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***Abstract* - This paper deals with temperature monitoring and control of large photo voltaic farm which implements maintaining efficiency of photo voltaic farms that facilitates electricity to number of areas. It provides cooling system for tropical countries like India as well as heating system for arctic countries.**

***Index Terms*—Temperature, Photo voltaic, solar, electricity, heat, cool.**

INTRODUCTION.

Our paper aims to describe the design of a module that provides maintaining the adaptability of photo voltaic panels. It will monitor and maintain proper temperature balance of the photo voltaic cells so that energy generation process is efficacy While panels need to be cooled down in tropical countries like India; they equally need to be heated up in countries facing medium to heavy snow. The proposed unit solves both heating and cooling solutions and thus boosting the panel's efficiency.
A photovoltaic power station is also known as a 'Solar Park'. It is designed for the supply of Power into the Electricity Grid. They are sometimes also referred to as Solar Farms or Solar Ranches. The Solar Power source is via Photovoltaic modules that converts light directly to electricity.
One of the key factors impacting the amount of electricity the solar panels produce is the temperature at which they operate. It is wrong to presume that more sun means more heat that will result in more electricity. Different solar panels react differently to the operating ambient temperature, but in all cases the efficiency of a solar panel decreases as it increases in temperature.
The impact of temperature on solar panel efficiency is known as the temperature coefficient. Solar panels are power tested at 25^0C, the efficiency of a solar panel is affected even if the temperature goes up or down by a degree.
Our project focuses on the Temperature variant. It deals with the impact of temperature on Large Photovoltaic Farm. We have developed an Embedded Project; a combination of Software & Hardware System which continuously monitors the change in temperature. It monitors both the rise in temperature as well as the fall in temperature.
The system also provides the ability to control the temperature by using the heater or cooler which is accordingly suitable. Our project includes an Integrated Serial GSM Modem which will send messages to a defined number in case of any false activity or natural calamity occurs with the Photovoltaic Farm.

HARDWARE REQUIREMENT

1. Precision Centigrade Temperature Sensors
   Type: LM35DZ
   Description: The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 is rated to operate over a −55˚ to +150˚C temperature range.
   Features:
   - 0.5˚C accuracy guarantee able (at +25˚C).
   - Calibrated directly in ˚ Celsius (Centigrade).

2. 8-bit Microcontroller
   Type: AT89S52 (belong from 8051 family).
   Description: The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard 80C51 instruction set and pin out.
   Feature:
   - 8K Bytes of In-System Programmable (ISP) Flash Memory.
   - 4.0V to 5.5V Operating Range.
   - Fully Static Operation: 0 Hz to 33 MHz
   - Three-level Program Memory Lock.
   - 256 x 8-bit Internal RAM

3. LCD-II
   Type: HD44780U
   Description: The HD44780U dot-matrix liquid crystal display controller and driver LSI displays alphanumeric, Japanese kana characters, and symbols. It can be configured to drive a dot-matrix liquid crystal display under the control of a 4- or 8-bit microprocessor
   Feature:

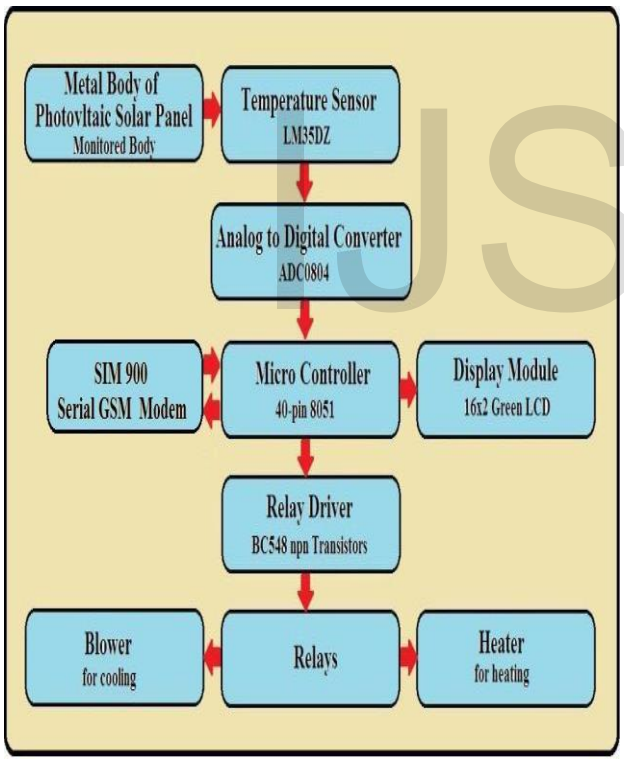
- 5 × 8 and 5 × 10 dot matrix possible.
- Low power operation support.
- Wide range of liquid crystal display driver power.
- Liquid crystals drive waveform.

4-bit or 8-bit MPU interface enabled

SOFTWARE REQUIREMENT

- KEIL Micro-Vision 2 or above installed.
- VP812 application for IC burning (writing).
- Express PCB software for PCB Designing.

SOFTWARE REQUIREMENTS



The temperature sensor LM35 senses temperature and gives proportional analog voltage output as per the extent of rise or fall in temperature. The Analog to Digital Converter IC (ADC0804), which is based on Successive Approximation, takes this analog voltage and converts it into 8-bit Parallel Binary Digital data. The converted Digital data it latched to the digital output pins and made available for the Micro Controller to use.

The micro controller, upon receiving this digital data from the ADC, processes it according to the embedded code and converts the reading into Temperature and displays it onto the 16*2 LCD unit connected to its output port. The Micro Controller also continuously keeps comparing the temperature to a hardcoded set of User Defined Values for the condition of Over Temperature or Under Temperature.

Every time a condition of Over Temperature is faced, the Micro Controller switches the Blower Relay ON, which switches ON the Blower and cools the panel down in some time; after which the relay is Switched back to OFF. The buzzer also sounds accordingly. At this point, the serial GSM modem is also commanded to send the Text Message of over Temperature Condition and the measure taken to control it to a predefined Mobile number.

Every time a condition of Under Temperature is faced, the Micro Controller switches the Heater Relay ON, which switches ON the Heater and heats the panel up in some time; after which the relay is Switched back to OFF. The buzzer also sounds accordingly. At this point, the serial GSM modem is also commanded to send the Text Message of under Temperature Condition and the measure taken to control it to a predefined Mobile number.

All the ongoing actions are aptly mentioned on the 16*2 LCD units as well .If the user wants to change the Set of Value for comparison, just a reprogram of the unit with the new limit values is required.

APPLICATION

1. It continuously monitors the temperature.
2. It facilitates Cooling solution in case of overheating.
3. It facilitates Heating solution in case of overcooling.
4. Data can be used for logging. Understanding patterns related to temperature efficiency in different geographical Location and in different weather condition
5. Nationwide programmed for capital incentive since 2006 and concluding in 2010 for grid-connected PV systems for urban applications.
6. Investment Tax Allowance & Capital Allowance for PV systems at national level since September 2007.
7. PV systems can help reduce electricity consumption from the network and provide other benefits such as reduced demand charges.

CONCLUSION

Thus, we have researched and implemented temperature monitoring and Control of large photo voltaic farms that has Resulted in increasing the efficiency of the farm and this research can be further continued.

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