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AUTOMATIC DAM SHUTTER OPENING SYSTEM

Sachin Suke[*1], Atharva Gedam[*2], Hemant Matre[*3], Hrushikesh Wathore[*4], Tushar Bisen[*5], Yogesh Bansod[*6]

[*1]Asst.Professor, Department Of Electronics And Power Engineering, Priyadarshini College Of Engineering, Nagpur, Maharashtra, India.

[*2,3,4,5,6]Students, Department Of Electronics And Power Engineering, Priyadarshini College Of Engineering, Nagpur, Maharashtra, India.

ABSTRACT

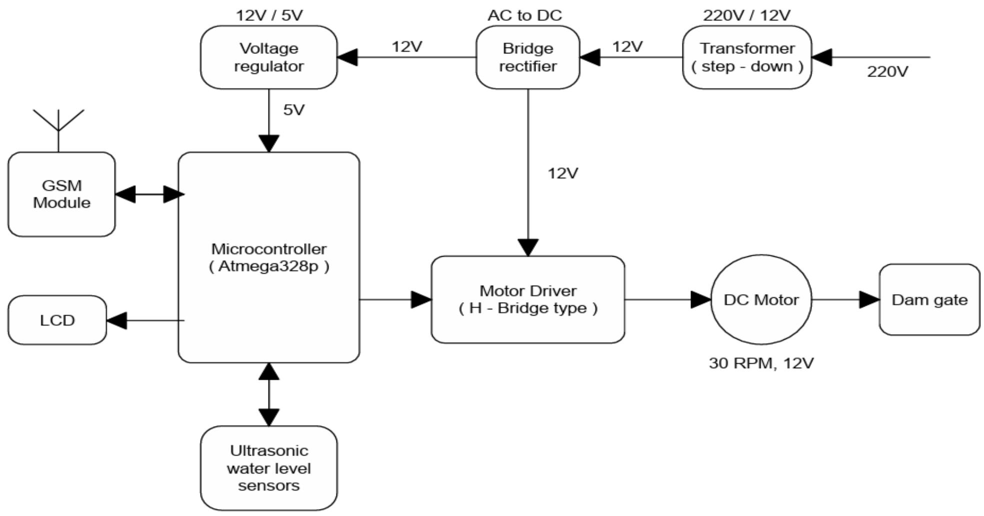
Dams are one of the major water sources for irrigation, electricity generation etc. in India. Lack of proper dam management system have been causing several losses including the floods. Dam failure is one of the biggest disasters that could happen. Dams are one of the major water sources for irrigation, electricity generation etc. in India. Lack of proper dam management system have been causing several losses including the floods. Dam failure is one of the biggest disasters that could happen. Inspired by the existing rural and socio-economic problems, an innovative Automatic Dam Shutter Opening System can be developed for dam management purposes. Hence, the main purpose of this project is to control the dam shutter automatically.

I. INTRODUCTION

The Peltier effect is a phenomenon in thermoelectric materials where the absorption of heat occurs at one end of the material while the opposite end releases heat. This unique behavior is a result of a current flow through the material. The Peltier effect is one of the two essential thermoelectric effects, the other being the See beck effect, which collectively enable the direct conversion between electrical and thermal energy. In the realm of thermoelectric cooling, often implemented through devices known as thermoelectric coolers (TECs), the Peltier effect plays a crucial role. Thermoelectric cooling offers several advantages, making it a preferred technology in certain applications. These advantages include high reliability, as there are no mechanical moving parts involved, resulting in reduced wear and tear. Additionally, thermoelectric coolers are known for their compact size and light weight, making them suitable for various applications where space and weight constraints are significant considerations.

Unlike traditional cooling methods that rely on working fluids and complex mechanical systems, thermoelectric cooling operates without the need for such components. This absence of working fluids not only simplifies the design but also contributes to the reliability of the system. Overall, the Peltier effect, in conjunction with the See beck effect, facilitates a direct and efficient conversion between electrical and thermal energy. This capability, coupled with the practical advantages of thermoelectric cooling technology, positions it as a promising and versatile solution in diverse fields such as electronics, medicine, and aerospace.

II. SYSTEM MODEL



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WORKING

When the current is supplied or the power is given to the system, the transformer converts it into the required amount of current only by using step-up or step-down technique. The required supply now reaches the voltage regulator which regulates the amount of voltage and distributes it into two phases, a microcontroller and a LCD display. Now all the components are in operating condition. When the water level touches the first sensor fixed at bottom, the signal is sent to microcontroller which further sends the signal to dam gate and the gate opens a little wider and the water is allowed to pass through it.

This is the condition when water level in the dam is moderate. Now as the water level increases, the sensor sends the signal to microcontroller which forwards the signal to the gate and this time the gate opens partially and the water flows through the dam. Now when the water level is overflowing, same function is done by top sensor and the dam is free from risk of damage due to water pressure.

III. EQUIPMENTS

Transformer (220V to 12V)

- Transformer are most commonly used for increasing low AC voltages at high current (a step-up transformer) or decreasing high AC voltages at low current (a step down transformer) in electric power applications.

Bridge Rectifier (1A, AC to DC)

- Rectifiers are used to convert an AC power to a DC power. Among the Rectifier, the Bridge Rectifier is the most efficient Rectifier Circuit.

Power SupplyESP Wroom 32 Wifi

(Up to 150 mbps, 20 dBm)

- ESP32-WROOM-32 is a powerful, generic Wi-Fi + Bluetooth® + Bluetooth LE MCU module that targets a wide variety of applications, ranging from low-power sensor networks to the most demanding tasks, such as voice encoding, music streaming and MP3 decoding. At the core of this module is the ESP32-D0WDQ6 chip.

Servo Motor (3V – 7.2V)

A servo motor, or servo, is a rotary or linear actuator that controls the angular or linear position, velocity, and acceleration of a mechanical system. It's part of a servomechanism and consists of a motor and a sensor for

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position feedback.

Ultrasonic Sensor (5V, 50Hz)

An ultrasonic sensor is a device that uses sound waves at frequencies higher than what the human ear can't detect (typically above 20KHz) to measure distance or detect objects.

Buzzer (5V)

A buzzer is a device that produces a sound when an electrical signal is applied to it. The sound can be a buzz or a beep. Buzzers are also known as sounders, audio alarms, or audio indicators.

IV. ADVANTAGE

1. **Compact and Lightweight:**

Thermoelectric air coolers are generally compact and lightweight, making them suitable for various applications where space is a constraint.

2. **No Refrigerants:**

Unlike traditional air conditioning systems, thermoelectric coolers do not require refrigerants, making them environmentally friendly and reducing maintenance concerns.

3. **Precise Temperature Control:**

The temperature control in thermoelectric coolers is precise, allowing users to maintain specific temperatures for their applications.

4. **Energy Efficiency:**

They can be energy-efficient in certain scenarios, especially when used for localized cooling needs or in situations where precise temperature control is more critical than high cooling capacity.

5. **Quiet Operation:**

Thermoelectric coolers operate quietly as they do not involve compressors or moving parts, providing a noise-free cooling solution.

V. APPLICATIONS

- To reduce the load of operator.
- To introduce this technique in this developing world ensuring the utility of multidisciplinary fields like mechatronics, robotics, Artificial Intelligence etc.

- To decrease the maintenance cost of system.
- To reduce the only use of mechanical linkages and different mechanisms in the system.
- Using this, the risk of disaster strike can also be minimized such as floods. If opening and closing of the dam gates is properly managed.

VI. CONCLUSION

Thermoelectric air coolers show promise in delivering energy-efficient and environmentally friendly cooling solutions. Their solid-state design, miniaturization potential, and compatibility with IoT technologies position them for diverse applications. The ability to integrate with renewable energy sources aligns with sustainability goals. Ongoing research in materials science aims to enhance their efficiency, while their precision makes them suitable for commercial and industrial use. Cost reduction efforts and scalability challenges need attention for broader adoption. Despite challenges, the future of thermoelectric air coolers looks positive, contingent on continued innovation and problem-solving.

VII. FUTURE SCOPE

Advanced Materials Research: Continued exploration and development of new thermoelectric materials with improved efficiency and performance could be a key method. Investing in research to discover materials that exhibit better thermoelectric properties can enhance the overall effectiveness of thermoelectric coolers.

Smart Technology Integration: Leveraging advancements in smart technologies and sensors for real-time monitoring and control can enhance the efficiency of thermoelectric coolers. Integration with smart systems can optimize cooling based on specific conditions, leading to energy savings and improved performance..

Miniaturization and Integration in Electronics: Further research into miniaturization techniques and integration methods for thermoelectric modules into electronic devices can open up new applications. This is particularly relevant for cooling electronic components in devices like smartphones, laptops, and wearables.

Efficiency Improvement: Investigating methods to enhance the efficiency of thermoelectric modules, such as optimizing their design and improving heat transfer mechanisms, can contribute to overall performance improvements. This may involve advancements in thermal management techniques.

Cost-Effective Manufacturing: Developing cost-effective manufacturing processes and scaling up production can address cost barriers associated with thermoelectric coolers. Economies of scale and innovative production methods could make these technologies more accessible and competitive in the market.

Collaborative Research and Industry Partnerships: Encouraging collaboration between research institutions, industry players, and government agencies can foster a more comprehensive approach to advancing thermoelectric cooler technology. Sharing knowledge, resources, and expertise can accelerate progress and address challenges effectively.

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