Power Monitoring and Generation in Pipelines

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Abstract—Power is generated in a variety of ways, including solar, thermal, nuclear, and biomass. However, these technologies require a significant capital investment and are not easily accessible to the poor. This project uses micro turbine to harvest electricity from the flowing tap water. The power generated from this process is later used for small house applications and later it is can also be stored in the rechargeable battery and it can be used whenever needed. Here, the power is generated from completely renewable and reusable liquids especially water.The power generated is then monitored and controlled using Arduino UNO.

Keywords: Micro turbine, Arduino UNO, LCD Display, Rechargeable battery,IOT.

I. INTRODUCTION

Electricity plays an important part in our day-to-day lives. It is being used widely in all applications around us. Used for room lighting, working fans and home appliances. All these provide comfort for people. In factories, large machines are powered by electricity. Basic objects likefood, clothesand paperareproductsofelectricity.But the method of producing the electricity involves a lot of raw materials and capital costs, and the electricity bill also keeps on increasing as the demand has also been increasing. Here, using this method, we can harvest electricity in our home just from our daily activities. That is, without water, we cannot live. Each family in India uses almost 15,000 gallons of water. So, it is possible to harvest energy every time you use your tap not only in our home but also in the process of transmitting water from lakes and rivers to huge water tanks. The upper water tank is placed on the terrace of the house and is filled with an underground sump or a domestic electric pump from a well. Water has high kinetic energy when it flows from high to low. Electricity can be generated from this kinetic energy with the help of a suitable micro turbine. The power produced by the turbine can be varied based on the amount of water flow in the line. Here, the power generated can be used for the load, and using the IOT technology, we can monitor the power generated and used with our mobile phones.

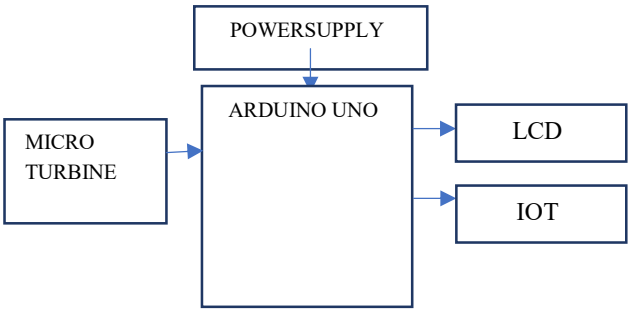

Figure 1. Block diagram.

The block diagram consist of Micro turbine, Power supply, Arduino UNO, Liquid Crystal Display, Internet of Things Technology.

II. PROPOSED SYSTEM

The proposed system is designed to provide a super beneficial model which will generate electricity from your regular household activities. The micro turbine connected to the tap starts to rotate whenever the tap is in use. The Arduino UNO is used for controlling the turbine and IOT technology is used to enhance the monitoring purpose and maintenance status of the turbine. Here, we monitor the power production and the turbine status. The use of rechargeable battery helps to store the generated power. It can be stored and can be used whenever needed. The LCD display is used to display the working condition of the entire system. The use of NodeMCU

Helps to connect the system with the Wi-Fi module. The system can be used for simple application the energy in this system is produced by renewable method and environmental friendly.

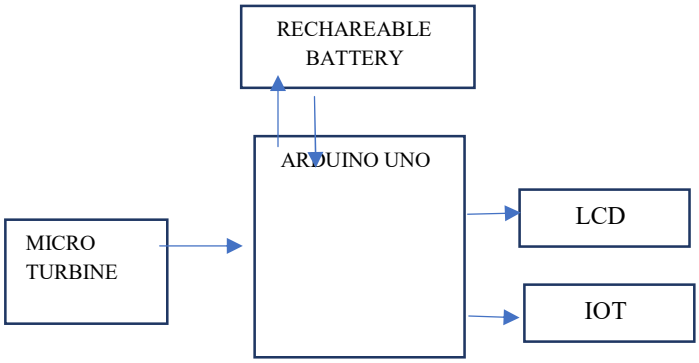

Figure 2. Proposed diagram.

A. Arduino UNO

A typical board for Arduino is the UNO. It was also Arduino's first USB board that was made available. It is regarded as the most effective board and is utilised in many projects.The ATmega328P microprocessor is the basis of the Arduino UNO. Comparison with other boards such as Arduino Mega Board, it is easy to use. The board is made up of shields, various circuits, and digital and analogue Input/output (I/O) pins. An In-Circuit Serial Programming (ie.ICSP) header, a USB port, 14 digital pins, a power jack, and six analog pin inputs are all included in the Arduino UNO. It is written in accordance with IDE, or Integrated Development Environment.ATmega328 Microcontroller,an individual chip microcontroller from the Atmel family is the ATmega328.Its processor code is 8-bit. It includes memories, analog-to-digital converters in addition to serial SPI ports, many input/output lines, registers, and timers, more external and internal interrupts, as well as oscillators. ISCP Pin, in the Arduino board enables users to programme using the device's firmware. The power LED indicator indicates whether the device is on or off. Digital I/O pin. Values are HIGH or LOW. The digital pins are numbered D0 through D13. TX and RX LEDs, lighting these signals indicates data transfer status. The reference voltage for Arduino will be received from the external supply. Required for programming Arduino boards. 16MHz crystal oscillator is used in this Arduino board. Change the input voltage to 5V using a voltage regulator. The ground pin acts as a non-powered pin.The input voltage is known as VIN. The pins with the letters A0 through A5 are known as analogue pins.

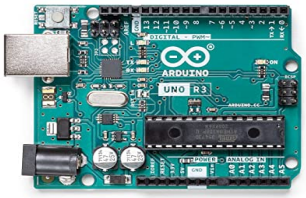

Figure 3. Arduino UNO

B. WI-FI Mode

It is an integrated TCP/IP protocol stack in a SOC. Microcontroller is allowed to access your Wi-Fi network by using module of ESP-01 ESP8266. The ESP8266 allows both application hosting and offloading of all Wi-Fi networking tasks to a separate application processor. Simply plug it into your Arduino device and you'll get Wi-Fi capabilities that are roughly equivalent to what a Wi-Fi shield provides. This module's on-board processing and storage power is sufficient for integration with the use of sensors and many more application-specific components. With its high degree of on-chip integration, less additional circuitry is required, and the front-end module takes up very little space on the circuit board. The ESP8266 includes a RF that enables it
to function in all operational situations and doesn't require any extra RF components. It also supports a Bluetooth interface coexisting with APSD for VoIP applications

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Figure 4.WIFI Module.

C. Battery

Lithium-ion Battery plays a major role in today's world. It consist of a cathode, Anode and Electrolyte solution. It is cheaper and also easy available. It is compact in size. The cathode part of this lithium ion battery consist of metal oxide, it is positive electrode. The anode side of Li ion battery consist of carbon graphite, it is also known as negative electrode.Electrolyte of Li batteries are lithium salt organic solvents. As the battery discharges and supplies current, Li ions travels from anode to the cathode, creating a flow of electrons. When it is connected to devices The Lithium ion travels from cathode and deposit in anode. Lithium ion movement results in free electrons at the anode and a charge on the positive side of the current collector. The flow of current is from the current collector via the powered device to the negative current collector. Separator is used to block the flow of electrons in a battery.In useable consumer electronics and electric vehicles, it is the most common form of battery. It is also widely used in military and aerospace applications as well as grid-scale energy storage. Li-ion batteries have high energy densities, little self-discharge, and no memory effect in comparison to other rechargeable battery technologies.

Figure 5. Lithium Battery

D. LCD

A specific kind of flat panel display known as an LCD uses liquid crystal as its primary form of movement. Given that they are mostly used in gadgets such as smartphones, televisions, computing monitors, and display panels, LCDs have a variety of useful applications for both consumers and companies. Everything is shown via transmissivity science on an LCD projector. Because to its inexpensive production costs and excellent colour reproduction, LCD projectors are more well-known than many other possibilities. A display is an electrically operated flat panel display or other optical device that takes advantage of the moderate modulation properties of liquid crystals in combination with polarizers. The use of backlights or reflectors to produce colour or monochrome images is an alternative to direct illumination from liquid crystals. Either an active matrix or a passive matrix display grid is used in the construction of LCDs. As a thin film transistor (TFT) display, the active matrix LCD is also referred as. Each junction in the conductor grid of the passive matrix LCD's pixels is home to a pixel. To regulate the light for any pixel, a current is delivered through two conductors on the grid. To regulate the luminance of a pixel, an active matrix, which has a transistor at each intersection of the pixels, uses less current. The screen refresh time can be improved by more frequent switching on and off of the current in an active matrix display as a result.

Figure 6. LCD Display

E. Micro Hydro Turbine

A type of hydroelectric power known as "micro hydro" uses the water's natural flow to generate electricity typically in the range of 5 kW and 100 kW. Pico hydro refers to installations with less than 5 kW. When net metering is available, these systems are often connected to electric power networks and can supply electricity to a remote residence or small community. These installations are widely spread throughout the world, especially in underdeveloped countries where they can offer a cheap source of electricity without the need to buy gasoline. Because water flow and hence accessible hydropower are often at their maximum in winter, where solar energy is at its lowest, micro-hydro systems can help complement photovoltaic systems. Pelton turbines are often used in small hydroelectric power plants for high-head with very low-flow water supply. Frequently, the use for industries consists of a tiny pool that has been dammed at the top of a waterfall and a conduit that extends for several hundred feet to a small generator housing. Archimedes' screws and water wheels are typically utilised at low head sites.

Figure 7. Micro Hydro Turbine

F. Methodology

The use of Micro turbine is one of the simplest and compact method to generate electricity when and where ever need. Water is one of the important resource and without water our daily routines are incomplete. It are also cheaper and easily available then other renewable energy generating sources. Based on the height of the tape and the distance between the tank and the tape, the rate of flow of water changes and based on the rate of flow of water from the tape, the power generated will also get changed. The power generated can be stored in a rechargeable batteries and the power used by devices can be monitored and controlled using IOT system.

III. RESULT AND DISCUSSION

Maximum output voltage about 12V, maximum output current about 3A, flow rate about 2.5 to 25 litres/minute. By continuously storing the power produced we can light lamp, use fans, can charge our phones and can use the obtained power for many other applications. We can also monitor the power generated and can monitor and control the power distribution for the connected devices using the IOT technology. Based on the velocity of water flow, the voltage obtained is varied.

IV. CONCLUSION

In summary, we have developed a power generating system using micro turbine, deformability, and production of maximum power from natural water flow. From this power generation and monitoring in pipeline system, we can reduce the necessity to depend on electricity from external resources especially for village areas it would be easy get electricity from flowing waters. This will also help to reduce the pressure on commercial power producers. This is easy to setup and needs very less expenditure for setting up in local areas. This does not requires any huge space like other sources. So this would be one of the best alternative to produce power at home with low cost.

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