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REAL TIME OPTIMIZATION OF REACTIVE POWER USING ARDUINO UNO

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Abstract: ***We are in desperate need of electricity, and we must make significant corrections to the way energy is wasted in the form of reactive force. As a result, the necessary energy can be used, with the energy undergoing significant correction in order to form a power factor. The power factor can be generated with the necessary energy, and the used power is properly used. The reactive power can be compensated with capacitor banks, and this is known as power factor correction. In order to compensate for a reactive power factor, power factor correction is a big issue in the industry. Reactive power can be compensated with reactive power and converted to actual power. As a result, the power factor can be compensated according to the load using the Arduino microcontroller, and the switching process is performed using the normal power factor, which can be operated by the microcontroller. The microcontroller has been designed to perform the necessary coding.***

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I INTRODUCTION

Efforts are also being made around the world to conduct research into improving energy quality and enabling renewable energy. Power is extremely valuable in today's technical transition, and the power system is becoming more complicated with each passing day. As a result, it becomes increasingly important to relay each unit of produced power over longer distances with minimal power loss. However, as the number of inductive loads has grown, as has the variance of load, the losses have multiplied. The load power factor decreases significantly as the usage of inductive loads grows, increasing device errors and reducing the performance of the power system. In India, the power sector is extremely important, and serving people according to their generation is insufficient. We're in desperate need of electricity. As a result, the necessary energy can be used, with the energy undergoing significant correction in order to form a power factor. The power factor is a metric that determines how efficiently energy is used. Low power factor is unfavourable because it induces a rise in current, which results in increased active power loss in the electric power supply chain.

Low power factor is recognised as a significant problem when it comes to increasing energy efficiency. With the necessary capacity, the power factor can be created, and the used power can be properly used. We must compensate for the energy losses that are lost by reactive power generation in order to reduce energy losses. Huge factories may consume a lot of power in the kw rating that the electricity department has approved. In a power system, we have a concept called power factor, which is defined as the ratio of losses to total power provided to power obtained in user terminals. Energy losses will be minimised if the term power factor is held at a nominal value. In a given market, power factor correction is a big issue. We used capacitor banks to compensate for the reactive power produced for this reason. The power factor varies based on the load rating attached to the supply mains. The power factor would be lower if we connect a smaller volume of inductive load. When the load is resistive, the power factor remains constant. The power factor can be kept steady if the capacitors are turned on in response to load variations at the right time.

By deriving the delay in the arrival of current and voltage signals from the source with high precision, an automatic power factor correction unit reads power from line voltage and line current. It calculates the phase angle between the voltage and current signals before calculating the power factor. The microcontroller then measures the necessary compensation and switches on the required number of capacitors from the capacitive bank before the voltage is normalised to unity. This methodology can be used to improve the performance of industrial power systems as well as household power systems. As an inductive load, the choke from a Compact Fluorescent Lamp (CFL) would be used.

II OBJECTIVES & BENEFITS OF PROJECT

The project's main goal was to develop correction equipment that could track the power factor of the mine's electrical framework and boost it to a desired level. The project was carried out with the following goals in mind.

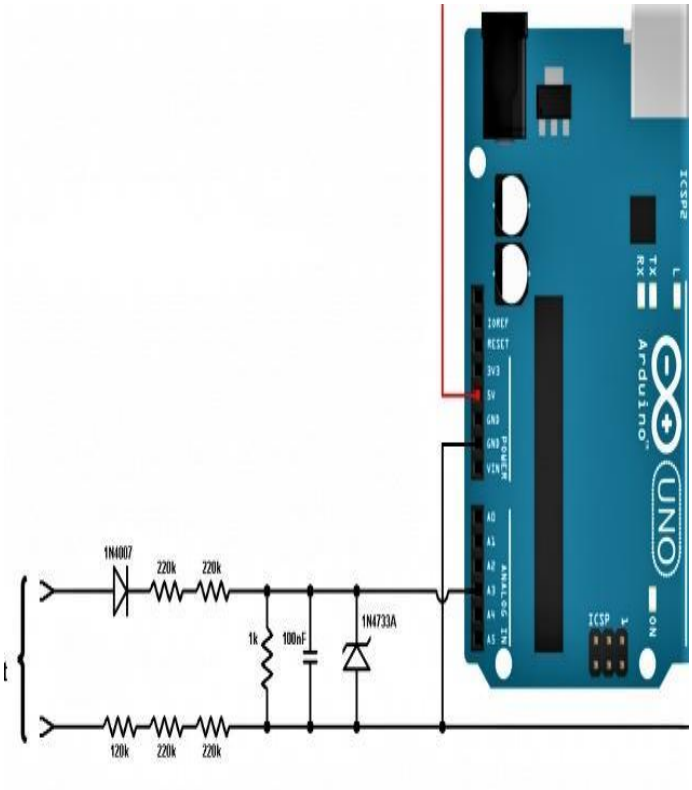
• To perform an electrical assessment of an opencast mine's current grid in order to investigate system setup and load habits, power factor variance during mine operating hours, and any power factor correction facilities.

• Create a microcontroller-based correction scheme to increase the device's power factor to the required value of greater than 0.95.

• Install the device and test it with various electrical load models and load patterns to ensure that the results are correct.

• To do an economic study in order to increase the power factor.

III SYSTEM BLOCK DIAGRAM

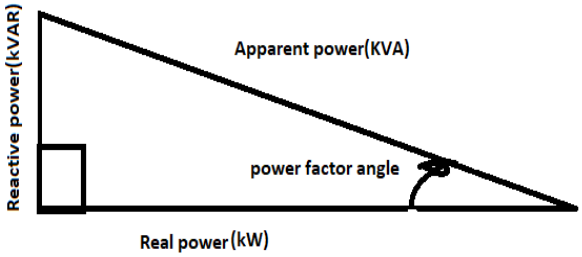


IV EXPLANATION

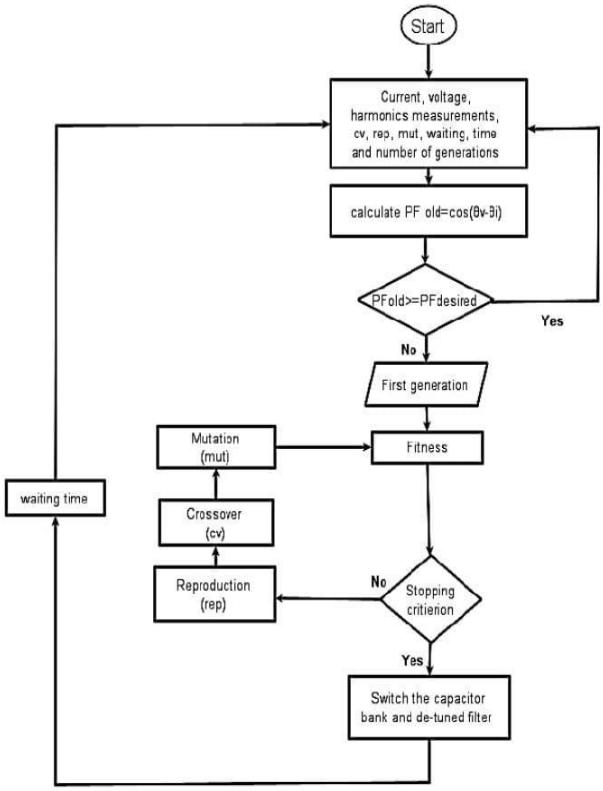
INTRO TO POWER FACTOR:-

Power factor is an energy concept that is related to power flow in electrical systems. Understanding the three common forms of control in electrical devices is useful in understanding power factors. The force that is directly turned into useful work for the creation of fire, light, and motion is known as real power. Real electricity is estimated in kilowatts (kW) and totaled in kilowatt-hours by the electric billing metre (kWh). The useful work that directly turns the shaft of a motor is an example of real force. The power used to maintain the electromagnetic field of inductive and capacitive devices is known as reactive power. It is the part of non-working electricity. The reactive strength of a system is calculated in kilovolt-amperes (kVAR). The customer billing statement does not have reactive capacity. Total power, also known as apparent power, is the sum of true and reactive power.

There is usually a phase difference between voltage and current in an ac circuit. The power triangle is a right-angle triangle representation that shows the relationship between active power, reactive power, and visible power. The wattmeter is used to quantify this strength. Reactive power is obtained by multiplying the reactive portion of the current by the circuit voltage.



V FLOW CHART



VI CONCLUSION

For calculation and monitoring of modelled electrical load, power factor correction equipment based on microcontrollers and capacitor banks was used, and the following deductions were made:

- Under the test load conditions, the engineered power factor correction unit was able to increase the power factor from 0.76 to 0.97.
- For the built load and various load patterns, the total energy consumption savings was about 1.7 percent.
- The processor energy is released as the current drawn is reduced with the correct amount of reactive power compensation.
- According to the economic review, the payback time will be about 9 months, with substantial oil cost savings.

VII RESULT

Both measurements must be taken separately with and without the correction equipment for the three different types of load designed. For each case, quantities such as supply voltage, frequency, current drawn by the load, power consumed, and power factor must be measured. The amount of energy used must therefore be tracked for a set period of time to ensure that all energy savings are realised.

VIII FUTURE SCOPE

We all know that solar energy is the most important part of human life in the future. That is why the number of solar projects is increasing. By using the solar water temperature control project, we can easily control water temperature without manually effort. We do not need to adjust water temperature manually. In this project, we have used a level indicator. With the help of this level indicator, we can set how much amount of water we need.

Water wastage is also eliminated as a result of this. We all know that water is the most essential aspect of human life. The project setup is often used to regulate the temperature of an electric heater. The most uneconomical aspect of an electric heater is the electricity bill. By changing the temperature of the water in the heater, we can conserve electrical energy. As a result, the energy bill is lowered, and the user benefits from hot water.

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