SOLAR OUTDOOR AIR PURIFIER AND AIR QUALITY MONITOR

Air pollution is a major environmental concern that severely affects human health, especially in outdoor and semi-urban environments. This project presents the design and implementation of a Solar Outdoor Air Purifier and Air Quality Monitoring System that operates using renewable energy and IoT technology. The system is powered by a solar panel with a charging circuit and battery backup, ensuring uninterrupted operation without dependence on grid power. An Arduino UNO acts as the central controller, interfacing with MQ-7 and MQ-135 gas sensors to continuously monitor harmful gases such as carbon monoxide and overall air quality. Based on the sensed pollution levels, the controller activates a relay to operate a HEPA filter equipped with four exhaust fans, effectively purifying the surrounding air. Real-time air quality parameters are displayed locally on an LCD and simultaneously transmitted to the ThingSpeak cloud platform via an ESP8266 Wi-Fi module for remote monitoring and data analysis. The proposed system offers a low-cost, energy-efficient, and eco-friendly solution for improving outdoor air quality while providing real-time pollution monitoring, making it suitable for public places, industrial areas, and smart city applications.

The main objective of this project:

☐ To design a solar-powered air purification system that operates independently of grid electricity using a battery-backed charging circuit.

☐ To continuously monitor outdoor air quality by detecting harmful gases such as carbon monoxide and other pollutants using MQ-7 and MQ-135 sensors.

☐ To automatically activate the HEPA filter with exhaust fans through a relay mechanism when pollution levels exceed safe limits.

☐ To display real-time air quality data locally on an LCD for immediate user awareness.

☐ To enable remote monitoring and data logging of air quality parameters on the ThingSpeak IoT platform using the ESP8266 Wi-Fi module.
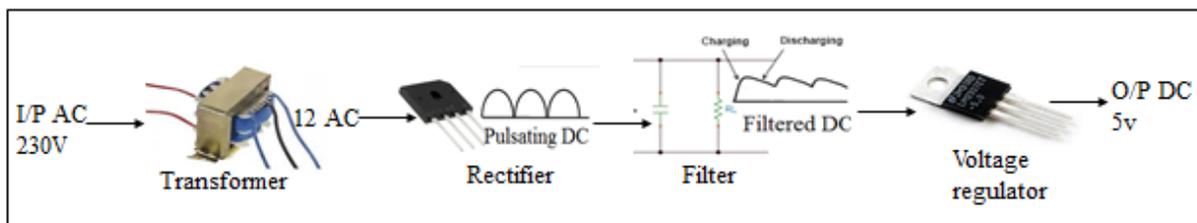
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The major building blocks of this project are:

- ▣ Power Supply.
- ▣ Arduino UNO Microcontroller.
- ▣ LCD display.
- ▣ MQ-7.
- ▣ MQ135.
- ▣ Hepa Filter.
- ▣ Relay with exhaust fans.
- ▣ Solar.
- ▣ Charging circuit.
- ▣ Battery.
- ▣ ESP8266 WI-FI.

Software's used:

1. Embedded C programming.
2. ARDUINO IDE STUDIO COMPILER for dumping code into Micro controller.
3. Express SCH for Circuit design.

Regulated Power Supply:

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Block diagram:

Block diagram

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