

LPG Gas Leakage Detector with Telegram Alert

Gas leakage remains one of the leading causes of household fire and explosion accidents, particularly in regions where LPG is the primary cooking fuel. Conventional gas detectors only provide a local audible alarm, which is ineffective when occupants are asleep or away from the premises. This project presents an IoT-enabled LPG gas leakage detector based on the ESP32 microcontroller that combines immediate local response with remote notification over the internet.

The system employs the MQ-2 semiconductor gas sensor, whose tin-dioxide sensing element exhibits a resistance change proportional to the concentration of combustible gases such as LPG, methane, and propane. The ESP32 continuously samples the sensor's analog output, applies a moving-average filter to suppress noise, and compares the computed gas level against a configurable danger threshold. When the threshold is exceeded, three response actions execute in parallel: a piezoelectric buzzer raises an audible alarm, a relay module energizes an exhaust fan to ventilate the affected area, and an alert message is pushed to the user's mobile phone through the Telegram Bot API using the ESP32's on-chip Wi-Fi.

Calibration is performed via an adjustable potentiometer on the sensor module combined with a baseline acquisition routine in the firmware, allowing the threshold to be tuned to the installation environment. Test results show the buzzer and relay activate within seconds of a controlled leak, with Telegram notifications delivered reliably under normal network conditions. The complete build uses low-cost, readily available components, making it suitable for academic final-year projects and real home deployment. Limitations include the MQ-2 sensor's warm-up requirement and indicative (non-precision) concentration readings, and the dependence on Wi-Fi connectivity for the remote alert path.