

Smart Helmet for Coal Miners Safety Monitoring System

Professor E. K. Rathod , Prathmesh Gaikwad, Balaji Gaikwad, Vishwanath Ghadage, Aniket Kadam

Department of Mechanical Engineering
Sinhgad College of Engineering, Vadgaon, Pune

Abstract: Coal mining is one of the most hazardous industries, where workers are frequently exposed to extreme conditions such as toxic gases, low oxygen levels, and structural collapses. This research proposes the design and development of a Smart Helmet for Coal Miners to enhance safety through real-time monitoring and alert mechanisms. The smart helmet integrates multiple sensors including gas sensors (for methane and carbon monoxide), temperature sensors, humidity sensors, and accelerometers to monitor the miner's surrounding environment and physical condition. The system uses a microcontroller and a wireless communication module (e.g., Zigbee/LoRa/Wi-Fi) to transmit data to a central monitoring unit. If abnormal readings are detected, immediate alerts are triggered for both the miner and the control room. This real-time safety system aims to reduce mining accidents, ensure prompt responses, and improve the overall health and safety conditions of coal miners..

Keywords: Smart Helmet, Coal Miners Safety, Real-Time Monitoring, Gas Detection, IoT in Mining, Wireless Communication, Hazard Prevention, Worker Health Monitoring, Embedded Safety Device

