AirSense

Technical Brief

Technology Summary

AirSense is a high-precision CO_2 detection system based on Non-Dispersive Infrared (NDIR) sensor technology. NDIR sensors operate by measuring the amount of infrared light absorbed by CO_2 molecules, ensuring accurate and stable readings over time. The system is designed for continuous indoor air quality (IAQ) monitoring in diverse environments from office buildings and educational institutions to industrial facilities and underground spaces. Deployed widely across offices, basement stores, industries, academic institutes, and government offices in Punjab, AirSense supports better decision making for ventilation, safety, and energy optimization.

Background

Poor indoor air quality, especially elevated CO_2 levels, can cause fatigue, reduced cognitive performance, and long-term health risks for occupants. In industrial and enclosed environments such as coal mines or basement storage areas, excessive CO_2 can compromise occupational safety. Conventional monitoring systems can be expensive, require frequent calibration, or lack remote data integration. AirSense addresses these issues with a reliable, low-maintenance, and cost-effective NDIR-based solution that enables real-time monitoring, supports compliance with safety norms, and helps optimize ventilation systems for energy savings.

Technology Description

AirSense uses an NDIR sensor to detect CO_2 concentration by quantifying the absorption of specific infrared wavelengths by CO_2 molecules. The sensor module is paired with an embedded processing unit that converts the optical signal into precise ppm (parts per million) readings. Data can be displayed locally or transmitted to a building management system (BMS) or cloud platform for remote monitoring.

The device features a color-coded indication system for quick visual interpretation of CO_2 levels:

- 400–1000 ppm – Green (Good air quality)
- 1000–2000 ppm – Yellow (Moderate; ventilation recommended)
- 2000–3000 ppm – Magenta (Poor; increased ventilation needed)
- 3000–4000 ppm – Blue (Very poor; take immediate action)
- 4000–5000 ppm – Red (Hazardous; evacuate/ventilate urgently)

Designed for minimal drift, extended sensor life, and low power consumption, AirSense is suitable for both standalone deployment and integration into large-scale monitoring networks.

Market Potential / Proposed Deployment

- Global Indoor Air Quality Market: USD 9.6B (2024) → USD 14.2B (2030) | CAGR ~6%
- Target Segments:
- Corporate offices & government buildings
- Industrial workplaces & basement storage facilities
- Educational institutes
- Agricultural greenhouses
- Mining sector & environmental monitoring agencies
- Socio-economic Impact:
- Health Benefits: Improved occupant wellbeing and productivity
- Occupational Safety: Reduced risk of respiratory distress in hazardous environments

Applications

- Buildings & Indoor Air Quality: Monitor CO_2 to optimize ventilation and maintain occupant comfort and productivity.
- Agriculture: Control CO_2 levels in greenhouses for enhanced plant growth.
- Coal Mines: Enhance worker safety by detecting hazardous CO_2 accumulation.
- Environmental Monitoring: Track emissions and indoor air quality for regulatory compliance.

Value Proposition

- Accurate & Stable: Reliable NDIR-based sensing with minimal drift over long-term operation.
- Real-Time Alerts: Instant notifications and color-coded visual warnings.
- Energy Efficiency: Data-driven ventilation control reduces energy costs.
- Health & Safety: Protects occupants from fatigue, poor cognitive performance, and occupational hazards.
- Scalable: Suitable for single-room use or large building-wide deployment.

Technology Status

- Technology Readiness Level (TRL): 9 – In market use
- Testing: Deployed and validated in offices, industries, and academic institutes
- IP Status: Technology transferred to Urban Air Labs Pvt. Ltd.
- Adoption: Active deployments in Punjab across multiple sectors