

TECH OFFER

Dilution Air Purification Systems (DAPS)



KEY INFORMATION

TECHNOLOGY CATEGORY:

Environment, Clean Air & Water - Sensor, Network,
Monitoring & Quality Control Systems

TECHNOLOGY READINESS LEVEL (TRL): **TRL6**

COUNTRY: **SINGAPORE**

ID NUMBER: **TO175295**

OVERVIEW

This technology represents an innovative approach to indoor air quality (IAQ) management, focusing on sustainability and energy efficiency. Leveraging the principle of dilution, outdoor airflow can be adjusted dynamically to balance energy consumption and air quality. The system uses a predefined control algorithm to determine the optimal mix of outdoor and recirculated air based on the concentration of particulate matter or carbon dioxide in the indoor environment. Users can customise the system's operation based on their IAQ requirements, ensuring efficient ventilation while minimising energy usage.

This low-cost solution aims to tackle challenges associated with IAQ, energy efficiency, and sustainability that cannot be accomplished by traditional heating, ventilation, and air conditioning (HVAC) systems. Instead, integrating decentralised air purification technologies into building design and urban planning initiatives, indoor pollutants can be removed while minimising operational costs and environmental impact.

City planners can now better prioritise IAQ and energy efficiency from the outset, ensuring that future developments contribute

to healthier, more livable communities. Public health, well-being, environmental sustainability, and climate resilience can be strengthened. This technology is best suited for retrofitting air conditioning systems in small to medium-sized residential care facilities and commercial buildings.

TECHNOLOGY FEATURES & SPECIFICATIONS

This technology uses IAQ management to maintain consistent air quality, tailored to individual rooms or zones. With customisable airflow rates and purification levels, IAQ can be more effectively managed across the entire building.

Additionally, integrating the Dilution Air Processing Unit (DAPU) enhances energy efficiency through process integration, engineered air psychrometry, and real-time monitoring and control. This significantly reduces energy consumption and operational costs compared to conventional HVAC systems.

The novelty of this technology lies in its comprehensive approach to IAQ management, integrating engineering principles with advanced technologies to deliver tailored solutions for various building needs. Key features and performance data of DAPS include:

- **Customisable fresh air intake:**
 - Gradually adjusts fresh air intake to maintain target PM1.0/PM2.5 levels.
 - Activates 100% fresh air only when PM levels reach user-defined critical thresholds.
- **Improved particle reduction efficiency:**
 - At a baseline ventilation requirement of 33% fresh air, DAPS reduces PM2.5 by 33%, compared to only 21% with traditional ACMV systems.
 - At 100% fresh air, DAPS reduces PM2.5 by 79%, whereas traditional ACMV systems achieve only 51%.
- **Better performance compared to air purifiers:**
 - Provides 10% higher PM2.5 particle reduction efficiency than standard air purifiers in similar room settings.
 - Air purifiers do not meet SS554 fresh air requirements for buildings.
- **Energy efficiency:**
 - When coupled with Dilution Air Processing Unit ([DAPU](#)), DAPS consumes 25% to 34% less energy across all fresh air settings than traditional ACMV systems.

POTENTIAL APPLICATIONS

- Critical environments such as hospitals and laboratories
- Commercial buildings requiring zone-level or room-level IAQ control
- Healthcare isolation and treatment facilities
- Hot-desking areas in airport terminals
- Hot-desking areas in shopping malls

UNIQUE VALUE PROPOSITION

- Optimises energy efficiency by identifying the ideal fresh air percentage to achieve the desired air quality, ensuring

energy savings and improved IAQ.

- Adapts purification levels in real-time to minimize unnecessary energy use while maintaining optimal air quality.
- Mitigates retrofitting issues for existing buildings by setting up easy-to-implement real-world examples.
- Incorporates advanced dynamic features that meet SS554 standards and outperform existing air cleaning technologies, including air purifiers and HEPA filters.
- Adopts a pollution-free, environmental-friendly approach for indoor air quality, aligning with global energy and environmental goal.

The technology owner seeks to collaborate with:

- Building and transport system integrators to drive widespread adoption of DAPS.
- Healthcare institutions looking to upgrade their ventilation systems to reduce respiratory illnesses among vulnerable occupants.
- AI-based statisticians to analyse correlations among various factors and develop predictive models for reducing the spread of airborne diseases using DAPS data-driven systems.

By integrating engineering, health sciences, and data science, the technology owner aims to develop comprehensive healthcare solutions for future advancements.