

## TECH OFFER

### Low-Energy Hvac System For Indoor Farming And Greenhouses



#### KEY INFORMATION

TECHNOLOGY CATEGORY:

Green Building - Heating, Ventilation & Air-conditioning  
Green Building - Indoor Environment Quality  
Environment, Clean Air & Water - Mechanical Systems

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

COUNTRY: **SINGAPORE**

ID NUMBER: **TO174803**

#### OVERVIEW

The sustainable urban farming concept is growing rapidly, and Singapore is progressing well towards it. The heating, ventilation, and air conditioning (HVAC) system accounts for more than 50% of the total energy used in an indoor agricultural farm, according to data on energy use.

Technological advancements can help to address energy reduction and improve the productivity of indoor farms. Low energy-based concepts can be implemented by mainstream farm owners in Singapore to increase farm productivity and serve the increasing market demands directly.

This technology offer is a Low-Energy (Low-E) HVAC system for farming. It can cool, heat, dehumidify and ventilate any indoor space using up to 100% outdoor air exchange. It is able to achieve and maintain the optimum cooling, drying conditions, and sufficient level of carbon dioxide that are needed for farming with lower energy consumption. The operating cost of the Low-E

HVAC fitted grow room is 35% to 37% lower than the conventional HVAC system for the same application.

The technology owner is keen to do R&D collaboration and test-bedding with potential indoor agricultural farm owners.

## TECHNOLOGY FEATURES & SPECIFICATIONS

The main features of this technology offer are:

- 35-37% energy reduction compared to conventional system
- 60% reduction of integrated airborne particle concentration of PM1.0 particulates
- Combined cooling, dehumidification and fresh air ventilation processes with up to 100% outdoor air exchange
- Unique Low-Energy (Low-E) HVAC system, eliminates the need to use separate equipment for each process
- Using computational fluid dynamics (CFD) method to maintain optimum cooling, drying conditions, and sufficient level of carbon dioxide to resist growth of mould, mildew, and potentially hazardous organisms.
- Portable, modular, and scalable assembly for different sizes of application

## POTENTIAL APPLICATIONS

The technology offer can be deployed in the following applications:

- Urban agriculture – farming and gardening
- Greenhouses/outdoor enclosed farms
- Enclosed incubation and isolation area
- Medical / scientific laboratory for sample preparation and storage

The system is also scalable and customisable for bigger application areas.

## UNIQUE VALUE PROPOSITION

This technology offer is a novel low-E HVAC system with:

- 100% outdoor air exchange to ensure the uninterrupted supply of carbon dioxide and oxygen for plant growth and maturity
- 40% to 60% drying conditions within the grow room with lower energy consumption compared to the conventional HVAC system.
- Computational fluid dynamics (CFD) simulation method to ensure uniformity of air distribution.
- Capable of achieving 35 to 37% lower electricity compared to the conventional HVAC system

- Portable, modular and flexible setup for both indoor and outdoor growing and can be adjusted even during operation

The technology owner is keen to do R&D collaboration and test-bedding with potential indoor agricultural farm owners.