

# GAHT®

(Ground To Air Heat Transfer System)

## ENERGY-EFFICIENT CLIMATE CONTROL

The GAHT® system is a ground to air heat exchanger, a system often referred to as a 'Climate Battery'. Ceres Greenhouse Solutions is an industry leader in climate battery technology, having designed and installed more systems in greenhouses than any other company in the world. The GAHT® system maximizes heat transfer to the soil, making it one of the most cost-effective climate control solutions for residential and commercial greenhouses alike.

### COOLING

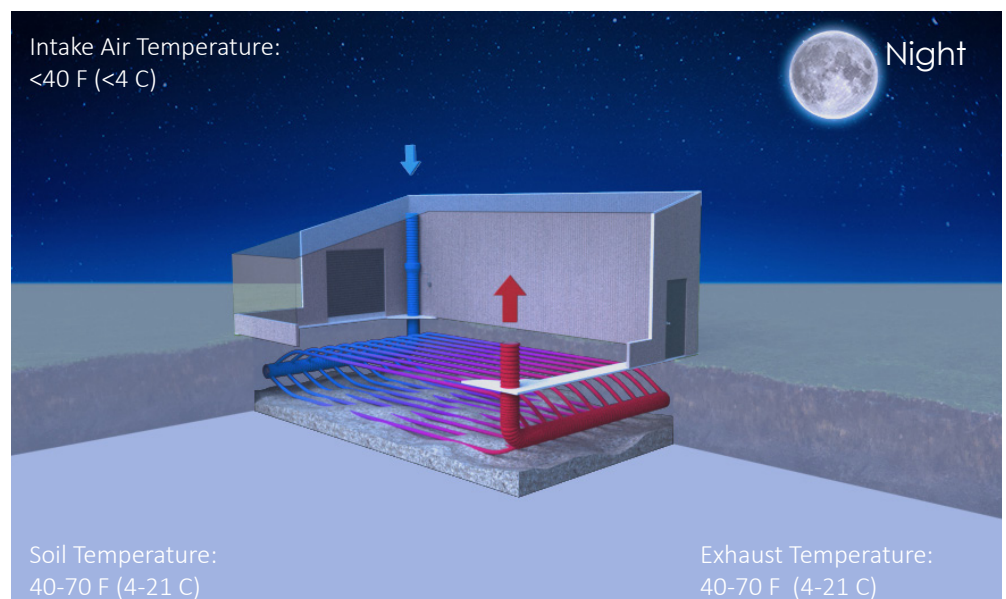
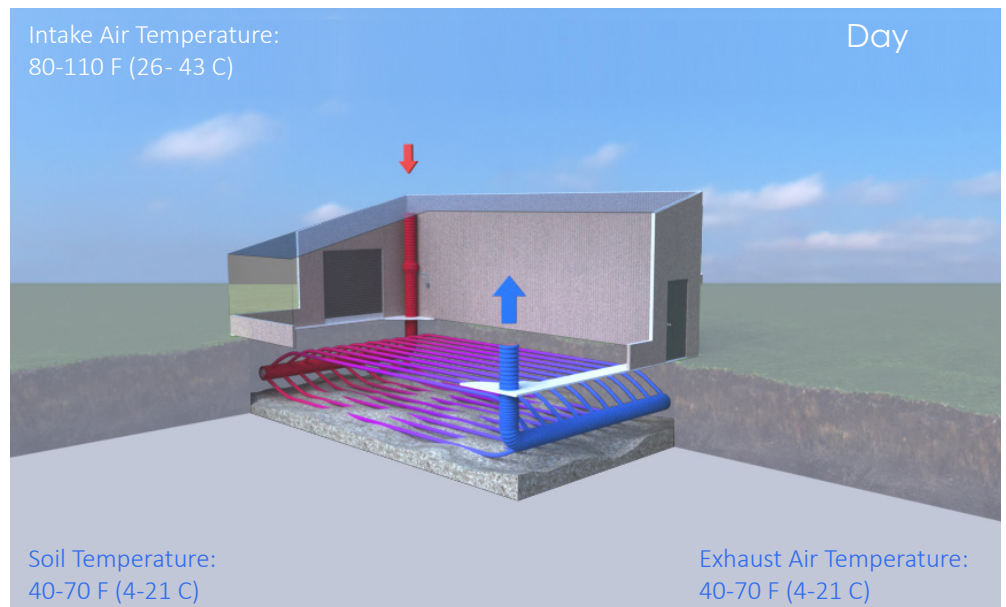
When the greenhouse heats up during the day, the GAHT® system draws the hot air from the greenhouse underground. The cooler soil absorbs thermal energy from the air. The air is then exhausted back into the greenhouse cooler and drier.

### DE-HUMIDIFICATION

As hot humid air is circulated underground during the day, it cools and reaches the dew point. Water vapor condenses and percolates into the soil through perforated pipes. The exhausted air is cooler and drier, helping reduce the risk of greenhouse pests and diseases.

### HEATING

A GAHT® system also allows the greenhouse to be 'self-heating.' At night or on cold days, the GAHT® system circulates air through the soil again. The warmer soil now heats the air. Warmer air is exhausted back into the greenhouse, providing low-cost, sustainable heating.



# THE POWER OF THE SOIL

## ENERGY-EFFICIENT, YEAR-ROUND CLIMATE CONTROL

### COMPONENTS

1. **INTAKE PIPE:** A large pipe takes air from the peak of greenhouse to underground pipe network.
2. **INLINE FAN:** Custom sized fans circulate air underground.
3. **PIPE MANIFOLD:** A customized pipe layout moves air at a target rate for maximum heat transfer.
4. **EXHAUST PIPE:** An additional large pipe exhausts air back into greenhouse to control temperature.
5. **CONTROLS:** Automated controls operate fans based on indoor conditions.



## A COMPLETE SOLUTION

### CUSTOMIZED DESIGN

Ceres customizes your GAHT<sup>®</sup> design based on your climate, soil type, growing goals, and greenhouse size. Each GAHT<sup>®</sup> system is optimized for your site's unique conditions, and sized for easy installation in your greenhouse.

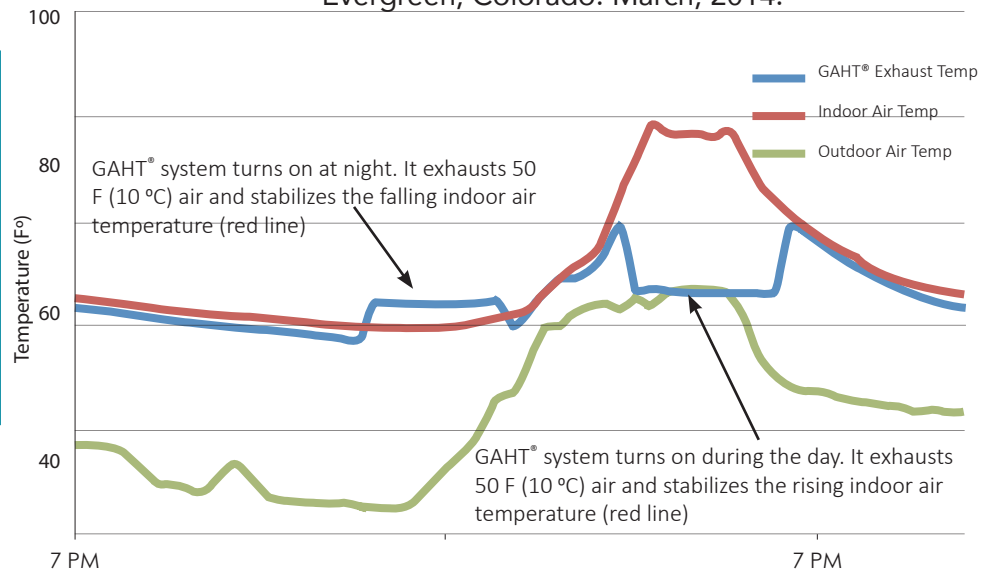
### INSTALLATION INSTRUCTIONS

Ceres GAHT<sup>®</sup> Installation Instructions allow growers / contractors to install a GAHT<sup>®</sup> without trial and error. Instructions detail each step of the installation process and include a materials list.

### MONITORING AND OPTIMIZATION

Ceres web-based climate monitoring system tracks GAHT<sup>®</sup> system performance and indoor conditions. Ceres offers personalized recommendations to ensure the GAHT<sup>®</sup> system operates at peak performance, year-round.

Effect of a Ground to Air Heat Transfer System over 24 hours.  
Evergreen, Colorado. March, 2014.



Despite outdoor lows of 7F (-13 °C), a greenhouse with GAHT<sup>®</sup> system maintains 40F (4 °C) indoor temperatures without any back-up heat, and does not overheat the following day.