

go green with ENV

Saving the Earth One Kilowatt at a Time.

INTRODUCING



by Climate Automation Systems

The first system of its kind to take intelligent climate control technology, previously exclusive only to large-scale commercial buildings, and bring them into the residential market. **env** balances all aspects of the home environment from forced air to radiant systems incorporating real-time weather data and established rules to result in an ideal climate not just for the home environment, but the earth's environment as well.

The true brilliance of the **env** system is the user-friendly Microsoft Windows control panel that integrates and governs the kinds of complex HVAC systems found in today's homes. These may include central forced air, radiant heating/cooling, humidity control, domestic hot water generation and other mechanical systems. The goal of **env** is to optimize all of these operations based on its four rules for a Sustainable Environment::

Going green with **env** means:

- Reducing energy consumption
- Increasing human well being and comfort
- Maximizing the efficient and rational use of energy sources (Exergy)
- Reducing CO₂ emissions



“Climate control systems must uncompromisingly address human comfort, energy, environment, and economy issues simultaneously. This must be our priority in all types of buildings for a sustainable future.”

- Dr. Birol Kilkis, FASHRAE and Distinguished Lecturer

the SCIENCE

Automated home climate systems without scientific control are nothing more than digital thermostats. The **env** system is truly unique in that even though it is inherently simple to use, its operations are advanced and complex and are rooted in sound, proven scientific understanding.

EXERGY: the base science behind the **env** system. A measure of the useful work potential of a given amount of energy.

Exergy computations answer the question as to which source of energy should be used to heat or cool an indoor space.

On average, people spend about 90 percent of their days indoors. EPA studies indicate that human exposure to air pollutants indoors can be 2-5 times, and occasionally up to 100 times, higher than outdoor levels. Along with the need for proper indoor air quality and other parameters like proper lighting and easy functionality, human wellbeing primarily depends on thermal comfort, which is a function of many variables, some of which have not been properly recognized yet. Radiant and convective heat transfer split factor, **R** and the **Exergy** consumption rate of the human body, ϵ_H are the most important factors that are yet to be recognized by climate automation systems.

“Climate” is the average condition of the atmosphere. Temperature, humidity, air movement, thermal radiation and convection, and solar effect establish the climate. These also define the internal climate of a building but with a key differential: these individual conditions can be controlled and all need to be in equilibrium for optimum comfort. People feel uncomfortable when the humidity is too high and, on a cold day, feel cold next to a window even though the room air temperature is “perfect”.

No two buildings are alike. Internal climate varies according to the seasons, location, construction, and use. Therefore each building requires a system that understands the rules of comfort and energy efficiency and implements them accordingly.

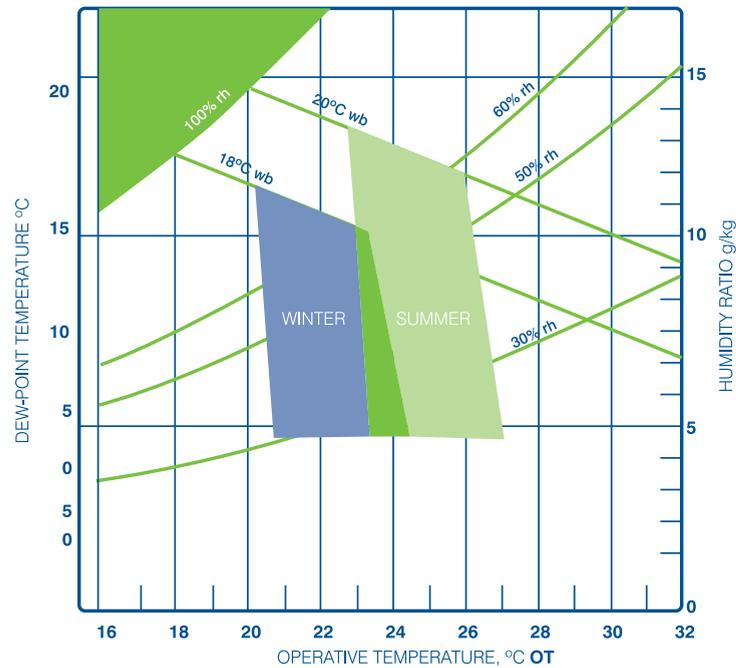
According to Fanger’s Thermal Balance equation, human thermal comfort at a given activity and clothing level primarily depends on:

- Relative humidity, % RH, (Water vapor pressure)
- Dry-bulb air temperature, T_a (K)
- Mean Radiant Temperature, MRT (K)
- Relative air velocity, V (m/s)

Find your comfort zone.

The Thermal Comfort diagram is shown here.

The horizontal axis represents Operative Temperature (OT) which is approximately computed as the average of Mean Radiant Temperature (MRT) and dry-bulb air temperature (T_a). The hash marked area represents the area in which a human is most comfortable. By skillfully manipulating these four factors **env** can bring an indoor space into the thermal comfort zone and its occupants will feel comfortable.



From ASHRAE FUNDAMENTALS Handbook 2005.
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“Our multi dimensional sensory perception system is not served well by one dimensional sensing devices”

- Robert Bean, ASHRAE Distinguished Lecturer

Achieve a higher level of comfort.

Selection of Mean Radiant Temperature (MRT) and dry-bulb air temperature (T_a) strongly affect other sustainability rules. For example, a high MRT in the heating season that is maintained by hydronic radiant panels means higher supply temperatures, thus high **Exergy** demand per unit thermal space heating load. This reduces the utilization of alternative and waste energy sources potential.

Therefore, MRT affects environment, economy and energy rules of sustainability. While MRT increases, T_a decreases, which reduces part of the heat losses and **Exergy** demand. Again all sustainability rules are affected.

Therefore MRT and T_a for a given Operative Temperature (OT) must be optimally controlled throughout the HVAC process and season.

It makes perfect sense then that in order to achieve a level of comfort under these conditions, a wall mounted thermostat set to a fixed temperature or scheduled by a typical “Home Automation System” is totally inadequate.

env BENEFITS

Reduction in the cost of operation of HVAC systems through implementation of strategic profiles.

Reduction in energy consumption.

Maximize the rules of Exergy.

Reduction in CO₂ emissions.

Satisfaction of the rule of a Sustainable Environment.

Elimination of mechanical room wall controls and ongoing maintenance and replacement expense.

Ease of installation and reduction in cost of installation. Less complex wiring for the installer since all control wires homerun to one location.

Possible application of tax credits for a Green installation based on State and Federal regulations.

Because **env** is rules based no charges for custom programming will be incurred at the time of installation or in the future when changes occur. However, hardware changes in the mechanical room may require a licensed HVAC contractor to implement.

Upgrade to new control strategies via software updates instead of hardware changes.

Owners have complete peace of mind that their environment is under control and, if not, they will be notified.



the SETUP

Access your home system from anywhere in the world via any internet web browser.

Microsoft SQL Server collects user data, sensor readings, National Oceanic and Atmospheric Association's Weather Service real-time weather, system definitions, etc. and renders predictive calculations.

Thermostats, dampers, heaters, forced-air units, etc. are all orchestrated and controlled to maintain the perfect Comfort Temperature.

the FEATURES

- **env** is a rules based system that does not require any custom programming to install or use. All tables and rules used by the system are entered using a standard web browser via point and click menus.
- Maintains a SQL Server database that is used to calculate performance and compute Climate Control Strategies (CCS).
- **env** accumulates historically:
 - a. kilowatt hour consumption by device
 - b. temperature variations by zone
 - c. zone efficiencies
 - d. radiant water temperatures by zone
 - e. and other data

- Various reports and graphs can be viewed and produced from this database.
- **env** interfaces to National Weather Service to gather forecasts that are used to alter CCS, i.e., the outside air temperature is rising rapidly... decrease the water temperature in the radiant floors well ahead of normal operation thereby saving energy making you more comfortable.
- **env** uses humidity readings to compute comfort levels and manage radiant cooling panels reducing the possibility of condensation.
- **env** optimizes and manages the combined use of forced-air and radiant systems to achieve optimal comfort, energy savings, and strategic use of energy resources.
- **env** allows user to report their level of comfort by zone and modifies CCS accordingly.
- Users/installers can select from different radiant control strategies, i.e., constant circulation, slab sensor or T-Stat control, outdoor reset, proportional reset, return water temperature differential, etc. This is accomplished using virtual device drivers not mechanical room hardware.
- Users define Climate Profiles (CP) by zone: Vacation, Summer/Winter, transitional, on/off.
- Climate Profiles define on/off events and temperature strategies by date and time. For example, turn off the master bedroom floors at 11^{PM} but turn on the forced-air in enough time to heat the room to 68^{°F} by 7^{AM}. Or turn off the domestic hot water heater at 11^{PM} and back on again at 6^{AM}.
- **env** generates web forms so that users can view and operate the Environment from any browser anywhere in the world.
- **env** automatically backs up its files locally and on the Climate Automation Systems web site.
- **env** constantly monitors the health of the environment and the mechanical systems and reports problems to the property owner or service company via email or Text Messaging.
- **env** has a heartbeat and "reports in" to Climate Automation Systems' web site periodically. If a report is missed, the property owner is notified that there may be a problem making **env** perfect for vacation homes in extreme climates.

climate automation systems

LOOK AROUND.
PEOPLE ARE TALKING.

And buyers are looking for new ideas that change the way we live in and treat our environment. Climate Automation Systems was formed to answer the challenge and is proud to offer ground breaking products such as **env**, which allows homeowners to enjoy complete comfort and unparalleled efficiency within their home environments all the while knowing their reduction of energy use is helping the environment.

There's lots to do, but with your help Climate Automation Systems can move environmental sustainability from obscure and expensive to expected & affordable. It won't happen overnight, but through smart integration and wise choices we can truly save the earth – one kilowatt at a time.

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