Energy Efficiency and Indoor Air Quality

Key factors for energy efficiency in indoor applications are the control of relative humidity (RH) and temperature levels. The question is how to achieve acceptable RH levels in an energy efficient manner. Energy efficient humidity control has a very strong bearing on thermal comfort, Indoor Air Quality (IAQ) and eventually on the health and performance of occupants in air-conditioned buildings.

IAQ seeks to reduce Volatile Organic Compounds (VOCs), and other air impurities such as microbial contaminants. As such, it is important to control the relative humidity which may lead to mold growth and promote the presence of bacteria and viruses as well as dust mites and other organisms and microbiological concerns.

CO2 measurement helps maintain IAQ in schools. . . . air handling units.

Facts:

- Energy Efficiency (EE) refers to either the reduction of energy inputs for a given service or the enhancement of a service for a given amount of energy inputs.
- Relative humidity is highly temperature dependent, so if the temperature is stable, so are the relative humidity levels.
- Air in our atmosphere is a mixture of gases with very large distances between molecules. Therefore, air can accommodate a large quantity of water vapor. The warmer the air, the more water vapor can be accomodated.

Air-conditioning system designs typically employ a high level of recirculation rates in cooling and dehumidification. Typical recirculation rates are in the order of 80-90% and sometimes even higher. The challenge is not so much in the dehumidification process, but do so without having to overcool. Thus, ventilation is integrated into a general comfort and economical savings approach.

Building technology is designed for certain room conditions including temperature, humidity, brightness, noise and air flow. Careful engineering and implementation of building automation and control is the only way to ensure energy efficient and building operation conditions are met during occupancy at the lowest possible energy costs.

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Why the need to measure relative humidity, CO_2 and temperature?

It is with precise temperature control of the supply air to rooms, where the temperature is maintained within a certain defined comfort range at the lowest possible energy consumption. The room temperature should be held constant as specified at the applicable set point in the given condition.

The temperature transmitters installed in the supply air duct are compared to this measured value with the supply air set point. A constant room temperature can result if there is little or no heat gain in the room. Supply air temperature control can be used where the air handling unit is primarily used for air renewal and room temperature control.

It is with good RH control that we can process the air for air conditioned rooms independent of the state of outside air and the processes in the room. This way the RH remains constant or within the pre-set limits and thus energy consumption for humidification and dehumidification is minimized.

Air conditioning is designed to maintain room temperature and RH as precisely as possible through the use of temperature and RH controlling and monitoring systems in the room. With precise control of temperature and humidity measurement, optimal energy consumption for humidification & dehumidification as well as thermal energy use for heating and cooling is attained.

Room air quality control designed for changing occupancy in buildings and rooms, can improve comfort and minimize energy consumption.

Room air quality is also influenced by demand-controlled ingress of outside air. The CO_2 content of the room can be a good indicator of air quality and trigger a need for adding outside air to the room.

With CO_2, RH and temperature measurement it is possible to implement energy efficient building operation conditions with the lowest energy costs.

135 Engineers Road, Hauppauge, NY 11788
Tel. 631-427-3898 • Fax. 631-427-3902 • info@rotronic-usa.com

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