

Energy Efficiency - System Design Strategies: HVAC Humidity Control

Strategy: Install rooftop units using desiccant energy recovery wheels which moderate indoor humidity levels and help to reduce energy demands by recovering some of the energy to heat or cool outdoor makeup air.

Relevant Store Scale/Type: S,M,L/New, Adapted, Existing

Initial Cost:

1. There is a very large variance in type and size for commercial equipment, depending on store size.

Return on Investment:

1. The payback on energy savings is very short when ASHRAE compliance ventilation rates are being maintained. The payback is immediate in new construction when air-conditioning equipment sizing and installations account for the added cooling and heating capacity provided by the ERVs.
2. Reduces the cost to condition outside air by up to 80%.

Operator Benefits:

1. Energy savings accrue through avoiding dehumidification and reheat by conventional equipment which requires more expensive handling of latent loads and more frequent defrost cycles due to higher dew points than those using desiccants.
2. Desiccant systems can improve indoor air quality by removing air pollutants and odors.
3. Improves ventilation rates.
4. Low humidity allows food to avoid sweating and frosting, which extends shelf life.
5. Aisles are kept at warmer, more comfortable temperatures than conventionally dehumidified stores.

Technical Considerations:

1. Humidity becomes present through infiltration, open doors, and ventilation. It is important to have good humidity control and a tight building.
2. Desiccants naturally attract moisture, efficiently removing latent (humidity-related) load from the air. Conventional air conditioners are then typically used to reduce the temperature (called the sensible load) of the dried air to desired occupant comfort levels. Latent and sensible loads are handled more efficiently because each component is optimized to independently remove these loads. When heated, the saturated desiccant is regenerated to be used again.
3. In supermarkets, desiccant dehumidification systems displace anti-sweat heaters and defrosters that consume considerable energy to control moisture levels in freezer display cases.
4. Where high outdoor air quantities are being introduced, consider liquid desiccant humidity control systems.
5. Special care should be exercised to assure that air quality levels meet the expected levels, including: using high quality filters; proper installation and maintenance of the desiccant with the ERV and designing the unit to meet its actual application.

Product/Manufacturer Suggestions, Resources & Examples:

Moving Advanced Desiccant Materials into Mainstream Non-CFC Cooling Products:

<http://www.ornl.gov/~webworks/cpr/rpt/103923.pdf>

Energy Recovery Wheels and IAQ:

<http://www.michaelsengineering.com/Briefs/IAQ15.htm>