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IN DEPTH: COMMERCIAL REAL ESTATE

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Environmental design of offices gives breath of fresh air to costs

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Energy conservation is an important priority for builders and facility managers. In recent years, many programs encouraging energy savings to reduce costs have been discontinued. And, with utility deregulation on the horizon, saving money by reducing energy consumption appears on the way out altogether.

However, being environmentally responsible remains vital in terms of reducing energy demand and improving the quality of conditions for people working in commercial buildings.

Other than lighting, air conditioning is the single largest user of energy in a building. Although energy reduction measures are in place for today's lighting design, the related energy consumption is not changing that much.

Therefore, air conditioning demand is the major area where engineering design can actually make a difference in addressing environmental issues that directly affect building occupants.

Given Houston's climate, controlling high humidity year-round is a key factor when engineering buildings to provide better air quality and more comfortable space. For example, aside from the general discomfort of working environments without effective humidity control, research shows that people are less attentive at high humidity levels, which makes them less productive.

At the same time, clean building design requires introducing large quantities of outside air to prevent "sick building syndrome." But, that increases the relative humidity and, in turn, creates an air conditioning problem. To maintain a comfortable indoor environment, large amounts of moisture must be removed during peak demand hours. Houston's air far exceeds the humidity levels for which most commercial units are manufactured in the United States.

THERMAL STORAGE

A good solution for large buildings -- or for any size building -- is thermal storage. Although not a new engineering approach, it declined in popularity as energy conservation credits fell by the wayside. Yet, rather than as a cost reduction, it can and should be viewed as a neutral payback to provide a better environment. A typical building's energy bill largely results from energy demand rather than energy consumption. Thermal storage saves on the demand side, because building management pays a premium for cooling during peak hours.

Here's how it works. Houston's energy demand starts at 1 p.m. and ends at 8 p.m. To best meet this daily demand period, chilled water or ice is produced at off-peak night hours and stored in large tanks to create excess capacity when demand is lowest and energy is cheapest. Then, during peak hours, pumps and fans circulate that cooled end-product to air condition the building. Power generation utilities, for instance, have taken advantage of thermal storage to reduce the need to build more plants by shifting the water cooling process from peak to off-peak.

And there are also fine-tuning techniques. For example, typically in Houston 42-degree water is used to supply air conditioning coils in order to get 55-degree air-conditioned air. For example, with ice storage systems, dropping the chilled water temperature to 38-degrees changes the leaving air temperature to 48-degrees. Yet that mere 4-degree difference in chilled water temperature dramatically lowers relative humidity inside the building.

One local building illustrates how other variables also come into play using thermal storage. Prior to air conditioning system redesign, the building was spending \$2 per square foot for electrical usage alone. When thermal storage was designed into the system, costs dropped. That's primarily because with the air so cold, smaller ducts and less ductwork were required and nighttime thermal storage took advantage of lower demand. As an overall result, the building received more outside air, but maintained a much less humid environment.

SUSTAINABLE BUILDING DESIGN

For building designers and managers, a key point for keeping Houston offices air conditioned is that lowering the relative humidity inside lets you increase the temperature of the incoming air supply. Building occupants feel colder at higher temperatures and the proper distribution of cold air, utilizing thermal storage, makes that possible while minimizing demand.

All this results in a sustainable building design. And this design, while not dramatically lowering operational costs, will create and maintain a more worker-friendly environment and save money. In Houston's high humidity, thermal storage can continue to be worth much more than yesterday's energy credits.

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