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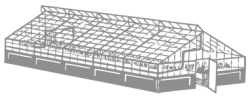
INDUSTRY

HOMES & BUILDINGS



GREENHOUSES

App Note 6: Adding dehumidification capacity to an existing HVAC system

The RH-Cube 18 is *THE* solution for increasing dehumidification capacity.

- ✓ ***Cost-effective***
- ✓ ***Simple installation***
- ✓ ***Reduces total system energy consumption***
- ✓ ***Creates the ultimate in comfort***

INTRODUCTION

In this application note we discuss the challenges associated with increasing the dehumidification capacity of an existing air conditioning system, and why DewAir's approach provides the simplest, most cost-effective solution.

TARGET AUDIENCE

This application note will be of interest to anyone who wishes to augment the latent cooling capacity of an existing HVAC system or anyone who is designing an HVAC system that has to cope with latent heat loads that are beyond the capacity of conventional air conditioning. Such systems would include gymnasiums, spas, dance halls, auditoriums, storage facilities, etc.

THE PROBLEM

Traditional approaches to increasing the dehumidification capacity of an existing HVAC system tend to be inefficient, expensive, and not always completely successful.

Traditional solutions include:

- adding an air conditioner with enhanced dehumidification capacity. This solution is very inefficient because these air conditioners enhance their dehumidification by first over-cooling and then compensating by reheating the delivery air with condenser heat.
- adding a ductless air conditioner tuned to maximize its dehumidification capacity. This solution over-cools.
- adding an industrial dehumidifier plus another air conditioner to account for additional heat load. This solution is very inefficient and expensive, but at least it may provide some humidity control.

All these approaches result in systems that have two or three times more cooling capacity than should be required, and they still don't provide the fine control over the humidity that the client desires because they operate at the margins of their ability to dehumidify.

RH-Cube 18 Benefits

The RH-Cube 18 is a less complex, less expensive solution than traditional approaches.

- There is no need for the addition of extra sensible cooling capacity. The RH-Cube 18's split-air architecture means it does not add heat load. Instead, it actually contributes some sensible cooling.
- Its high efficiency makes it inherently less expensive. Its condenser is one half to one third the size of competitors' systems of similar capacity.
- Because the RH-Cube 18 operates independently of the air conditioner, it decouples control of humidity from control of temperature. This greatly simplifies the proper sizing of dehumidifier capacity as well as enabling proper humidity control.
- Because of the RH-Cube 18's extraordinary efficiency it can actually reduce overall system energy consumption rather than add to it. The detailed explanation behind how this is possible is found in DewAir's application note[2] on Duct Configurations.

Example

A dance hall has a 15-ton air conditioning system that, on a warm day (95° F), has the capacity to maintain 76°F and 60% RH when 60 people are on the dance floor. This is warmer and more humid than the 75° F and 50% RH that the owner would like to maintain, but is still considered acceptable. The owner now wants to increase the capacity of his air conditioning system to be able to handle 120 dancers under these same conditions of 76° F and 60% RH.

Analysis

According to the ASHRAE Handbook[1] a dancer dissipates roughly 703 BTUs of heat per hour (286 BTUs sensible and 417 BTUs latent). Increasing the number of dancers from 60 to 120 would increase the latent heat load by 25,020 BTUs per hour.

Traditional Solution

To deal with this 25,020 BTU latent heat load, the owner had been quoted a solution consisting of a 10-Ton of air conditioner with condenser reheat. The solution would require extensive reworking of the existing ducting system.

The RH-Cube 18 Solution

For the same 25,020 BTU latent heat load DewAir quoted three RH-Cube 18 CZ's for a total of 4.5 Tons.

DewAir's quote was half that of the traditional solution. As added benefits, the operating costs of the DewAir solution was less than half of the traditional approach, and the DewAir solution provided decoupling. The client would be able to truly control humidity levels to maximize comfort and minimize energy bills.

Analysis Behind DewAir's Quote

With an outdoor temperature of 95° F and indoor condition of 75° F and 60% RH, the RH-Cube 18 CZ removes 9.6 pounds of water per hour (9325 BTUs/hr equivalent). A single RH-Cube 18 CZ can account for the latent heat load of 22 dancers. Therefore, three RH-Cube 18 CZ's would be sufficient to address the 25,020 BTU latent heat produced by 60 additional dancers.

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References

(1) ASHRAE POCKET GUIDE for Air Conditioning, Heating, Ventilation, Refrigeration (I-P Edition) 8th Edition

Table 12.18 Representative Rates at Which Heat and Moisture are Given Off by Human Beings in Different States of Activity

(2) AP2 - Recommended Duct Configurations - DewAir Corporation 2020