BTU DELIVERY SYSTEM FOR HVAC SYSTEM

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ABSTRACT
This paper introduces the analysis of thermostat activity over time to determine the BTU replacement requirement for HVAC equipment. This analysis allows HVAC equipment to operate for precise delivery of BTU's dynamically with the heat loss characteristics of an enclosed environment.

PRESENT METHODS
Most heating and cooling systems operate to bring a fixed temperature transfer medium to the controlled enclosed environment by means of a thermostat. Some systems enhance the delivery of needed transfer medium with source temperature adjustment accomplished by means of an outside sensor reset process. Outside reset devices do not adapt well to leads and lags due to piping loss or the changing aspects of the various heat loss characteristics of enclosed occupied space. Outside reset systems do not consider even comfort circulation needs. At best outdoor reset devices approximate actual demand by means of adjustable compensation rates.

THE PROBLEM
Building structures experience variable factors, which cause changing BTU loss characteristics. Thermostat activity needs a way to direct the Source HVAC equipment to provide precise BTU replacement for maximum comfort and minimum energy use.

THERMOSTAT DEMAND ANALYSIS
Thermostat activity is an information base for demand analysis in addition to circulation demand activity**.**

Thermostat data gathering
By polling a thermostat periodically (every second) for demand status over time (one hour) actual demand activity can be determined. By comparing actual demand to an Ideal demand value (.60), the variation of demand value from ideal demand value will determine the need for raising or lowering the transfer medium supply temperatures. A microcontroller containing an algorithm can control the source output to adjust the transfer medium temperatures upward or downward.

BTU supply temperature adjustment
Correction of BTU source temperature, hour to hour provides a smooth transition of BTU supply in close proximity with changing heat loss/gain characteristics on the enclosed environment. Analysis periods, Ideal demand factors and temperature change increments can be determined and preset in software by the heat loss behavior of the structure and the given outer environment. Geography and structure will vary.

Example
Ideal thermostat demand factor = .60
Actual thermostat demand factor = .83
Temp Change factor = ((.83-.60) x10)= +2.3
Temp Change Increment 2Far
2.3 x 2F = + 4.6Far
Current High Temp set Point 150 degrees Far
150F + 4.6 F = 154.6 F
New High temp limit = 154.6 F
Higher for the next hour

ADVANTAGES

Comfort

Increased circulation of properly tempered transfer medium: fluid, air or gas, will distribute BTU's more evenly with less variation of temperature throughout the enclosed environment. Even temperature will increase occupant comfort

Economy

The closer the BTU supply is to BTU loss or gain the less energy is required to achieve the desired comfort. As this method of adjustment is applied to existing HVAC plants, varying degrees of economy will be achieved. Properly designed systems will gain fewer savings with the addition of this analysis method. Poorly designed plants will gain much economy, as the plants will be tamed to the actual requirements as revealed with this method of demand analysis. As most present systems are over designed to avoid disappointment, application of this demand analysis method should achieve reduction in energy expense. Future HVAC plants will not require over designed capacity.

MULTI ZONE OPERATION

In this multi zone application the analysis is conducted on a representative zone and the balance of the zones adjust by means of the individual zone thermostat activity. By using an Ideal demand factor of .60 circulation for the analysis zone, the balance of the zones have a 40% variance for individual zone requirements.

CONCLUSION

Precise measurement of demand analysis from thermostat activity over time provides new opportunities for equipment and system designs for maximum comfort and economy. This will reduce the demand for limited natural resources and reduce the undesirable air pollution.

REFERENCES:

1. US Patent 6,402,043 10/18/01
2. www.Exqheat.com