Fundamentals to frontiers

Complementary technologies

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In the December 1986 issue of *Heating/Piping/Air Conditioning,* I authored an article titled "Steam Heating Systems." The purpose of that article was to explore problems that have been encountered in these systems and present design techniques that could be implemented to avoid those problems. In the March 1987 issue, in "Open For Discussion," Mr. Bertram Waller authored a rebuttal article pointing out quite properly why, in many circumstances, one should avoid the use of steam in preference to hot water systems. The fact that Mr. Waller interpreted the original article as one promoting the use of steam in preference to hot water demonstrated that one of the major points of the article was not successfully made.

This exchange provides an opportunity to address a fundamental issue of design philosophy. A good example of that issue lies in the ongoing discussion of steam and hot water heating systems (Note: the expression was not "steam vs. hot water"). The fact is that steam and hot water are complementary technologies; they are *not* competitive technologies.

Virtually every applied branch of technology has some disadvantages in application. Ultimately, substitute or alternative technologies are developed to supplement the initial one in some if not all of its applications. When the alternative is introduced into the marketplace, it is considered "competitive" to the industry supporting the initial concept.

As the technology matures, however, skilled, unbiased practitioners recognize the differences and learn to apply the most suitable technology for each application. In this way the two technologies (the initial and the alternative) become complementary; each has its specific application in the marketplace.

The steam/hot water issue is a splendid example of this issue. As Mr. Waller stated, water systems have numerous advantages in that they provide much better terminal control of temperature and are less troublesome; on the other hand, if one wanted to raise heat from the basement to the top floor of a 60 story building in Manhattan, water would not be a good choice of fluid. There are other applications in which steam has a *reason* for being a preferred heat transfer fluid (usually an intermediate fluid), and all designers should learn how to design such systems when the need arises.

In any mature technology, system alternatives lose their competitive features after they are subjected to scrutiny by independent engineering practitioners. It is only the manufacturers who are vying for a larger share of the market who see their products as competitive. For example, a manufacturer producing water circulators for hydronic systems is truly competitive with another circulator manufacturer striving for the same market. But he shouldn't be considered a competitor of a steam trap manufacturer. If the design parameters are properly identified and addressed, they and they alone will dictate the proper system for the job.

The same is true of many other design alternatives such as central plant vs. unitary devices, absorption chillers vs. electric centrifugal units, perimeter radiation vs. overhead air heating, etc. For each particular application there is a singular best design selection, and the essence of design engineering is to identify which choice in each subsystem category *is* the singular best!

This is probably the best explanation as to why the consulting engineering profession came into existence and will inevitably survive as a host of other delivery techniques come and go in the building marketplace. Each of the other concepts (manufacturer design groups, contractor design-build, etc.) carry with them a motive to market or otherwise promote the use of a certain system or product whereas the independent consultant is totally unconstrained in this regard and has the motivation to select *the* singular best system or product for the application.

The only question is: does he have the *ability*? Ω

Roger Haines on controls

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percent, as noted above.

- If a packaged system with 10,000 cfm air quantity is used, it will be necessary to use reheat, and a lower RH can be obtained at an increase in operating cost. One possible solution would be to use an internal heat reclaim system as described in my *HPAC* column for August 1980. This would add to first cost but would provide most or all of the needed reheat.
- When the ducts are exposed and supply air temperatures are below the room dew point, as in this case, the ducts must be insulated. Internal insulation could be used.

3) To answer his general questions regarding applications with low sensible/total ratios:

- The type and size of system and possible ΔT have been discussed above. With a DX coil, the ΔT will be on the order of 25 F, which I consider too high. It creates uncomfortably cold, drafty conditions. A ΔT of 10 to 12 F can be obtained by means of reheat. This is limited by most energy codes unless reclaimed heat is used.
- A bypass damper can be used with a DX coil. The amount of bypass must be limited to prevent icing. Any bypass will tend to increase the room humidity since the bypassed "mixed air" is at a relatively high humidity.
- Condensation will occur on exposed, uninsulated ducts whenever the ambient air dew point exceeds the duct air temperature.

I hope that this will clarify my article. Ω