

CONTRACTOR

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Bigger and cooler are better for heat-emitting surfaces

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Our industry has borrowed several important hydronic methods from Europe. One is low-temperature heat distribution. Mixing valves or buffer tanks allow the boiler to operate at higher temperatures to prevent flue gas condensation, while allowing heat distribution loops to operate at less than 120°F.

The second most significant aspect of European hydronic heating is the heat distribution system. The trend in Europe over the past 15 years in designing radiation has been directed to larger and larger heat-emission surfaces. Heating comfort and fuel efficiency are the reasons.

The larger the heat-emission surfaces, the lower the heating medium temperature. The result is a higher percentage of radiant heat output and less convection heat through the use of large surface steel, cast iron and aluminum radiators, or wall and floor surfaces. The lower the radiant surface temperature, the higher the level of heating comfort due to reduced air movement and the effects of radiant heat on the human body.

Large surface panel-type radiators emit 60% convection and 40% radiant heat, operating at water temperatures from 80°F to 160°F de-

pending on heat load conditions. Systems that use the floor or wall structure material as a radiator emit nearly 100% radiant heat, operating at water temperatures from 70°F to 120°F even under design weather conditions.

There are floor-heating systems currently in use in Europe for special applications where water temperatures approach room temperature under design conditions. The high cost of these systems cannot be justified for most applications.

A low water-temperature heating system with constant circulation and an outdoor reset control provides not only improved heating comfort, but also high fuel efficiency in both residential and commercial heating.

A floor-heated space allows a reduction of 3°F to 4°F in ambient air temperature without losing heating comfort.

For every degree a building's temperature setpoint is lowered, a resulting fuel saving of 3% can be expected. A similar rule can be applied to the mean system water temperature. For every 3°F reduction of a building's seasonal mean supply water operating temperature, 1% fuel saving can be expected. This figure has been derived empirically and has been confirmed in many operating system comparisons.

The fuel savings can be explained partially by the fact that constant circulation tends to smooth out water temperature fluctuations, eliminating overshooting of the desired setpoint and maintaining almost a straight temperature curve. In other words, the system offers only the instantaneously required Btu input for the building at any given heat load condition.

Furthermore, transportation losses are reduced greatly when getting the heating medium from the boiler to the area to be heated, eliminating the overheating of building areas where building supply and return lines are located.

When the greater portion of the heat distribution system is radiant as opposed to convective, less temperature stratification will occur within the building. Less stratification contributes to reduced heat loss through the roof, because there's less difference between interior and exterior ceiling temperatures.

This fact is dramatically evident in large-volume, high-ceiling structures such as modern homes, factories and warehouses, where floor heating is the only heat distribution system. Temperatures measured at ceiling level are actually lower in these instances than at head level. Enormous reductions in fuel consumption can be realized in these applications.