A climate of comfort

With thermal comfort an essential element of our wellbeing, **Dr David Brunt** of **David Brunt Consulting**, explores how a building's occupants can benefit from radiant heating and cooling.

When it comes to heating and cooling, what are the main issues affecting occupant wellbeing in buildings?

Thermal comfort can be defined as 'the condition of mind that expresses satisfaction with the thermal environment and is assessed by subjective evaluation.'

Strongly linked to our health, wellbeing and productivity, thermal comfort is ranked as one of the highest contributing factors influencing overall human satisfaction in buildings and it can have physical health effects. For example, temperature change can trigger asthma in adults and is also thought to play a role in 'sick building syndrome'.

Research has shown that productivity can be reduced by 4-6% if the temperature is too hot or cold and in the USA, 41% of office workers have expressed dissatisfaction with their thermal environment.

How can we solve these problems?

In order to overcome these issues, it is important to control the thermal environment by:

- controlling the absolute temperature
- keeping the temperature stable throughout the day
- minimising the difference in temperature across an area vertically and horizontally
- controlling the humidity
- removing draughts

How does radiant heating and cooling work?

Radiant cooling mimics the very effective way the earth heats and cools. The earth gets heated up by the sun's radiation (radiant heating). During the night, the earth cools down by radiating that heat back into space (radiative cooling). The earth 'radiates' the heat into space which is very cold. In the same way, we are warmed by the infra-red radiation from the ceiling, or when it's cold, we radiate the heat in our bodies not into space but to the cold surface of a panel as part of a radiant heating or cooling system.

With radiant systems, hot or cold water is circulated through the system's panels to heat or cool the occupants of the room.

"Studies show a radiant system maintains a more stable temperature throughout the day"

What is thermal gradient?

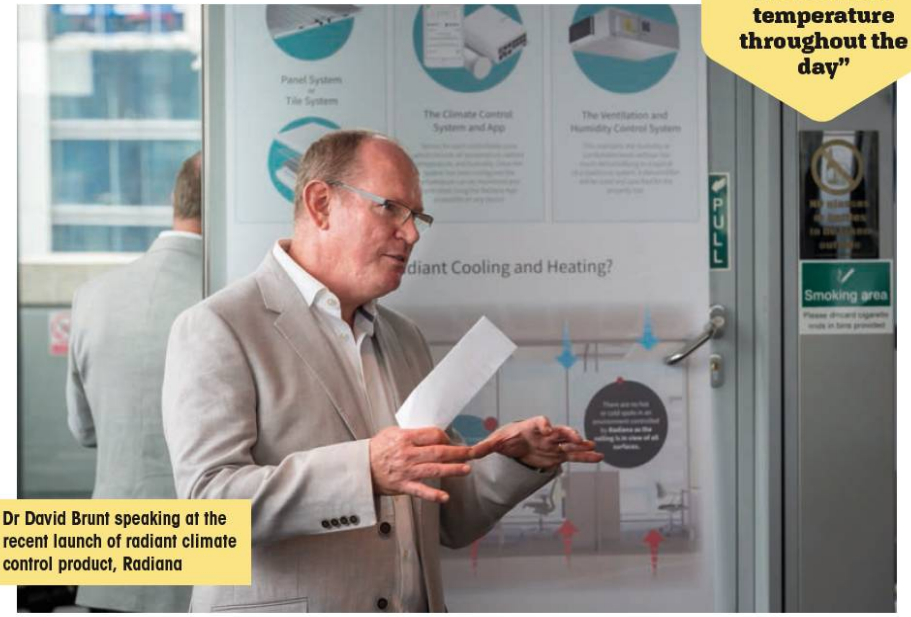
A thermal gradient is the temperature difference from one area to the other.

It is important to minimise any differences and radiant cooling is particularly good at this. Typically, the temperature gradient we are most concerned about is the one from the floor to the ceiling, or from foot to head.

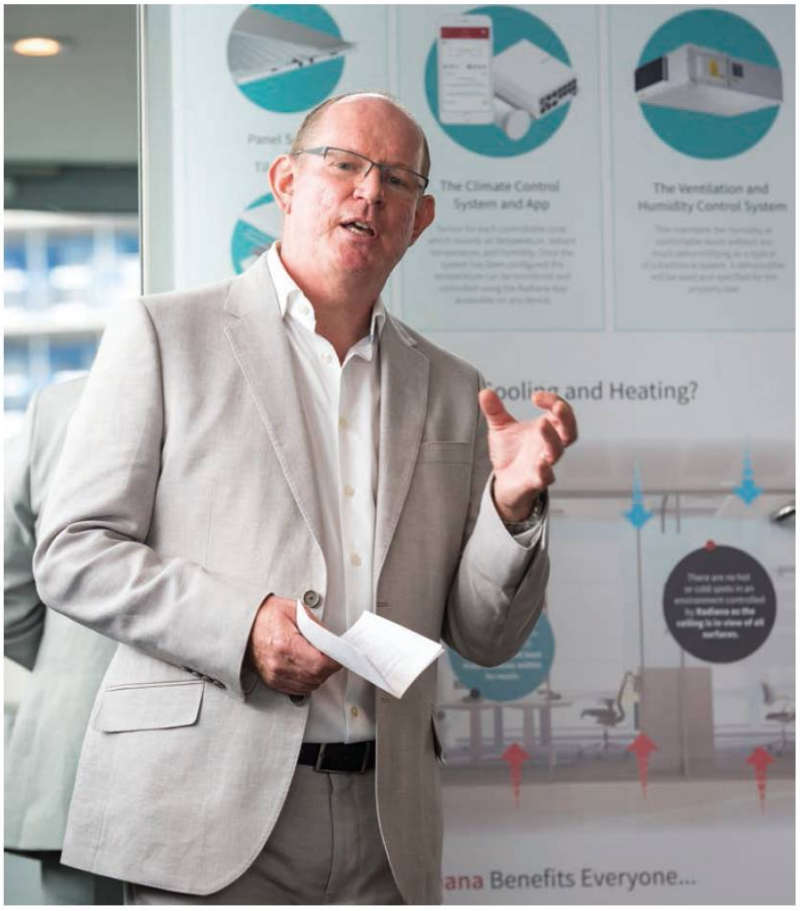
With traditional [cooling] systems, there are often complaints about this variation in temperature but radiant cooling systems have been shown to provide much smaller thermal gradients, increasing occupant comfort.

How is temperature stability affected by radiant cooling?

Published studies have shown that 24hr temperature fluctuations are much lower with a radiant cooling system compared to an all-air system and the satisfaction of people living or working in a radiant-cooled building is higher. Therefore, a radiant system maintains a more stable



Dr David Brunt speaking at the recent launch of radiant climate control product, Radiana



temperature with less fluctuations throughout the working day.

Does the WELL Building Institute advocate radiant heating/cooling?

The International WELL Building institute has created the leading standard for advancing health and wellbeing in buildings and the latest revised version, WELL v2, gives specific credits to thermal comfort as follows:

- Thermal zoning. Credits for multiple zones and individual control.
- Radiant thermal comfort. Credit is given to 'hydronic radiant heating and/or cooling systems' if at least 50% of the project floor area is serviced by this system.
- Humidity control. Credit is given if the mechanical system has the capability of maintaining relative humidity between 30% and 60% at all times.

It appears that traditional air-based systems are not eligible for credits for thermal comfort – whereas radiant cooling/heating systems are.

It is also important to note that the system also needs to manage humidity and have the ability to control thermal zones, so that different temperatures can be set locally in the building.

Why is radiant heating/cooling better for people with health conditions such as eczema?

I have no firm evidence for this, however I think there are benefits from separating the heating /cooling and humidity control. Traditional air-conditioning blows air to heat and cool and this also tends to dry out the air. Dry air blowing over skin could have an aggravating effect on eczema.

Also, because there is less air movement with radiant heating/cooling there is less dust movement which also benefits asthma sufferers.

www.davidbruntconsulting.co.uk

Radiant and revolutionary

Dr David Brunt is an independent sustainability consultant supporting Radiana, the intelligent radiant cooling and heating system.

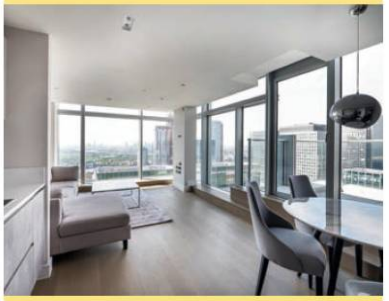
Radiana, a new climate-control product from underfloor heating supplier, WMS, uses hot or cold water circulated through its ceiling panels to heat or cool the occupants of the room, resulting in a host of benefits including reduced draughts, better vertical air temperature gradient and greater stability of temperature.

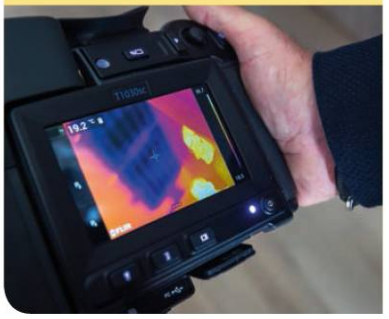
David says: "Because the Radiana system uses water instead of cold air to cool, cold draughts are reduced because there is no excessive air movement. Ventilation is separated from cooling so significantly less air flow can be used for the ventilation component.

"Radiant cooling using ceiling tiles, like Radiana, also has the flexibility of creating many temperature zones which, coupled with an intelligent control system, can deliver tailored cooling or heating in different parts of the building, depending on solar gain and occupants' preferences.

"In addition, a system like Radiana separates the cooling/heating from humidity control, allowing humidity to be controlled much more effectively and eliminating the 'drying effect' that some people claim to experience with an air-based system."

www.radiana.co.uk





A thermal imaging camera (below) reveals the Radiana system in action behind the ceiling at this luxury London apartment (pictured above)