

Sensible comfort with Chilled Beams

By Jonas Åkesson, Swegon

Is there such a thing as a “typical hotel guest”? Probably not since all of us are individuals with different backgrounds and preferences. Studies show that even with the best possible indoor climate, at least 5% of any given population is likely to feel uncomfortable. A perfect temperature, great air quality and draft-free air supply will not be appreciated if the sound level is too high. In fact one of the most common complaints from hotel guests concerns noise. Of course sound can come from different sources such as traffic, elevators or noisy neighbors. But it can also come from noisy air conditioning. This can be influenced by turning it off, but this will of course have a negative effect on the room climate. Another, more sensible, way to avoid high sound levels is to eliminate the sound generation by introducing chilled beam technology.

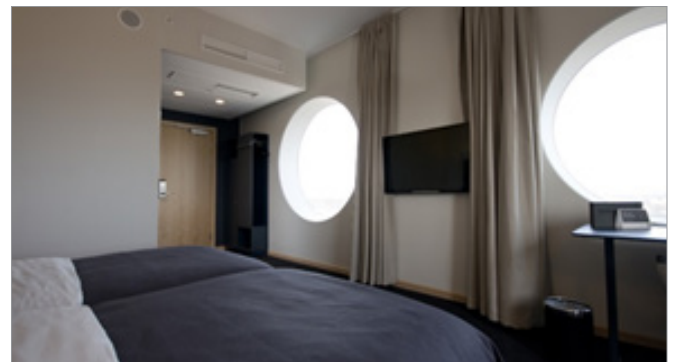
A chilled beam is powered by fresh supply air produced by a central air handling unit, through a duct to the individual guest room. This means that there is no fan inside the guest room and therefore the room is much quieter. The supply air is forced through small nozzles inside the chilled beam and creates induction. The induction causes negative pressure inside the chilled beam which causes room air to be sucked through a heat exchanger (coil). As the recirculated room air passes through the coil it can be cooled, heated or untreated before it is mixed with the supply air and distributed to the room. Thanks to the induction, high cooling and heating output is efficiently distributed along with the supply air. To further optimize comfort, the distributed air is carried all the way to the opposite side of the room avoiding undesirable drop of cool air in the occupied zone. As the air finds its way into the



occupied zone the air velocity decreases and the cool air mixes with the room air creating the right temperature without draft.

To further emphasize chilled beams as a sensible choice, it is a 100% dry system. This means that there is no condensation in the guest room. The cooling water temperature is supplied at 57°F (high temperature cooling) which prevents condensation in normal guest rooms. To ensure that there will not be any condensation, the supply air is cooled and dried using a cooling coil positioned in the supply air duct just after the air handling unit. This means that all moisture in the supply air is removed outside the guest room leaving all *sensible* cooling to the room.

Dry cooling also helps saving energy. The efficiency (COP) of a chiller is greatly improved when producing high temperature cooling water instead of more traditional 45°F water. A European study carried out by Environmental Design Solutions Ltd. shows an average annual energy cost saving of 22% comparing an active chilled beam system to a variable volume fan coil system with high efficiency electronically-commutated (EC) motors. High temperature cooling also enables free cooling (use of cold outside air to cool the building without the cost of mechanical refrigeration) to be utilized over a longer period of the year in locations where the climate allows it.



Photos: Hotel room with chilled beam built into the suspended ceiling in the hall.

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Chilled beams in hotel guest rooms works well in both constant air volume (CAV) systems and demand control ventilation (DCV) systems. In a DCV system further energy saving can be achieved by controlling the airflow and temperature depending on the actual demand. When the room is unoccupied the supply air volume is decreased and the temperature is allowed to rise or drop a little bit more to save energy. When the room is occupied the supply air volume is increased to achieve the required comfort. Sophisticated controls on the chilled beam continuously retrieve data from sensors to maximize comfort and energy savings.

The energy saving will of course have great impact on the life cycle cost. Another important aspect concerning operating costs is maintenance. To minimize time and cost spent on maintenance it is crucial to keep service points to a minimum. Since chilled beams have no internal fan the maintenance comes down to servicing the fan in the air handling unit with no need to access the guest rooms. Thanks to the dry cooling, dust will not get stuck in the coil of the chilled beam in the same way it would in a wet coil. The fin-spacing in a chilled beam is also quite big which enables dust particles to pass freely

through the coil. Based on this there is no need for room unit filters, that otherwise would need to be cleaned or replaced. Without condensation there is also no need for a drainage system, which further reduces the need of maintenance, and the risk of Legionella.

In general, the capital cost for a chilled beam system is similar to high end fan coil systems where supply air is included. Of course the cost will vary between a CAV and a DCV system but with good planning, the extra investment can be returned very quickly. A chilled beam system also enables low installations which can be used to reduce the space between the slabs reducing the building volume. The space saving can also be used to get an extra floor into the building within the same height in case the building is high enough to utilize this possibility.

All things considered the “typical hotel guest” will have a comfortable stay in the guest room while the sensible chilled beam system saves energy needing a minimum of maintenance.

“Swegon’s comfort modules have enabled us to maximize livable space in our hotel rooms and provide an extremely comfortable climate for our guests, with no drafts and low noise levels. In addition to this improved occupant climate, the Paragon solution by Swegon will significantly reduce operational spend by lowering maintenance and energy consumption”

Menno Hilberts, citizenM Hotels

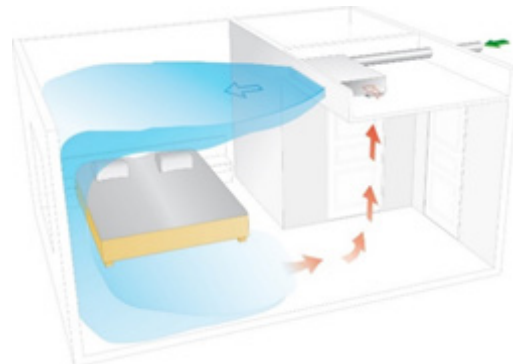


Illustration: Function principle of chilled beam for hotel rooms.