

 Content archived on 2023-03-20

Intelligent door seal prevents poor air quality

For a long time, heat insulation was en vogue – and nearly no one was concerned about poor indoor air quality. And yet excess CO₂ hampers concentration. Now, researchers have come up with an intelligent door seal system.

Heated debates and no agreement in sight: the eight employees sitting in a small conference room have come together to get an important project moving. But after an hour, some of them have trouble focusing on the discussion, and some are even beginning to become drowsy. No wonder: the air in the conference room is stuffy and stale, and increased levels of carbon dioxide (CO₂) are making them tired and robbing meeting participants of their concentration.

There's only one solution: air the room out. Or else rely on the intelligent door seal system that has now been developed by researchers at the Fraunhofer Institute for Microelectronic Circuits and Systems IMS in cooperation with the Athmer Company. Users of the system not only spare themselves the effort of regular airing: the door seal is also cold air's worst enemy, insulating to provide a perfect indoor climate.

Indoor concentrations of CO₂ are still a problem, particularly in newer buildings. "Modern buildings are becoming increasingly airtight," according to Hans-Jürgen Schliepkorte, group manager at Fraunhofer IMS in Duisburg. On the one hand, better windows and construction materials provide effective insulation - an issue that was long a major concern. But air quality was overlooked in the process. "In many cases, the supply of fresh air still comes through an open window," Schliepkorte points out. "This has consequences for the energy efficiency."

Sensor measures CO₂ concentration in the air

The electronically controlled door seal developed by IMS engineers opens or closes based on the CO₂ concentration in a room. A CO₂ sensor records concentrations in the air. If this value exceeds a certain threshold, a tiny motor moves a spring to open the door seal at the bottom of the door leaf. The seal raises to permit an exchange of air inside the room. At the same time, the system uses building based measurement

and control technology to activate the ventilation system to extract stale air from the room.

“Our standard is based on the Pettenkofer value of 1000 ppm (parts per million),” Schliepkorte explains. It was Max von Pettenkofer who investigated indoor air quality in the middle of the previous century and identified the CO₂ value that, if met or exceeded, makes people begin to feel unwell indoors. Today’s rules and guidelines based on DIN for the workplace set 1500 ppm as the upper limit and recommend a CO₂ concentration of 1000 ppm. “We can achieve this with the aid of the intelligent door seal – without having to open doors or windows,” Schliepkorte observes.

The door seal system is electronically coupled with building measurement and control systems. If a ventilation system or for that matter a heat recovery system has been installed, they can additionally be activated based on indoor CO₂ concentrations and temperatures. “The system always calculates the best compromise between good indoor air and optimal utilization of energy efficiency,” Schliepkorte says. Beginning in June of this year, it will be in use in the Fraunhofer inHaus-Center in Duisburg, an innovation workshop for application oriented and market based research for systems in rooms and buildings.

Indeed, Fraunhofer researchers have already set their sights on further applications: in the future, the door seal may well also help regulate humidity in residential and commercial buildings. This may soon make mold in the home and dry eyes in the office a thing of the past.

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Last update: 11 June 2013

Permalink: <https://cordis.europa.eu/article/id/131069-intelligent-door-seal-prevents-poor-air-quality>

European Union, 2025