MULTIFUNCTIONAL ACTIVE FAÇADE IEQ EFFECTS ON OCCUPANTS

MEZeroE
Measuring Envelope systems for Zero Energy buildings

FOCCHI

Product: Multifunctional active façade

FOCCHI designs, produces and installs complex façade systems for high-quality buildings.

The tested solution is an innovative multifunctional façade system integrating IoT, heat pumps, automatic blinds and windows to ensure indoor comfort and energy efficiency.

Focchi's Multifunctional façade

Pilot Measurement & Verification Line 2

Managed by: EURAC Research

PM&VL2

The scope of the PM&VL2 is a complete characterization of all the envelope parts and their effects on internal occupants in real operating conditions. The Façade System Interactions Lab aims to assess the interaction between the elements that make up a building and the indoor environmental quality and comfort conditions.

HEALTH

INTERACTION

Which is the need covered by this service?

This node of PM&VL2 covers the testing and development of a multifunctional façade designed for achieving Nearly Zero Energy Building (nZEB) ensuring multi-comfort (thermal, visual, and acoustic comfort) with good indoor air quality (IAQ). The prefabricated façade integrates heating/cooling systems, ventilation, automated controls, and sensors for optimal performance. Testing procedure involves thermal characterization and assessing integrated component performance in controlled as well as semi-controlled conditions.

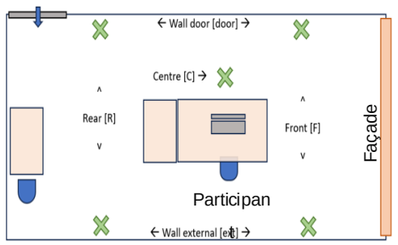
FSIL allows to test the façade in realistic operating conditions, by verifying the quality of the indoor environment as affected by façade systems, while using different system configurations. The laboratory allows the study, on a real scale, of the influence of these systems on perceived and measured comfort.

Design of Experiments

The experiment involved assessing the façade in summer conditions within an office setting. The primary goal was to examine how the façade influences the quality of the indoor environment. The participants could engage with the façade web application, as it autonomously establishes the indoor conditions.

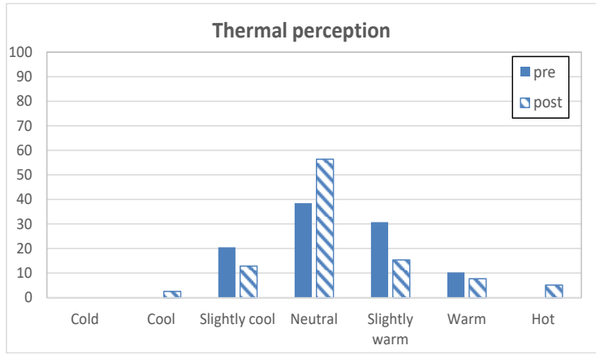
Indoor monitoring – air temperature, relative humidity, CO2, air speed, globe temperature, surface temperatures.

Subjective feedback – 39 participants were recruited, and questionnaires were administered for: perception, preference and acceptability of the different domains of IEQ (thermal, air quality, ventilation, lighting, acoustic, and global perception), completed twice at the beginning and end of the test.

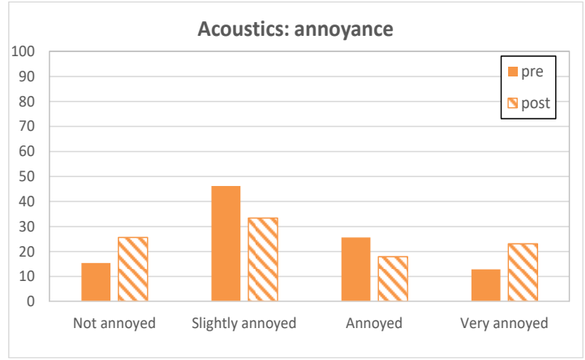


Results

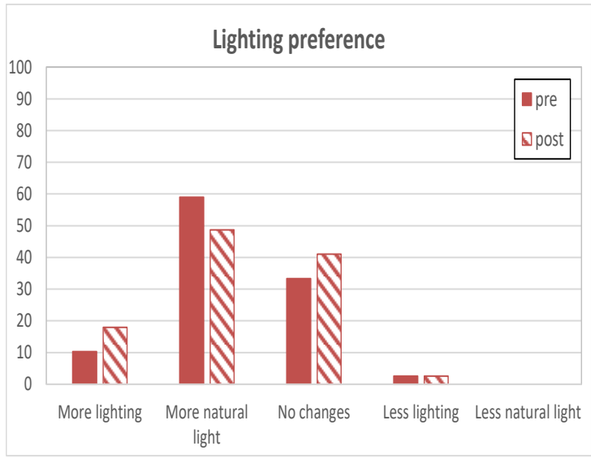
Results from the questionnaires administered by the participants:



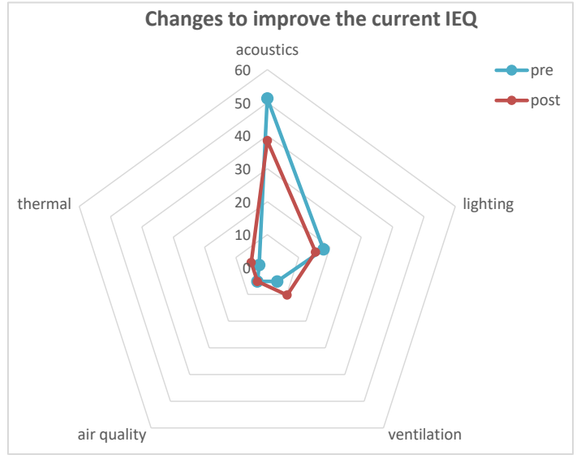
As compared to the beginning of the test, after interacting with the façade, participants judging their thermal state as close to thermal neutrality increased by 18 percentage points.



The participants reported to be "slightly annoyed" by the acoustic environment, indicated their preference for a "quieter" or even "much quieter" acoustic environment.



The preference judgement indicated that the frequency of "More natural lighting" was higher than the other categories, even though a slight decrease was observed at the end of the experiment, after the participants had the possibility to interact with the façade by giving a judgment on the illuminance of the room.



When asked what changes should be done to improve the indoor environment, the participants indicted clearly the necessity to improve the acoustic environment (i.e., reduce the noise emitted by the ventilation system) and the lighting (i.e., increase the amount of natural lighting from the windows).

Conclusions

The experiment assessed the summer performance of the façade system in an office setup, focusing on its influence on indoor environmental quality. Using a web application, participants engaged with the façade's automatic regulation of the indoor environment.

In addition to objective data, feedback from 39 participants on thermal comfort, air quality, ventilation, lighting, acoustics, and overall perception was collected through questionnaires administered at the beginning and end of the test. The findings offer insights for future improvements and optimizations of the façade's functionality.

The sole responsibility for the content of this poster lies only with the authors. It does not necessarily reflect the opinion of the European Union. The European Commission is not responsible for any use that may be made of the information contained therein. The MEZeroE Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 953157.

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