MIST Workshop: Room ventilation and air cleaning

WP3 - TU Eindhoven
November 5, 2025

Introduction

On November 5th a workshop was organized related to WP3 of the MIST project. The focus of the workshop was on the use of room ventilation and air cleaning to reduce exposure to pathogens.

Originally, 15 participants signed up for the workshop. Due to some last-minute cancellations, 11 people participated in the meeting.

After a short introduction round, Twan and Marcel explained, in two 15-minute presentations, the outcomes and status of the two related projects CLAIRE and P3Venti. These presentations provided some background information and presented the status of current research at the TU/e. It also served as a starting point for discussion in the workshop.

Then the workshop procedure was explained. The workshop was organized around four questions (themes), covering the topics of indicators, current status, quick gains, and innovations. We assumed that rooms with multiple people, such as meeting rooms, classrooms, (long-term) healthcare were the most important/interesting rooms to have in mind in the discussions.

In two groups of 5-6 persons, each question was discussed and main remarks noted on a flip-over sheet (~10 min), after which each group reported the results of the discussion to the other group (~10 min) including some discussion/clarification. In total, one round lasted around 25 min. After two rounds, a short break allowed for a visit to the lab to show the test facility. With the four rounds complete, some concluding remarks were followed with a drink in De Zwarte Doos.

Topic discussions

Below you will find a summary of the remarks made about each topic, based on the flip-over sheets filled.

Topic 1: Identify needs: what do we want the room ventilation to provide? How can air cleaners play a role in this?

Several broad and specific performance requirements came to mind. Notably, healthy air and comfort were mentioned, i.e., not forgetting about the thermal comfort requirements when designing ventilation and air cleaning systems. Similarly, noise can be included in comfort perception.

On the healthy air part, contaminant control is obviously linked to ventilation, reducing exposure. This also includes odor. No specific indicators were mentioned, though attention could be paid to the quality of the inhaled air and not perse focus on room average, living zone results.

Use of air cleaners can serve as an ‘extra’ in case of a pandemic/ extreme situation. For mobile air cleaners, the performance should be linked to its position. Overall, no unexpected/new requirements were mentioned that are linked to ventilation, though this doesn’t imply that ventilation performance is easily addressed. For now, we may refer to known approaches to identify performance, such as contaminant removal

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effectiveness. As an addition, we may want to pay some more attention to inhaled air quality. So, focus at least on the breathing zone.

Topic 2: Identify issues: why good/why not good? What are we missing?

In the discussion about this topic, i.e. the fact that ventilation is not always good, several thoughts are reflected towards building regulations and users. Regulations appear not in line with new developments and needs. As for the users, there is little knowledge about the ventilation system present in the building and how to operate it best.

We also see lots of old buildings that are in urgent need of renovation and improvement of the ventilation system. Notably, these buildings were built according to the prevailing rules at the time.

Also, for newly built buildings (renovations?), we still see that assurance of good functioning of systems during operation/occupancy often is missing. There is not always a match with the requirements/intentions at the start of the design and when the building is actually constructed. In line with that, changes in use (persons, changes in layout) of the building are very often not considered, while it is more common than not that such changes will happen.

As for something positive, it is noted that control of the building services has improved over the years and is expected to continue improving.

Topic 3: Identify chances (Knowledge, design, practice): what changes are possible in the current situation (existing building) and what can be improved?

Although Covid is still known as a virus and awareness of the benefits of ventilation to some extent is still present, it is important to (continue to) raise awareness that good ventilation is also important for indoor air quality in general. In that context, for the long-term, changes in regulations will be an important means to change design and performance outcomes with regard to ventilation.

Awareness and behavioral changes may be directed through protocols. In such protocols, additional ventilation and mobile air cleaning may be addressed as back-up systems in case of a pandemic or other type of emergency.

A (regular) building scan could identify how resilient an available system is. It also helps in assuring knowledge on the available system(s) and its maintenance status. Labeling/classification of the buildings can also incentivize the improvement of buildings in this respect

This can be linked to energy checks, as these have received much more attention over the last decades than the indoor environment. In this context, sensor-based monitoring seems an emerging topic that also links very well to the topic of ventilation. Monitoring biological parameters is still more difficult though.

From a research point of view, the chances also lie in the multidisciplinary of the topic, e.g. when focusing on bioaerosols.

The focus seems much on mechanical ventilation. Could hybrid solutions (natural/mechanical) still be interesting?

Topic 4: Identify innovation (Knowledge, design, practice): what could optimal room ventilation look like? How can it be combined with air cleaning?

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Some general examples of solutions were proposed. Apart from personalized ventilation, which will be looked into separately, a zonal approach could be interesting. One example refers to a classroom, where you could separate the teacher from the class.

Other examples can be thought of. In the same line, automatic control, allowing to change the flow distribution in the room could be an interesting pathway. E.g. temporarily supply or exhaust (unsure which one is best) more air near the place in an open office/large room where people are.

In that same context, the combination of ventilation and in-built air cleaning systems was discussed. It has advantages in the sense that, unlike mobile systems, it doesn't take space and most probably has less issues with noise. Flexibility in supply/exhaust seems possible, referring to the change in flow distribution. The combination with ventilation and overall performance is an issue of research.

Conclusions

Overall, the workshop was very interactive, all participants were very engaged, and there were some good discussions. We thank the participants for that. As usual, it is not that easy to boil down some firm conclusions from this type of workshop. However, some research directions could be identified, of which two stand out:

- The option of creating zones in a room, and how to do that.

- The option to control the flow direction in the room based on sensed use.

Both options seem to allow for an interesting integration with in-room air cleaning systems, e.g. in a suspended ceiling, or at the ceiling.

Research questions would relate to the possibility of creating zones in a room and to what extent such zones can be controlled, transferred into the room and potentially combined with an air cleaning system. In the assessment, we can rely on the known indicators or approaches with inhaled air quality (air quality at the breathing zone) as the point-of-departure.

Annex

List of participants

1. Frank Dreef (Hiensch engineering)
2. Marc Boers (Extreme air products)
3. Paul Joosten (Kuijpers)
4. Kieran McBrien (Novaerus)
5. Erica Ding (TU Delft)
6. Elham Maghsoudi Nia (TU Delft)
7. Rui Carneiro (TU/e)
8. Peng Qin (TU/e)
9. Matias Duran Mutate (TU/e)
10. Marcel Loomans (TU/e)
11. Twan van Hooff (TU/e)

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