

Technical performance and principles of system design

Indoor air quality

We typically spend up to 90% of our time indoors, in schools, offices, hospitals and our homes. Clean air is something we assume we have in the buildings in which we live, work and learn, yet impurities found in the air can cause health problems and a reduction in our general well-being.

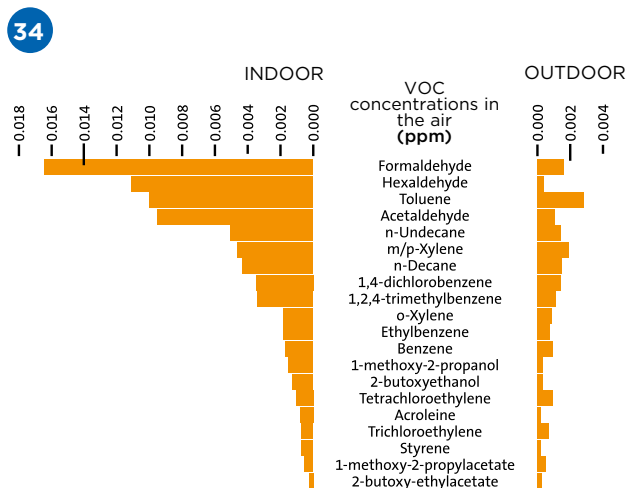
Clean air on the other hand can speed up patient recovery in hospitals, reduce absence at work and increase pupils' concentration at school.

Volatile organic compounds (VOC's)

Although we don't notice them, pollutants called volatile organic compounds (VOC's) including formaldehyde are often present in the air we breathe – naturally emitted from furniture, carpets, paints, varnishes, cleaning products and building materials.

VOC's have an initial boiling point of less than or equal to 250°C. They are emitted as a gas from a liquid or solid and enter the surrounding air. VOC's are numerous and varied. They include both human-made and naturally occurring chemical compounds. Formaldehyde (CH_2O) is both the highest concentration and highest risk VOC. Refer to figure 34 – VOC concentration.

Studies have shown that the air indoors can have concentrations of VOC's many times higher than the outdoor air. The increased focus on the reduction of energy consumption is leading to more airtight buildings, which means the quality of air is becoming even more critical. Refer to figure 34 – VOC concentration. Studies have shown that ventilation systems are only about 30% effective at removing VOC's from the air indoors.



Source: Indoor Air Quality Observatory (OQAI)

VOC concentration comparison, indoor vs outdoor

Some of the health problems VOC's can cause

People often complain about health problems after extended periods of time spent indoors. Studies have shown that many of these symptoms can be attributed to VOC's:

- Headaches
- Nausea
- Allergies and increased allergic reactions
- Lack of concentration
- Eye irritation
- Fatigue
- Breathing problems

The World Health Organisation (WHO) concerns about formaldehyde (which is a common VOC) in relation to human health are well published (WHO guidelines for indoor air quality: selected pollutants; 2010). All current regulation focuses on VOC emissions at project handover, and in reducing the VOC content of construction products.

Legislation and guidance

However, academic and evidence based design is increasingly highlighting that the major issue with VOC's is post handover / during building use.

Building regulations and guidance relating to VOC's:

- Building Regulations Approved Document F (ventilation)
- Building Bulletin 101 (education)
- BRE Digest 464 Part 2
- BRE Environmental Assessment Method (BREEAM) (indoor air quality)
- Health Technical Memorandum (HTM)03-01
- Leadership in Energy and Environmental Design (LEED) (indoor air quality)
- WELL Building Standard (indoor air quality)
- Al Sa'fat Dubai Green Building Evaluation System

You can't see or smell VOC's. Therefore there is no way of knowing what concentrations you are being exposed to on a daily basis.

Activ'Air® technology

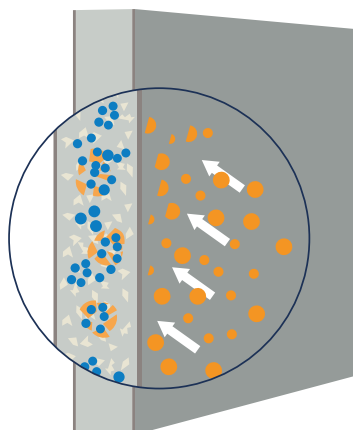
Activ'Air is a new technology added to certain Gyproc products. It is designed specially to convert formaldehyde into non-harmful inert compounds, thus eliminating the risk of re-emission. It is tested to capture and convert up to 70% of formaldehyde. Refer to figure 35 – Activ'Air technology.

Improving the indoor air quality is a major consideration amongst clients and building occupants, most notably those concerned with sustainability and health and wellbeing. Good clean air can reduce health problems as well as enhancing our healthy living in both our work and living spaces.

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1. Formaldehyde molecules

(●) in the air are absorbed by the plasterboard, plaster or ceiling

2. Activ'Air technology

(↔) converts them into inert compounds

3. The inert compounds

(●) remain locked in the plasterboard, plaster or ceiling

Activ'Air technology:

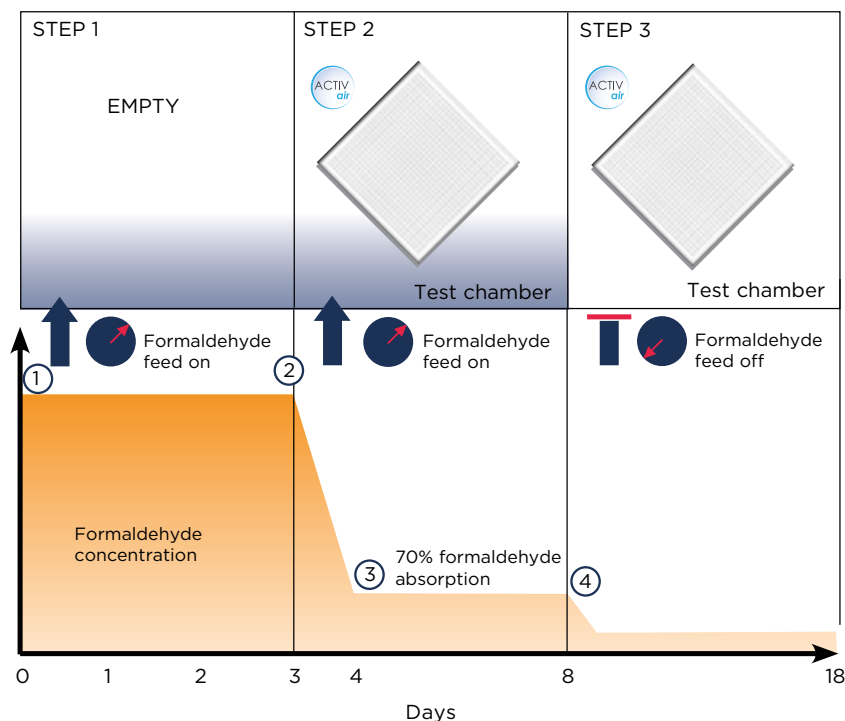
- Converts up to 70% of formaldehyde into inert compounds making indoor spaces healthier¹
- Uniquely captures and converts formaldehyde, removing the risk of re-emission even if the product is damaged or at end of life
- Will continue to work for at least 50 years
- Works through an emulsion paint finish
- Is fully recyclable.
- Has no impact on the installation or performance of the products or systems they are included in with regards to fire, acoustics, thermal or durability compared to standard versions of the products



¹When using Activ'Air products aim to have coverage in each room on the walls and / or ceiling equivalent to the m² area of the floor.

Activ'Air technology

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Activ'Air test principle

1. Formaldehyde was fed into the empty test chamber at a constant level
2. On day 3, a sample of a product containing Activ'Air technology was introduced to the test chamber
3. After 24 hours, Activ'Air technology had absorbed 70% of the formaldehyde in the chamber, with a continued in-feed of formaldehyde
4. Formaldehyde feed was stopped on day 8, and levels were further reduced as they continued to be absorbed by Activ'Air technology