Protect Your Family: The CO2 Levels Hiding in Your Home & The UK Ventilation Law You Must Know

Breathing Easy at Home: Understanding CO2 Levels and Minimising Them

In our quest for comfortable living, we often overlook the invisible air we breathe within our homes. That feeling of **drowsiness, a dull headache, or poor sleep**? It's often not just fatigue—it could be dangerously high **carbon dioxide (CO2)** levels trapped indoors.

One crucial aspect of indoor air quality (IAQ) is the concentration of CO2. Let's explore the significance of CO2 levels in the home and discover effective ways to minimise them for a healthier living space that complies with modern UK standards.

High indoor CO2 levels (anything consistently above 1000 ppm) are scientifically linked to reduced cognitive function, headaches, and fatigue. The ideal range for excellent indoor air quality is 400-600 ppm. The most effective way to lower CO2 is through controlled mechanical ventilation (like dMEV or MVHR), which ensures continuous fresh airflow without compromising a home's energy efficiency. Addressing high indoor CO2 is now an urgent matter of public health, echoing the principles of Ella's Law by ensuring a human right to clean air.

Understanding CO2 Levels: What's Optimal and What Causes Fatigue?

Carbon dioxide is a natural component of the air we breathe, typically constituting about 0.04% of the atmosphere. However, in confined spaces, CO2 levels can rise significantly, impacting indoor air quality and our well-being.

Understanding CO2 Levels: What's Ideal and What's Not?

Maintaining optimal indoor air quality hinges on understanding carbon dioxide (CO2) concentrations. The benchmark for excellent indoor air is generally considered to be **below 600 parts per million (ppm)**. However, as the World Health Organization (WHO) notes, levels can rise in occupied spaces, and concentrations exceeding **1000 ppm** may begin to impact comfort and well-being, potentially leading to the health issues we'll discuss later.

Current Guidelines for Indoor CO2 Levels (Updated for 2024):

- **400-600 ppm**: **Optimal.** This range signifies excellent indoor air quality, typical of well-ventilated outdoor environments.
- **600-1000 ppm**: **Acceptable.** While not ideal, this range is common in many indoor settings and generally does not cause significant discomfort for most individuals.
- **1000-2000 ppm**: **Noticeable Impact.** At these levels, many people report symptoms such as headaches, drowsiness, and a feeling of stuffiness. Cognitive function may begin to decline.
- **2000-5000 ppm**: **Significant Health Risks.** Prolonged exposure can lead to pronounced headaches, fatigue, poor concentration, increased heart rate, and nausea. This range is often seen in poorly ventilated, densely occupied rooms.
- **Above 5000 ppm**: **Dangerous.** Exposure poses severe health risks, including impaired judgment, loss of consciousness, and, in extreme, prolonged cases, potential asphyxiation. These levels are rare and typically associated with catastrophic ventilation failure.

Impact on Health

Research indicates that elevated CO2 levels can lead to various health issues. A study conducted by the Harvard T.H. Chan School of Public Health found that cognitive function scores significantly decline when CO2 levels exceed 1000 ppm. Symptoms of elevated CO2 include:

- **1000-2000 ppm**: Headaches, dizziness, and fatigue.
- **2000-5000 ppm**: Stagnation, stuffiness, poor concentration, increased heart rate, and nausea.
- **50,000-100,000 ppm**: Immediate risk to life, leading to severe toxicity and potential death due to asphyxiation.

The UK Department for Education suggests a daily average of 1,000 ppm for mechanically ventilated and 1,500 ppm for naturally ventilated spaces, which reflects the variability of wind-driven ventilation.

General indoor environments

In most indoor settings, a CO2 concentration of **400-1000 ppm** is considered acceptable. This range is commonly used as a guideline for maintaining good indoor air quality in homes, offices, and public spaces.

Offices and classrooms

In office spaces and classrooms, a common guideline is to maintain CO2 levels **below 1000 ppm**. This is because higher CO2 levels have been found to lead to decreased cognitive performance and reduced productivity.

Common Sources of Elevated CO2 and Trapped Pollutants

1. **Poor Ventilation**: Inadequate airflow can lead to the accumulation of CO2, especially in spaces with limited ventilation. Studies show that proper ventilation can reduce CO2 levels by up to 50%.
2. **Combustion Appliances**: Gas stoves, heaters, and fireplaces can contribute to increased CO2 levels. The Environmental Protection Agency (EPA) highlights that combustion appliances can double indoor CO2 concentrations.
3. **Occupancy and Activities**: The number of people in a space and certain activities (cooking, exercising) can generate additional CO2. Each person can produce about 0.5-1.0 kg of CO2 per day.

Higher levels of CO2 will start to take effect on the body quite quickly. Once the readings start to head over 1000ppm some people will start to report the feeling a little dizzy. It is at this point that you might notice the change in air quality.

At levels between 2000-5000ppm there will be signs of Headaches, fatigue, stagnant, stuffiness, poor concentration, loss of focus, increased heart rate and nausea. The initial feeling as the figure begins to reach 2000ppm is the start of a headache. The 2500ppm is achievable in occupied rooms with poor ventilation.

When the CO2 concentration reach between 50,000-100,000ppm there is an immediate risk to life. The body will begin to react severely due to the levels of toxicity in the blood stream. This is enough to cause death. This is though these levels are only made up 5-10% of the air content. These higher figures are only achievable through failure in a piece of equipment or in an enclosed environment with no fresh air supply.

CO2 is Not the Only Problem

High CO2 is often an indicator that your home is trapping other, more dangerous pollutants. These include **Volatile Organic Compounds (VOCs)** released from new furniture, paints, and cleaning products. A solution designed to remove CO2 (e.g., proper ventilation) is also the primary defence against these complex airborne toxins.

The Right to Breathe Easy: How UK Law is Responding to Indoor Air Quality

Addressing high indoor CO2 levels is not just a personal health issue; it is becoming a matter of legislative compliance and public health protection, particularly in the UK.

The Legislative Drive: Ella's Law

The push for better air quality is underlined by the tragedy that inspired the **Clean Air (Human Rights) Bill**, often referred to as **Ella's Law**. Ella Kissi-Debrah became the first person in the UK to have air pollution officially listed as a cause of death during her inquest. This drive to protect vulnerable populations highlights the need for continuous, controlled airflow to safeguard health.

UK Building Regulations-Compliant Ventilation Solution

While much of the focus is on outdoor pollution, UK Building Regulations recognise that modern, airtight homes (due to increased insulation and efficiency efforts) trap pollutants.

The **UK Building Regulations (Approved Document F)** set out guidelines for ventilation in residential properties. These regulations require adequate ventilation rates to ensure good IAQ, particularly in new builds or following major renovations.

Effective Strategies to Minimise CO2 Levels in the Home and Office

Enhance Ventilation

- **Invest in Ventilation Systems**: Mechanical ventilation systems, such as exhaust fans and air purifiers, can help maintain fresh air circulation. The Building Regulations in the UK (i.e. Approved Document F) recommend adequate ventilation rates to ensure good air quality.
- **Open Windows**: Regularly open windows to allow for natural ventilation and the exchange of indoor and outdoor air.

Indoor Plants

- **Natural Air Purifiers**: Incorporate indoor plants known for their air-purifying qualities, such as snake plants and peace lilies. They absorb CO2 and release oxygen. Though, according to NASA, you would need a lot of them to make a real improvement – The equivalent of a leaf the size of a single car garage in optimal conditions.

Regular Air Quality Monitoring:

- **Use CO2 Monitors**: Install CO2 monitors to keep track of indoor levels. This empowers you to take timely actions when needed. The UK Health Security Agency recommends maintaining CO2 levels below 1000 ppm for optimal indoor air quality.

Mindful Habits:

- **Cooking Practices**: Use exhaust fans while cooking to remove airborne pollutants and excess CO2. Cooking can increase CO2 levels significantly, so proper ventilation during this activity is crucial.
- **Proper Ventilation During Activities**: Ensure adequate ventilation during activities that may increase CO2 levels, such as exercising. Studies indicate that high-intensity activities can raise CO2 levels dramatically.

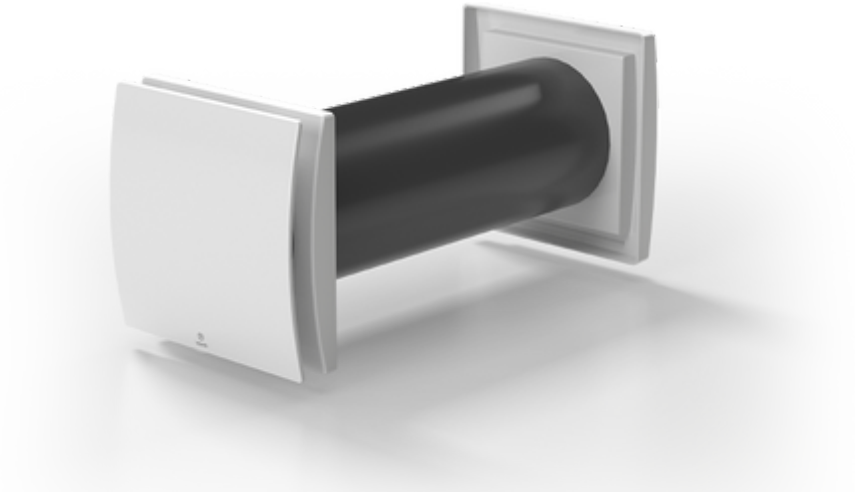
Consideration of Building Materials:

- **Opt for Low-Emission Materials**: Choose building materials and furnishings with low emissions of volatile organic compounds (VOCs) to maintain better indoor air quality. The UK Green Building Council provides guidelines on selecting materials that contribute to healthier indoor environments.

Prioritising Your Well-being

With considerable changes to our homes over the last few decades we have seen our house become more and more airtight. The unfortunate by-product of this is a poor ventilation. A home with optimal CO2 levels is a home where you can breathe easy and thrive. By incorporating these strategies into your living space, you not only enhance indoor air quality but also contribute to a

healthier and more comfortable environment for you and your loved ones.



Remember, your well-being starts with the air you breathe. Let’s create homes where every breath is refreshing and invigorating. When you are aware of the symptoms you become aware of the problems.

To find out more about indoor air quality and our services contact VENTI and speak to one of our team. We will support you to find the air handling solutions to suit your needs. We will provide the advice to ensure that you can breathe easily in your home.

FAQs

Q: How can I tell if my home has high CO2 levels?

A: The most effective way to measure indoor CO2 levels is by installing a CO2 monitor. These devices can provide real-time readings of CO2 concentrations. Additionally, signs of high CO2 levels may include:

- Dizziness or headaches
- Shortness of breath
- Fatigue or sleepiness
- Stuffy or stagnant air

If you notice these symptoms, it may be a good idea to check your CO2 levels.

Q: What are the ideal CO2 levels for indoor air quality?

A: Ideally, indoor CO2 levels should be below 600 ppm. Levels between 600-1000 ppm are generally acceptable, while levels above 1000 ppm can lead to discomfort and health issues. If levels exceed 2000 ppm, significant health risks may arise.

Q: Are there specific plants that are best for reducing CO2?

A: Yes! Some of the best indoor plants for improving air quality and reducing CO2 levels include:

- **Snake Plant (Sansevieria)**: Known for its ability to convert CO2 into oxygen at night.
- **Peace Lily (Spathiphyllum)**: Effective at filtering out harmful pollutants.
- **Spider Plant (Chlorophytum comosum)**: Great for removing indoor toxins and improving

air quality.
- **Areca Palm (Dypsis lutescens)**: A natural humidifier that helps to purify the air.

While having these plants can help, multiple plants may be needed for a noticeable impact on CO2 levels.

Q: What should I do if my CO2 levels are consistently high?

A: If your CO2 levels are consistently high, consider the following steps:

- **Increase Ventilation**: Open windows and doors to allow fresh air in. Use exhaust fans in kitchens and bathrooms.
- **Use CO2 Monitors**: Regularly check CO2 levels with a monitor to track changes.
- **Invest in Air Purifiers**: Consider using air purifiers equipped with HEPA filters to help reduce indoor pollutants.
- **Consult an Expert**: If high levels persist, consult an indoor air quality expert to assess your home and recommend solutions.

Q: How do cooking and other activities affect CO2 levels in the home?

A: Cooking, especially with gas stoves, can significantly increase CO2 levels. Activities like exercising indoors can also elevate CO2 concentrations due to increased respiration. To mitigate these effects, ensure proper ventilation during cooking and consider opening windows or using exhaust fans.

Q: Can home insulation affect indoor air quality?

A: Yes, while good insulation is essential for energy efficiency, it can also lead to reduced ventilation, causing CO2 levels to rise. It’s important to balance insulation with adequate ventilation systems, such as heat recovery ventilators (HRVs), to maintain good indoor air quality.

Q: How often should I ventilate my home?

A: It’s recommended to ventilate your home regularly, ideally several times a day. Opening windows for at least 15-30 minutes can significantly improve indoor air quality. Additionally, consider using mechanical ventilation systems to ensure continuous airflow, especially in tightly sealed homes.

Q: Are there any legal requirements for indoor air quality in the UK?

A: Yes, the UK Building Regulations set out guidelines for ventilation in residential and commercial properties. These regulations require adequate ventilation to ensure good indoor air quality, particularly in new builds. It’s important to be aware of these regulations when renovating or constructing a home.

Q: What role does humidity play in indoor air quality?

A: Humidity levels can significantly impact indoor air quality. High humidity can promote mould growth and dust mites, while low humidity can lead to respiratory issues. Ideally, indoor humidity should be maintained between 30-50%. Using dehumidifiers or humidifiers can help achieve optimal levels.

Q: How can I improve indoor air quality without spending a lot of money?

A: There are several cost-effective ways to improve indoor air quality:

- **Regular Cleaning**: Dust and vacuum frequently to reduce allergens and pollutants.
- **Natural Ventilation**: Open windows and doors whenever possible to allow fresh air in.
- **DIY Air Purifiers**: Use items like baking soda and activated charcoal to absorb odours and pollutants.
- **Houseplants**: Incorporate indoor plants that improve air quality without requiring significant investment.