Avery Dennison
Performance Tapes
Whitepaper

Europe
July 2021

Don’t let your poor ventilation put a block on your health. Why investing in ventilation will deliver a healthy return.

When it comes to our health and well-being, it is easy to forget about air as a potential risk factor because we can’t really see it. But, a vast number of studies over the past 50 years have demonstrated that the quality of the air you are breathing is something to really consider.

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Air pollution is the single biggest environmental threat to human health according to the World Health Organization (WHO). Nine out of 10 people in the world breathe polluted air, causing more than seven million premature deaths every year — double the number of people dying from HIV, malaria and tick-borne encephalitis combined[1]. In 2016 diseases of the respiratory system accounted for 7.5% of all deaths in the EU[2].

Much progress has been made in Europe in improving outdoor air quality. However, one commonly overlooked fact is that we spend on average 93% of our time indoors[3], be it at home, in school, the office, or other public buildings. This is of significant importance, because the concentrations of some pollutants are often two to five times higher than typical outdoor concentrations. While three million of the abovementioned premature deaths are caused by outdoor air pollution-related diseases, more than four million are caused by indoor air pollution.

Indoor air quality (IAQ) is the relative measure of harmful pollutants that can be found in the air of an indoor environment[4]. These pollutants can include anything from gases such as carbon monoxide to microbial contaminants such as mold or bacteria. Indoor air may contain over 900 chemicals, particles and biological materials with potential detrimental health effects[5].

IAQ is affected by a variety of factors. Of course, climate and outdoor environment, ventilation, cleaning conditions and products used in households all influence IAQ - however, building materials used, particularly in flooring and walls, also play an important part. These can emit airborne particulates and volatile organic compounds that may be harmful to the building's occupants.

900 Chemicals, Biologicals & Particles

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The air we breathe

Prolonged exposure to high levels of air pollution can affect human respiratory and inflammatory systems. Poor IAQ not only causes headaches and dizziness, it can also exacerbate asthma and allergies. Furthermore, it can lead to increased mortality from stroke, heart disease, chronic obstructive pulmonary disease, lung cancer and acute respiratory infections. Children, pregnant women and the elderly, in particular, are highly susceptible to negative effects from air pollution.

Of the four million premature deaths each year from exposure to household air pollutants, the causes are divided as follows:

- Stroke: 34%
- Ischemic heart disease: 26%
- Chronic obstructive pulmonary disease: 22%
- Pneumonia: 12%
- Lung cancer: 6%

According to the WHO, asthma is the most common chronic disease among children. In 2019, it affected an estimated 262 million people and caused 461,000 deaths[6].

Around one in 13, or 25 million Americans had asthma in 2019, including 8% of adults and 7% of children.

Schoolchildren in particular are exposed to high amounts of fine dust, excessive amounts of radon and too much benzene. Furthermore, high proportions of pupils are exposed to high levels of formaldehyde and carbon dioxide within school grounds[7].

Asthma is a chronic inflammatory disease of the airways that causes recurring episodes of wheezing, breathlessness, chest tightness and coughing. It is a common disease that affects people of all ages throughout Europe. It most commonly arises in childhood and may persist into adulthood. In two-thirds of children with asthma, the disease remits in the early teenage years, only to relapse in adulthood in about a third of these cases[8].

In another study carried out in London, it was found that the majority of classrooms contained CO_2 levels above the recommended 1,000 parts per million, indicating a need for more ventilation[9].

Although asthma is more likely to arise in individuals whose close family members also have asthma, there are environmental factors that can make a person more susceptible. Events in early life which affect the development of lungs can increase risk - such events include low birth weight, prematurity, exposure to tobacco smoke and other sources of air pollution, and viral respiratory infections[10]. The distribution of the disease suggests a strong association and link with our 'Western' environment, possibly reflective of urbanization and our tendency to spend ever more time indoors. This is backed by the fact that exacerbations of asthma are especially common in winter and shortly after the return of children to school after the summer holiday. Meanwhile, in the UK, a recent study found that anywhere between 7% and 12% of annual childhood asthma cases may be attributable to traffic-related NO_2 and nitrogen oxides (NOx) exposures.

Kindergartens and schools are the environments where children spend the majority of their time, and the need for a healthy indoor environment in such institutions should be emphasized. Hence in schools, additional precautions should be taken to reduce allergen exposure for asthmatic children.

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Sick building syndrome

In most cases asthmatic symptoms subside during young adulthood, but the fact remains that about 35% of people relapse during adulthood, again suggesting a strong link to poor IAQ in the workplace environment.

The term Sick Building Syndrome (SBS) is used to describe situations where people experience negative health effects from spending time in a home or building[11]. The syndrome was first described and reported during the 1970s among employees working in brand-new office buildings. The affliction was officially acknowledged in 1984, when the WHO published the first report mentioning SBS as a real and valid disease caused by well-determined and clear causes, namely poor IAQ[12]. During the oil crisis that dominated the seventies, energy became a high-priced commodity and people sought a way to decrease heat-ing costs and hence make new buildings as energy-efficient as possible. This led to newly built and renovated schools, offices and houses, being designed to be as hermetically sealed as possible. Although this assumption was true, as these buildings required less heating and were hence more energy-efficient, that way of designing and building structures also caused substantial negative side effects. Indeed, the new build-ings were efficient at keeping cold air out, but unfortunately also very efficient at trapping bacteria, molds and other pollutants inside.

Ever since studies have also demonstrated SBS to be prevalent in hospitals and schools. A common characteristic of SBS is that it never affects just one person, but instead groups of people, i.e. employees working – or people residing in – the same building. Symptoms range from relatively harmless to more severe, including: headaches, severe fatigue, irritability, problems concentrating, dizziness, nausea, irritation of the eyes, colds, tight feeling in the chest area, all the way up to more severe and frequent respiratory infections, causing absenteeism and burn-outs.

Research has shown up to 80% of employees can be affected by SBS. Scientists have identified a number of clear biological factors that contribute to SBS, mainly the presence of microorganisms (microbes) and molds, as well as chemical factors such as ozone gas, components emitted from paper, wooden, other building materials, and phthalates. The latter are industrial chemical substances added to the likes of PVC plastics in order to make them more pliable, or are found in building materials such as vinyl flooring and solvents which emit particulates that are subsequently aspired by the building's occupants.

The most effective remedy against SBS consists of reducing or eliminating the risk factors. Reducing risks can be achieved by increasing ventilation, regular and thorough cleaning of floors and furniture, and keeping the ambient temperature low. However, eliminating risks requires a more structural approach, i.e. avoiding building materials that emit harmful chemical components.

Research into SBS has demonstrated a clear and unambiguous link with poor IAQ. The indoor oxygen level decreases due to microscopic dust and airborne particulates exponentially multiplying. These allergens multiply at considerable speed. In dry air environments that are insufficiently ventilated, allergens multiply by 20 each and every day. In damp indoor environments this number increases to 60.

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An inside job

As stated at the top of this paper, air pollution, both indoors and outdoors, is currently one of the major European and worldwide health concerns. A lot of attention so far has gone to outdoor air quality and limiting several pollutants. However, IAQ requires at least the same amount of attention because this is where we spend most of our time. The goal of the EU air policy is to achieve levels of air quality that do not result in unacceptable risks to human health.

Indoor exposure to air pollutants may occur in both private and public indoor environments such as homes, offices, schools and transport systems. Although some indoor air pollutants come from the outside, most are released inside the building, for example when cleaning. Certain construction materials can also emit pollutants. Dampness and lack of ventilation may further exacerbate poor IAQ[13].

Climate change and ever-increasing energy costs have an impact on IAQ as well.

For example, extreme weather conditions may increase the need for additional insulation and decreased ventilation, which may lead to too high or too low indoor temperatures or to humidity problems. The main determining factors influencing IAQ are listed below.

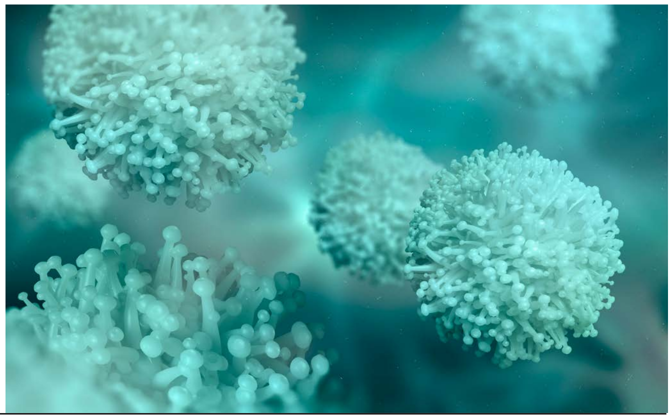
Volatile organic compounds

Two common causes of complaints associated with poor IAQ are bad smells and irritation of the eyes, nose and throat[14]. Such irritation is usually induced by specific chemicals, with a common worsening effect due to dry indoor air. Bad smells are unpleasant but not harmful in themselves. They can, however, lead to more severe symptoms such as headaches, nausea, and irritation of eyes or throat.

The main culprits of these unpleasant and/or harmful effects are volatile organic compounds (VOCs). These are organic chemicals that evaporate at low ambient room temperature and are easily dispersed into the surrounding air[15].

VOCs include both human-made and naturally occurring chemical compounds, some of which may also cause short- and long-term adverse health effects. Concentrations of VOCs are commonly up to 10 times higher than outdoors[16]. VOCs are emitted by a wide array of products:

- A major source of man-made VOCs are coatings, especially paints and protective coatings[17]. These solvents are required to apply a protective or decorative film.
- Another source of VOCs is benzene. It is frequently used in the production of plastics, resins and synthetic fibers. Benzene evaporates into the air quickly and has also been known to contaminate food and water, possibly leading to serious illness if ingested[18].
- Methylene chloride can be found in adhesive removers and aerosol spray paints. In the human body, methylene chloride is metabolized to carbon monoxide.
- Formaldehyde is slowly emitted from building materials such as paints, adhesives, wall boards, and ceiling tiles. The compound irritates the mucous membranes and can make a person irritated and uncomfortable. High humidity and high temperatures allow more vaporization of formaldehyde from wooden materials.



Radon

Radon, which occurs naturally in parts of Europe and the rest of the world, is a radioactive gas emitted by uranium in soil and rocks. It is a clear, odorless and tasteless gas and hence unperceivable when present in buildings. Radiation from inhaled radon and long-lived radon decay products may damage lung tissue, which can lead to lung cancer after prolonged exposure. It's the second leading cause of lung cancer, besides smoking. In an outdoor environment radon is quickly dispersed into the atmosphere and thus quite harmless. Indoors, however, it can accumulate in insufficiently ventilated rooms. Other influencing factors of radon concentrations consist of the surrounding area in itself, the underlying soil and the building materials used.

Suspended particles

Coarse, fine and ultrafine particles in ambient air are known to cause adverse health effects, particularly on the respiratory and cardiovascular systems. These particles may come from outdoor pollution, but can also form indoors by reactions between ozone and some VOCs, and by the burning of fuels for heating and cooking. In addition, man-made nanoparticles, which are increasingly used in consumer products, may also impact indoor air pollutants.

Microbes

Microorganisms such as fungi and viruses are especially problematic in damp buildings or indoor environments because these cause mold, while many fungi release substances that cause allergies[19]. Viral infections may also be transmitted by indoor air and some of them can lead to an increase in asthma and allergies.

Humidity

Dampness or moisture may accumulate in the building structures or finishing materials via leaks in roofs, windows or piping. Dampness and mold increase risk of asthma-related problems by 30-50%[20]. Good IAQ requires an optimal level of humidity. Too low humidity causes eye irritation, dry skin, and rashes, whereas too high humidity results in water damage and mold problems, and favors the growth of dust mites.

Ventilation

Ventilation is one of the most important factors determining IAQ. Poorly ventilated offices and schools can affect health and work or academic performance. Adequate ventilation is especially needed in heavily insulated buildings that allow little air exchange with the outside.

Temperature

In addition to ventilation, proper ambient temperature is also one of the basic requirements for good IAQ. Extreme indoor temperatures are a serious health hazard. Indoor air that is very cold or hot is highly unhealthy. Air that is too warm, for example, aggravates the effects of insufficient humidity.

Lead

The use of lead-containing indoor paints has been banned or restricted for quite some time now. However, some old houses in parts of the EU still have paintwork containing lead. Even low-level exposure to lead is harmful for children, for whom the main route of exposure is swallowing dust.

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Better safe than sorry

According to the European Lung Foundation[21], one in eight deaths in the EU are from respiratory diseases, totaling 600,000 people who die every year in the EU from respiratory disease. Six million hospital admissions per year are due to respiratory diseases. Indoor air pollution is the eighth most important risk factor for disease and is responsible for an estimated 2.7% of the global burden of all diseases in the EU, linking between 1.5 million and two million deaths a year to indoor air pollution. The total cost of respiratory disease in the EU exceeds 380 billion euros.

These are staggering numbers, and that is why the EU is vying for the tightening of building material standards to avoid worsening IAQ, and reducing indoor air pollutants putting workers at risk.

Exposure to household air pollution, as well as poor air quality in offices and public buildings, can lead to a wide range of health problems. These can range anywhere from short-term to long-term effects, and can even result in death[22].

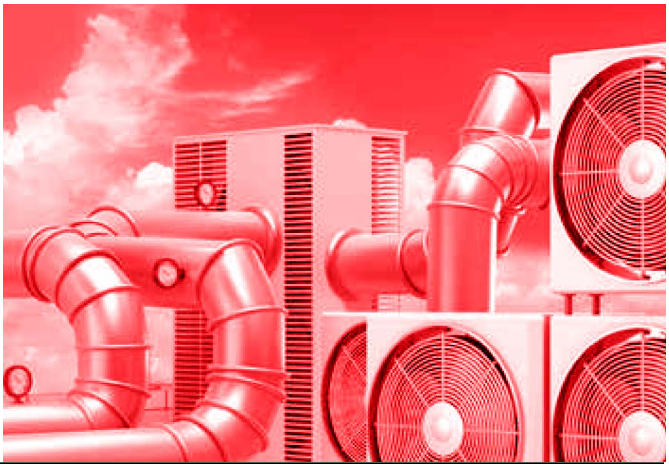
Short-term	Long-term
Eye irritation	(Worsening) asthma
Pharyngitis (throat irritation	Chronic obstructive pulmonary disease
Coughing	Lung cancer
Headache	Ischemic heart disease
Dizziness	Stroke
Wheezing	Cataract
Nasal congestion (inflammation of the nose)	Dyspnea (strenuous or painful breathing)
Fatigue	Muscle Pain
Nausea	Vomiting

One very important thing to consider when taking into account all of the above health risks, is that certain people are considerably more vulnerable than others to indoor air pollution. These include children, pregnant women, people over 65 years of age, and per-sons suffering from cardiovascular and respiratory diseases (e.g. asthma). Other factors that may render some people more vulnerable are genetic traits, lifestyle, nutrition and – for some pollutants – other health problems (e.g. immunodeficiency)[23].

Depending on their age and the type of chemical or airborne particulates to which they are exposed, children may be more vulnerable than adults to certain toxic substances (e.g. lead). This is due to a variety of rea-sons: their lungs are still growing and developing, their immune and metabolic systems are still developing, they suffer from frequent respiratory infections, and they are more active outdoors than adults and therefore breathe in higher doses of outdoor pollutants[24]. Vulnerability to chemical toxicity after birth is highest during the first six months and continues for years before maturation[25].

The negative effect on child lung development has been observed at a much lower concentration level of toxins at which no adverse effects were observed in adults, which suggests that children are more vulnerable than adults. In addition, air pollutants may cause cough, bronchitis and other respiratory diseases, and make asthma worse. Particulate matter, nitrogen dioxide and ozone have been identified as important causes. Young children are also at risk of higher exposure due to specific behavioral patterns (e.g. hand-to-mouth activity). In pregnant women, exposure of unborn babies to high levels of air pollution over longer periods of time may cause adverse pregnancy outcomes such as reduced birth weight or preterm birth[26].

Elderly people are at an increased risk of developing the aforementioned health issues and are particularly vulnerable to air pollution because the ability to eliminate chemicals from the body decreases with age.



Persons suffering from cardiovascular diseases are more vulnerable to particles and those suffering from respiratory diseases such as asthma are more vulnerable to several air pollutants. In people with asthma, exposure to air pollution might worsen symptoms or trigger asthma attacks. People with lung disease, such as chronic bronchitis (also called chronic obstructive pulmonary disease or COPD), may suffer from worsening symptoms when exposed to air pollution. People suffering from cardiovascular (heart) disease might experience symptoms such as palpitations, chest pain or shortness of breath when exposed to air pollution[27].

The fact that not only these vulnerable groups, but in fact all people, spend the majority of their time indoors warrants an across-the-board general strategy and approach to reducing adverse effects caused by poor air quality. These measures can range anywhere from structural measures such as correct building materials and flooring choices, to temporary measures such as eliminating or reducing sources of toxins and increasing ventilation.

Preventing the entry of pollutants from outside the building[28]:

- This can be achieved by installing radon barriers and by sealing cracks and openings, including the joints where the floor meets the wall, openings in the floor for the passage of pipes and wires, and hollow masonry walls that penetrate the floor.
- Ventilating the entire building on regular intervals, especially the basement as well as any crawlspaces.
- Placing entry mat systems critical in trapping soil, pollutants, and moisture that otherwise would spread into and throughout the building.

Reducing exposure to biological contaminants:

- Install and use exhaust fans that are vented to the outdoors in kitchens and bathrooms.
- Ventilate the attic and crawl spaces to prevent moisture build-up.
- Thoroughly clean and dry water-damaged carpets and building materials (within 24 hours if possible) or consider removal and replacement.
- Regular cleaning will reduce house dust mites, pollens, animal dander and other allergy-causing agents.

Reducing or eliminating the emission of VOCs:

- Increase ventilation when using products that emit VOCs.
- Do not store products containing formaldehyde or benzene such as paint strippers, adhesive removers and aerosol spray paints, and only use them outdoors when possible; or indoors only if the area is well ventilated.
- Many building materials such as wood, paints, adhesives, and wall boards slowly emit low amounts of formaldehyde, which can be counteracted by lowering humidity and temperature.
- Use low-VOC or no-VOC paint and other products when decorating.

Contrary to the reactive and temporary measures above, the only permanent long-term solution to optimize IAQ and maintain healthy indoor living conditions consists of making smart and well-informed decisions when it comes to choosing building materials and ventilation for your home, office, or school building.

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Why insulation and ventilation need not be incompatible

Any attempts to improve the indoor air quality of a building should start with ventilation. Defined in simple terms as the supply of outdoor air to a building, ventilation dilutes indoor-generated air pollutants such as VOCs and flushes them out. Furthermore, it can prevent high levels of nitrogen dioxide and carbon dioxide from building up.

According to studies, increased ventilation rates are associated with fewer adverse health effects and superior work and school performance. On top of this, well ventilated buildings suffer less from occupancy absence.

There are two major forms of ventilation that buildings can draw upon:

- **Natural ventilation:** Some buildings are naturally ventilated by the opening of windows and doors, along with other openings, or leaks, in the building's envelope. This applies mostly to homes and represents their most common form of ventilation beyond mechanical fans found in ovens and bathrooms.
- **Mechanical ventilation:** Buildings with low-leakage envelopes or unsuited to having windows and doors open rely on mechanical ventilation to maintain standards of indoor air quality. Commercial and industrial buildings usually operate through a series of fans and ductwork that are part of heating, ventilating, and air conditioning (HVAC) systems.

Ventilation performance of buildings in all settings – from homes and hotels to offices and schools – has come under high levels of scrutiny since the outbreak of the coronavirus pandemic in early 2020.

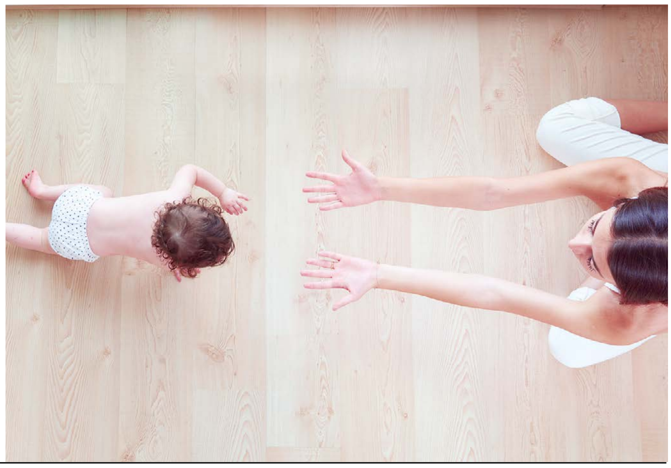
As scientists have gathered more evidence from around the world on how COVID-19 transmits, it has become increasingly clear that it is an airborne disease which passes from person to person in the form of tiny droplets. These are miniscule in size and invisible to the naked eye, making it difficult to avoid should you come into close contact with an infectious person.

In the United States, as with many nations' health authorities, detailed advice has been published regarding a series of measures that can be taken to enhance ventilation practices with the aim of making buildings as covid-secure as possible.

The Centers for Disease Control and Prevention (CDC) routinely updates its guidance which is designed to inform building managers on how to enable the safe return of occupants as societal restrictions are eased. These include:

Increasing introduction of outdoor air by opening windows and doors, and/or setting outdoor air dampeners beyond minimum settings to reduce HVAC air recirculation (possible in mild weather conditions).

- Using fans to increase effectiveness of open windows.
- Checking and adjusting existing air ventilation and HVAC systems to ensure they are working as effectively as possible.
- Turn off any demand-controlled ventilation (DCV) controls that reduce air supply based on occupancy or temperature during occupied hours.
- Improve central air filtration.
- In non-residential settings, run the HVAC system at maximum outside airflow for 2 hours before and after the building is occupied.
- Actively monitor room CO_2 levels and steer ventilation levels accordingly.



Ventilation and the road to carbon neutrality

These are, however, predominantly short-term solutions in extraordinary circumstances.

As societies around the world continue to vaccinate their populations against COVID-19, it is expected that these jabs will do the majority of the heavy lifting in terms of reducing serious illness and death caused by the virus.

But the pandemic has shone a spotlight on the general importance of maintaining high standards of indoor air quality. The vast majority of cases have been contracted inside buildings, serving a stark reminder of the more general benefits of well-ventilated buildings described earlier in this chapter – improved working performance and reduced absence of occupants.

To ensure high levels of indoor air quality in the longer term, more viable solutions are required that are compatible with a host of other building requirements – for example, in cold winter months, it will not be realistic to keep doors and windows open.

Ventilation strategies also need to complement sustainability criteria, especially those surrounding insulation which are designed to make buildings as energy efficient as possible.

The global building stock accounts for more than a third of the total energy consumption and for almost 40% of the total direct and indirect carbon dioxide emissions.

Although tremendous efforts and progress has been made in transitioning away from reliance of fossil fuel generated power towards renewable energy such as solar, wind, hydro and others, a basic principle still holds true when it comes to achieving carbon neutrality: You can't omit emissions from energy you do not consume.

If we translate this principle back to our building stock, we can conclude that the number one priority for our buildings to help the environment is to become more efficient, and this can primarily be done by improving the insulation of the building envelope. Put simply, greater insulation will reduce the amount of energy required to heat or cool a building to a suitable level for its occupants.

An energy efficient building is classified as such when its consumption is below 100kWh per square meter per year – this translates into an EPC rating of A. However, it is estimated that around nine in every 10 buildings today are not up to this benchmark, even in markets generally regarded as sustainable such as Belgium. Furthermore, the vast majority of the buildings that aren't of EPC A standards will still be in use by 2050, which is the target year outlined in the Paris Agreement for making all building stock energy efficient. It is a looming goal which national governments, international bodies such as the European Union and the broader construction sector are seeking to attain through a huge wave of renovation projects.

"Energy-related CO_2 emissions from buildings have risen in recent years after flattening between 2013 and 2016. Direct and indirect emissions from electricity and commercial heat used in buildings rose to 10 $GtCO_2$ in 2019, the highest level ever recorded. Several factors have contributed to this rise, including growing energy demand for heating and cooling with rising air-conditioner ownership and extreme weather events."

- IEA

"Over a ventilation system life of ten to fifteen years, a 1% reduction in productivity will usually significantly exceed any savings made on the design and installation costs of the system. Therefore, it is important for building owners and operators to ensure that buildings are ventilated to provide a healthy and effective environment."

- CIBSE

An insulation vs. ventilation dilemma?

It is clear the insulation is key to bringing existing building stock up to standard in time for 2050. But what impact does this have on indoor air quality?

Effective insulation relies on air tightness in order to be effective. Buildings which seep air through numerous joints and leakage points in their envelopes tend not to rate highly on insulation charts – indeed, high proportions of heat loss (up to 40% in some cases) can arise from poor levels of air tightness.

This means that new window installation systems, roof insulation and other crucial insulation solutions are installed using various techniques that keep the conditioned air in, allowing only vapour to escape.

However, we also know how important ventilation and air movement is to ensuring high levels of indoor air quality. This means that energy efficient building renovations, because of the focus on airtight insulation, could sacrifice the benefits of airflow that were enabled (even inadvertently) by natural ventilation through leak points.

This creates a potential dilemma. Do developers and building managers prioritize insulation and energy efficiency over ventilation?

Smart solutions can solve the problem

According to the Chartered Institute of Building Service Engineers (CIBSE), an international professional engineering association based in London that represents building services engineers, unnecessary ventilation can waste energy and prove extremely costly.

Indeed, CIBSE predicts that ventilation accounts for approximately 30% of heat loss in most commercial buildings, and 25% of heat loss in industrial buildings.

Fortunately, there are a range of smart ventilation systems and solutions that can complement building insulation and deliver the best of both worlds.

Ensuring airtight building envelopes are properly ventilated relies on two key criteria or factors:

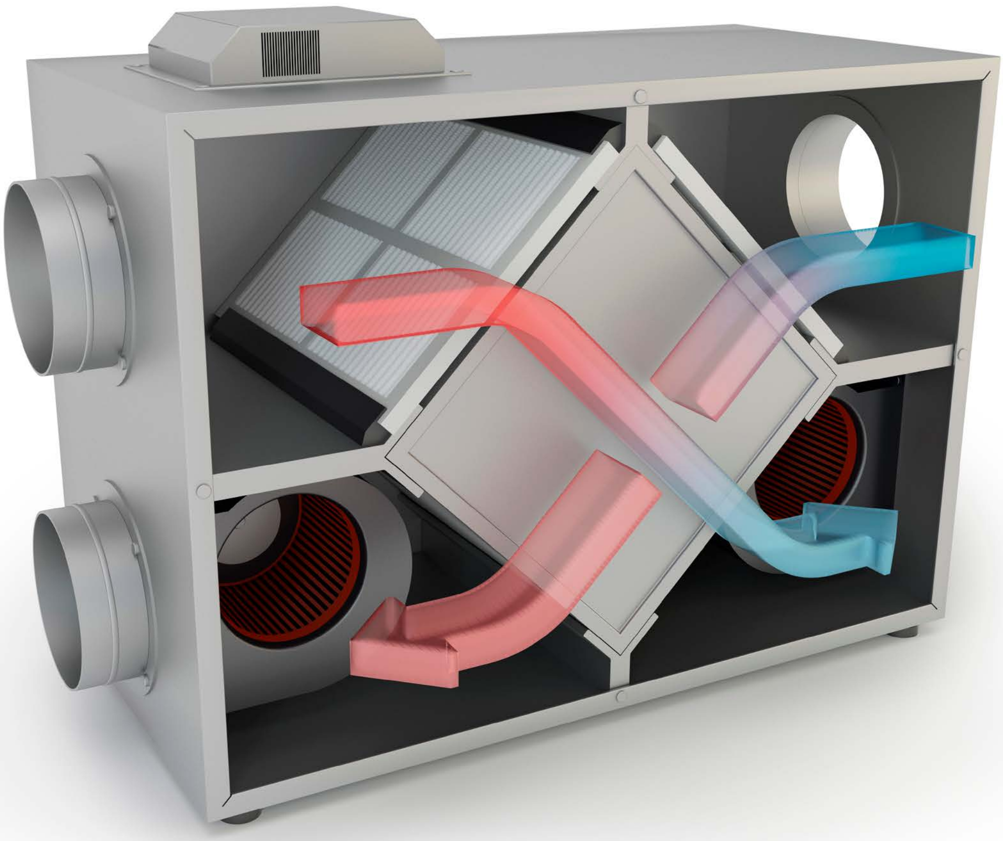
- Controlling the amount of air movement through dedicated channels and, when possible, steering it to the demand required by the amount of people or activity that is carried out indoors.
- Winning as much of the energy that is in the conditioned air leaving the building back as possible, and using it in warming or cooling the fresh air that is taken into the building.

Fulfilling the first of these criteria requires application of mechanical ventilation shafts with technology that steers and balances air vents and airflow speeds. There are many smart ventilation control systems on the market. Generally, they use sensors to measure temperature, humidity and air quality, underpinned by algorithms which enable automatic air flow regulation based on the measured elements and external factors such as local weather conditions.

The second criteria concerning winning back energy from outbound air is made possible through the application of heat recuperation systems. Also known as heat recovery ventilation systems, these work by extracting moist and stale air from wet rooms in a home or building. It recovers the usually lost heat from the extracted air, and replaces it with a supply of clean, filtered fresh air that is heated from the recovered warmth of the extracted heat.

Indeed, ventilation can only improve indoor air quality when the air taken in is in a superior condition to the air which is being removed from the building.

By leveraging some of the clever techniques available and now growing in popularity in modern buildings, inbound air can be filtered for small particles, grime and soot that is commonly found in the air mass in the vicinity of offices, industrial complexes and other urban-based constructs. As the above examples show, allowing such air to be filtered and circulated inside buildings need not sacrifice the integrity or effectiveness of its insulation.



Conclusion

We spend ever-more time indoors. At home, at the office, in school, in the gym, in public transportation systems… we are constantly exposed to much higher concentrations of pollutants and biological contaminants than would be the case outdoors, where these harmful substances evaporate and disperse much faster.

Our modern, indoor lifestyle has created worsening health issues, ranging from short-term illnesses to long-term medical conditions, and even fatalities. These negative effects are encountered across the board, from the general population to particularly vulnerable groups such as children, pregnant women and elderly people. They not only affect families at home, but also create major health issues and considerable prejudices and costs in the form of healthcare, work-related accidents and illnesses, and school absenteeism.

In addition to a wide array of gases, microbes, particles, chemicals, and bacteria, the main culprits of poor IAQ are VOCs, namely organic chemicals that evaporate at ordinary room temperature, thus easily dispersing throughout buildings, and accumulating to much higher concentrations than outdoors.

Besides temporary and reactive measures such as proper ventilation, regular and thorough cleaning, and keeping a low and constant ambient temperature, the main structural, long-term solution consists of reducing and/or eliminating the main sources of VOCs – smart ventilation is absolutely critical to meeting this end.

The effect of ventilation on our health is important to a much greater extent when effectuated in a modern energy efficient building. Buildings which are poorly ventilated leave their occupants prone to the harmful effects of VOCs, microbes, high humidity levels, odours and viruses, the latter being particularly prominent over the course of 2020 and 2021 amid the coronavirus pandemic.

It is important not to view effective ventilation as a trade off with energy efficiency. The absence of ventilation will have a dramatic effect on the indoor air quality air tightening enhancements to the building envelope – any efforts to improve insulation must therefore take into account ventilation systems and enable both to exist in harmony.

There are many ventilation solutions available which can help to achieve this. From smart systems which leverage data to control airflow to heat recuperation systems which recover lost heat and return cleaner air into the building, organizations and building managers have an array of technologies available to push both the energy efficient and indoor air quality agendas.

Don't let poor IAQ sacrifice the health of those residing and occupying your buildings. Choose quality ventilation systems that complement your sustainability driven targets.

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[1] https://www.ft.com/content/dc088e34-1577-11e8-9376-4a6390addb44
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