EDITORIAL

Indoor air quality and pollution

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Indoor Air Quality (IAQ), as defined by the EPA, is the air quality inside and around buildings and structures, particularly as it relates to the health and comfort of building occupants. IAP, on the other hand, refers to the presence of pollutants such as Volatile Organic Compounds (VOCs), Particulate Matter (PM), inorganic compounds, physical chemicals, and biological components at high quantities in the indoor air of non-industrial buildings, all of which can have detrimental health effects. IAQ has formed and evolved as a scientific field in order to safeguard people from such contaminants. Pollutant concentrations, environmental conditions (temperature, airflow, and relative humidity), light, and noise are the key characteristics used to assess IAQ.

Thermal conditions are important in IAQ for two reasons:

- A variety of problems associated with poor IAQ can be remedied simply by modifying relative humidity or temperature
- Building materials in high-temperature buildings can be highly released

Three key elements have been identified as having a substantial impact on IAQ in residential areas or buildings.

- Building and construction materials, equipment, and furniture
- Human activity in buildings
- Building and construction materials, equipment, and furniture. Due to the likelihood of contaminants being transported from outdoors to interiors, it is well recognised that outdoor pollutant concentrations and building airtightness have a significant impact on IAQ

As the concentrations of pollutants in the outdoors rise, they are transferred from the outside to the indoor environment via ventilation. As a result, the relationship between outdoor air pollution and IAQ is strongly dependent on ventilation rates, as well as the lifetimes and mixing ratios of contaminants. Waste gases, tobacco smoke, pesticides, solvents, cleaning agents, particulates, dust, mildew, fibres, and allergies are all known to cause IAP in humans. Millions of mould, fungi, pollen, spores, bacteria, viruses, and insects, such as dust mites and roaches, thrive under the environment created by humans. Carbon dioxide (CO_2), Sulphur dioxide (SO_2), Carbon monoxide (CO), Nitrogen dioxide (NO2), and Particulate Matter (PM) are all emitted into indoor air environments by combustion sources and cooking actions. Furthermore, office machines such as computers, photocopiers, printers, and other office machinery create ozone (O3) and volatile chemicals. Toxic chemicals can be released by common building materials such as Polyvinyl Chloride PVC floor covering, parquet, linoleum, rubber carpet, glue, lacquer, paint, sealer, and particle board.

The design and functioning of ventilation systems, for example, have a considerable impact on IAQ. Ventilation improves IAQ and promotes a healthy interior environment by replacing stale indoor air with fresh outdoor air.

There are a number of advantages to using ventilation in a building, including:

- Providing oxygen and fresh air for human respiration
- Diluting indoor air pollutants to reach the short-term exposure limits of dangerous contaminants, smells, and vapours
- Regulating aerosols inside buildings utilising outdoor air with a low aerosol concentration
- Controlling internal humidity

Mechanical ventilation systems, which use mechanical equipment such as fans or blowers, and natural ventilation systems are the two types of ventilation systems, which are techniques for exchanging interior and outdoor air without the need of mechanical equipment. Natural ventilation systems, while widely used by residents, are insufficient in certain buildings or climates. Mechanical ventilation systems are now widely used in buildings, resulting in large increases in energy usage. In order to reduce energy consumption and enhance the usage of sustainable technologies, hybrid ventilation systems are designed to take advantage of both mechanical and natural ventilation systems. Mechanical components will compensate for the inadequacies of natural ventilation in hybrid ventilation systems. In summary, ventilation is important in building Heating, Ventilation, and Air Conditioning (HVAC) systems since it not only contribute to good indoor air quality, but it also contributes to energy consumption. As a result, optimising building ventilation systems is critical not just for improving energy efficiency but also for delivering improved IAQ to occupants and reducing the risk of health concerns as a result.

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