What is Positive Input Ventilation (PIV)?

Positive Input Ventilation (PIV) is a type of mechanical ventilation system that introduces fresh, filtered air into a property, typically from a central point such as a loft or hallway. The fan unit draws air from outside (or the loft space), filters it, and then gently pushes it into the dwelling. This process creates a slight positive pressure within the building, forcing stale, moisture-laden air and pollutants out through natural leakage points, such as gaps around windows, doors, and other building envelope cracks.

Synonym(s):

Loft fan, PIV system, single-unit ventilation system.

Explanation and Application:

Historically, PIV systems have been primarily installed as a targeted solution to combat condensation and the subsequent growth of black mould in residential properties. By continuously supplying a small amount of fresh, drier air, they lower the internal humidity level, which in turn reduces the likelihood of condensation forming on cold surfaces.

In the context of the **UK housing and residential retrofit sectors**, PIV systems offer a relatively simple and cost-effective way to improve indoor air quality and address moisture issues. For example, in a terraced house in London suffering from persistent condensation on bedroom windows and mould in cupboards, a PIV unit installed in the loft can help by diluting the humid air and expelling it from the property. This addresses the root cause of the condensation issue without the need for extensive, disruptive works.

While PIV can be effective, it's crucial to understand its limitations. Unlike extract ventilation systems (like those in kitchens and bathrooms), PIV does not remove moisture at the source. This is a key reason why **Building Regulations Part F (Ventilation)** and **PAS 2035:2023** have become more cautious about their use. The latest version of **Approved Document F, Volume 1 (2021 edition)** for dwellings outlines different strategies for whole-dwelling ventilation, but it does not specifically refer to PIV as a primary method for providing the minimum required ventilation rates. Instead, the focus has shifted to balanced systems and the use of continuous extract fans.

A significant concern with PIV is the potential for creating **overpressure**, which could theoretically drive humid air into the building's fabric, especially in older, permeable buildings. While this pressure is generally low, the continuous operation of the fan could, over time, cause issues if not considered as part of a holistic ventilation strategy. As such, expert advice is now recommended for their application, particularly within retrofit projects aiming to improve a home's overall airtightness and thermal performance.

Additional Essential Terms

Whole-Dwelling Ventilation

This refers to a system that provides a continuous supply of fresh air to all habitable rooms within a home while removing stale air. The aim is to ensure a healthy indoor environment by managing humidity, removing pollutants, and preventing the build-up of contaminants. In the UK, **Approved Document F (2021)** outlines four main strategies for achieving whole-dwelling ventilation, ranging

from natural ventilation (System 1) to continuous mechanical ventilation with heat recovery (System 4).

Background and Purge Ventilation

Background ventilation is the continuous, low-rate flow of fresh air into a room, typically provided by trickle vents in window frames. **Purge ventilation** is the rapid removal of air from a room, used to clear high concentrations of pollutants or smells (e.g., opening a window fully). Both are required under **Approved Document F** and work together to provide effective air change.

Airtightness

This is a measure of how well a building's envelope resists uncontrolled air leakage. A building with high airtightness has fewer gaps and cracks, which means air can only enter or leave through designated ventilation points. Improving airtightness is a key aspect of residential retrofitting in the UK, as it reduces heat loss. However, it also necessitates a well-designed mechanical ventilation system to prevent moisture build-up and poor indoor air quality.

Mechanical Ventilation with Heat Recovery (MVHR)

MVHR is a balanced, continuous ventilation system that extracts stale, moist air from "wet" rooms (kitchens, bathrooms) and supplies fresh, filtered air to "dry" rooms (living rooms, bedrooms). The key feature is the heat exchanger, which recovers up to 95% of the heat from the outgoing air and uses it to warm the incoming fresh air, significantly reducing energy costs. This is considered a best-practice solution for highly airtight homes in the UK.

Condensation

The process by which water vapour in the air turns back into liquid water when it comes into contact with a cold surface that is below the **dew point** temperature. Condensation is a significant problem in many UK homes, particularly during colder months, as it can lead to mould growth, damage to paintwork, and a general decline in indoor air quality. Inadequate ventilation is a primary cause.

Dew Point

The temperature at which the air becomes saturated with water vapour and can no longer hold all the moisture, causing it to condense into liquid water. The dew point is a critical concept in managing condensation. For example, if the dew point in a room is 10°C, any surface that drops to or below this temperature will become a site for condensation.

Stack Effect

A natural phenomenon that occurs in buildings, particularly tall ones, where warm air rises and escapes through the roof, creating negative pressure at the base that draws in colder air from outside. This is a form of natural ventilation but can also contribute to uncontrolled air leakage and heat loss, especially in older, less airtight properties.

Frequently Asked Questions about PIV

What does PIV mean?

PIV stands for **Positive Input Ventilation**, a system designed to improve indoor air quality by introducing fresh air into a building.

How does a PIV system work?

A PIV system works by drawing in outside air, filtering it, and then distributing it throughout the home, creating a slight positive pressure that helps expel stale air.

What are the benefits of positive input ventilation?

PIV systems help reduce condensation, improve indoor air quality, and prevent mould growth, making them an effective solution for homes with moisture issues.

What is a PIV unit?

A PIV unit is the mechanical device used in positive input ventilation systems to filter and distribute fresh air into a dwelling.

What are the limitations or problems with PIV systems?

While PIV systems can effectively improve indoor air quality, they do not remove moisture at the source, which can lead to persistent humidity issues. Additionally, there is a risk of creating overpressure in older buildings, potentially driving humid air into the building fabric. Therefore, expert advice is recommended when considering PIV systems, especially in retrofit projects.