Efficient decentralised home ventilation units

Decentralised push-pull home ventilation units have been enjoying uninterrupted growth for years and this year will be no exception, with an increase in the region of at least 20 % (source: BDH). Yet many critics still consider the "insufficient" ventilation efficiency of such systems to be the dominant factor. This will be examined in more detail in this information sheet.

We will begin by looking at types of ventilation. Air exchange efficiency ε^a can have a value of between 0 and 1, where 0 indicates a maximum short-circuit flow, 0.5 a mixed flow (see Fig. 1) and 1 a displacement or piston flow (see Fig. 2). In some technical publications, these values are still standardised using $1/\varepsilon^a$.

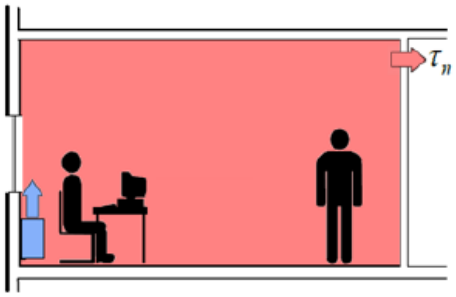

Fig. 1: Mixed flow. Source: REHVA

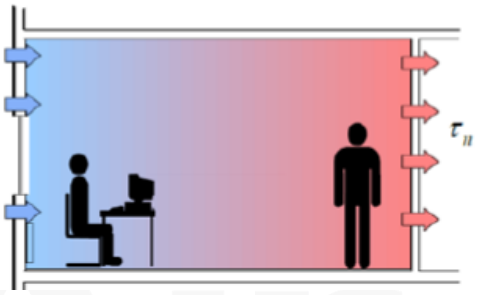

Fig. 2: Displacement flow. Source: REHVA

Accordingly, the best possible ventilation efficiency of decentralised units is achieved precisely when $\varepsilon^a = 0.5$ or $1/\varepsilon^a = 2$ and perfect **mixed ventilation** therefore prevails.

Studies such as those by Dr Alexander Merzkirch (see dissertation: "Energy efficiency, user comfort and cost analysis of ventilation systems in residential buildings: field tests of new systems and presentation of demand-driven prototypes") have proven that high ventilation efficiency is also achieved with decentralised push-pull systems. Dr Merzkirch determined ε^a values of 0.45 and $1/\varepsilon^a$ values of 2.2 for decentralised push-pull systems in a sample dwelling. This corresponds to an almost perfect mix of stale and fresh air, as described above.

The inside covers from getAir provide additional support for this mixing process, as the fresh air is transported far into the room through the single-sided opening in the cover, and then in the next extract air cycle, the used air is drawn in from all sides at a close range and removed. Mixing of the supply air and return air flows can therefore be effectively prevented. Here we see a simple physical effect at work: blowing out a candle is fine, but not "sucking out". The result is slowly rotating, circulating air that renews the air in the room.

Extensive simulations by RWTH Aachen University as part of the EwWalt research project on the energetic assessment of decentralised facilities for controlled ventilation with alternating operation find comparable results to those of Dr Merzkirch. In some cases, $1/\varepsilon^a$ even has a value of exactly 2. It was also shown that the position of the push-pull system in the residential unit has hardly any influence on the mixing patterns, which only fluctuate between $1/\varepsilon^a = 2 \pm 0.1$. The indoor air is therefore almost perfectly mixed here as well. Such systems are therefore very simple and stable in terms of design and positioning.