CLASS C AIR-TIGHTNESS: PROVEN ROI IN BLACK AND WHITE

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ABSTRACT

Class C air-tightness: proven ROI in black and white

At the end of 2010, two manufacturers have commissioned an independent engineering firm to carry out a cost-benefit analysis of air-tightness in ventilation. The study report uncovers the clear return of investment in class C air-tight ventilation systems in Belgium.

The study comprises:

- The composition of a detailed spreadsheet with the result of the energy cost savings and additional investment cost;
- The application of the spreadsheet to three Belgian cases (the renovation of a hospital wing, a nursing home and an office building);

The simulations show that the total energy consumption linked to ventilation can be reduced by as much as 30% with a break-even-point between 2 and 3 years.

KEYWORDS

air-tightness, ventilation, class C, ROI, fire dampers

INTRODUCTION

A **ventilation system** has an important technical function. On the one hand the system moves treated air to rooms where there are people present (supply air). On the other hand, used air is extracted from these rooms and discharged outside (extract air).

The transportation (fan power) and treatment (filtering, heating, cooling, dehumidifying and humidifying) of air is a **significant energy cost when operating a building**. It is therefore important to get the desired amount of air in the right rooms effectively and in a controlled way. On the way in and out, as little ventilation air as possible must be lost; and this is only possible by building an airtight ventilation system.

This paper offers an answer to a number of legitimate questions regarding air-tightness of ventilation systems: What impact do investments in ventilation air-tightness have on the energy consumption of a building? How can we calculate the **break-even-point of such investments**?

AIR-TIGHTNESS OF VENTILATION SYSTEMS

The air-tightness of a ventilation system is determined by the air-tightness of each component of the system: this includes the air ducts themselves, but also all the accessories such as fire dampers, flow-balancing units, silencers, etc.

The air-tightness of ductworks is described and quantified in European standards (including EN12237, EN1507, and EN1751). The air-tightness class determines the size of the air leak: air-tightness class C or D indicates a very performing ventilation system, class A or lower (3A, 9A) are awarded to systems with minimum air-tightness.

In order to go up an air-tightness class, a ventilation system must become three times more efficient: so the leakage flow rate in a type C ductwork is three times lower than the leakage flow rate of a type B ductwork.

AIR-TIGHTNESS STUDY

At the end of 2010, a manufacturer of ventilation ducts and a manufacturer of fire dampers have commissioned an independent engineering firm to carry out a cost-benefit analysis of air-tightness in ventilation in Belgium.

The study comprises the composition of a detailed spreadsheet [1] which summarizes the energy cost savings and additional investment cost related to air-tightness; as well as the application of the spreadsheet to three cases, which is the subject of this paper.

The calculation method was applied to following (existing) sites:

- Case 1 – Renovation of a hospital wing, Antwerp
- Case 2 – Nursing home, West-Flanders
- Case 3 – Office building, Flemish Brabant

		Case 1	Case 2	Case 3
Building surface area	-	11,380	8,830	11,200
Ventilation flow	m³/h	57,450	43,305	53,940
Duct surface (supply and extract)	m²	5,094	2,400	2,480
Percentage of round ducts	-	25%	15%	15%
Fire dampers, number	-	476	496	90
Eq. surface area dampers	m²	461	395	183
Flow-adjustment units, number	-	527	398	407
Dynamic flow adjusters (Constant Air Volume, Variable Air Volume), number	-	133	0	77
Silencers, number	-	17	14	19

Table 1 Case study – properties of technical installations

UP TO MORE THAN 30% SAVINGS

The simulations show that the total energy consumption linked to ventilation can be reduced by as much as 30% with a break-even-point between 2 and 3 years.

The table and figures below show the results of the simulations. The simulations show that the total energy consumption linked to ventilation can be reduced by over 30% (case 1).

		Case 1	Case 2	Case 3
Annual energy savings	EUR/y	10,175	6,750	2,335
Investment cost	EUR	14,862	11,068	7,212
Pay Back Time (dynamic)	years	2	2	3

Table 2 Profitability if the ventilation system's air-tightness improves from class A to class C

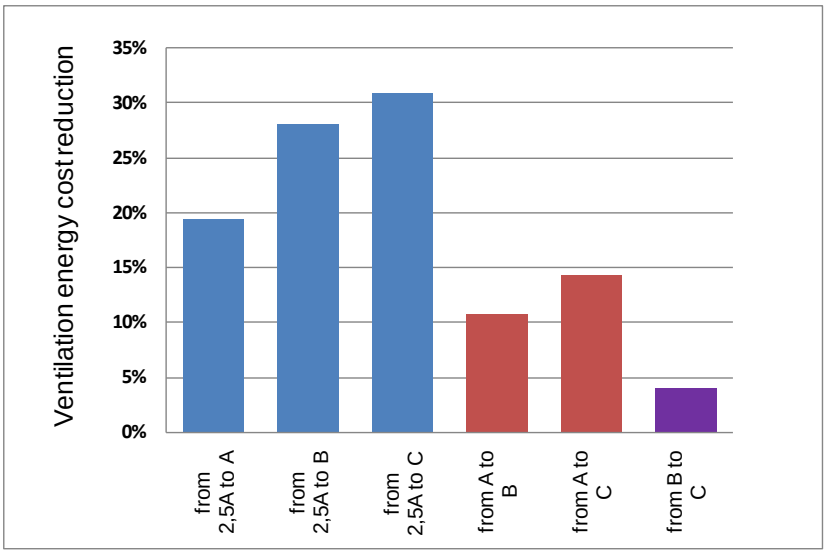

Figure 1 - Results simulation case 1

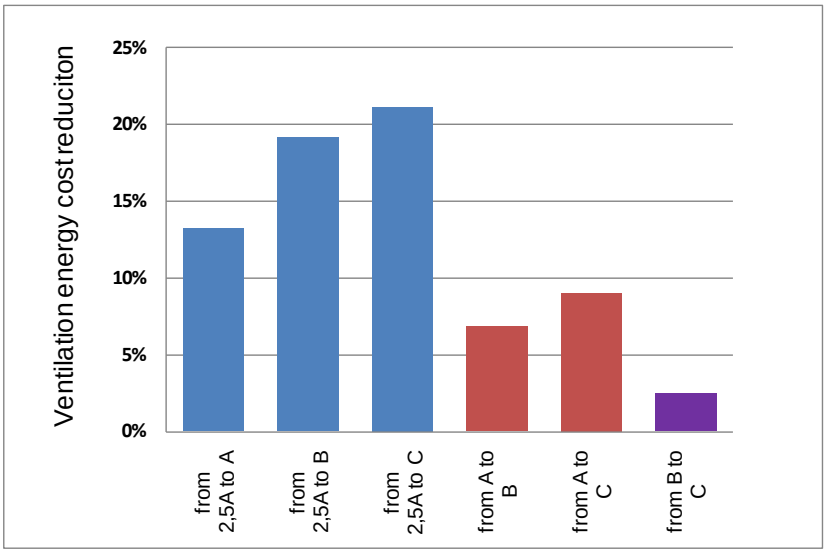

Figure 2 - Results simulation case 2

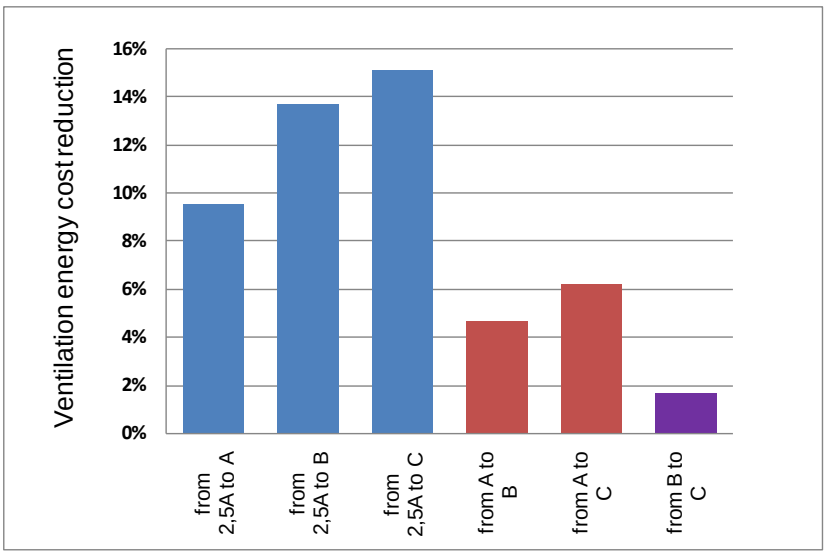

Figure 3 - Results simulation case 3

CONCLUSION

Optimising the air-tightness of the ductwork is worthwhile. The total amount of energy linked to the ventilation system can be reduced by as much as 30%.

The importance of air-tightness is also acknowledged by the Belgian Buildings Authority, which is expected to impose class C very soon in its Standard Specifications. In view of the pioneering role of the Standard Specifications, we can expect the Belgian installation world to catch up so that (at least) air-tightness class C will soon be standard.

REFERENCES

[1] the spreadsheet is covered in another paper in this congress.