

INNOVATIONS IN VENTILATION TECHNOLOGY

**21ST ANNUAL AIVC CONFERENCE
THE HAGUE, NETHERLANDS, 26-29 SEPTEMBER 2000**

**VENTILATION IN THE FRENCH HOMES :
SURVEY OF THE ATTITUDES AND BEHAVIOUR OF PRIVATE CITIZENS**

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Synopsis

ADEME (French Agency for Environment and Energy Management) regularly commissions surveys of the attitudes and behaviour of private citizens with regard to energy, and periodically it also commissions more detailed surveys relating to a particular appliance.

The purpose of the survey is to take stock of changing attitudes in households with regard to their use of energy and to assess the impact of ADEME's policies relating to the home.

The questionnaire covers the following aspects: description of the work carried out during the year surveyed, tax allowances and/or grants applicable to certain kinds of energy saving work (knowledge, demand), applications for loans to finance this work, satisfaction with the work carried out).

In addition to these questions which are asked regularly, every 3 years we carry out a more detailed survey relating to a specific piece of equipment used to manage energy in the home (adjustment, insulation, ventilation).

The subject studied in greater detail from 1998 to 2000 is ventilation in the home, in order to gain a better understanding of the expectations and reasons for satisfaction or dissatisfaction of households and to take these into account when trying to improve the products on offer.

In this presentation ADEME presents the results of the survey on ventilation, providing figures relating to the equipment, usage and user satisfaction. ADEME analyses the results, which overall are generally positive for mechanical ventilation, particularly if air flow can be regulated.

1 – Objectives and method

ADEME (French Agency for Environment and Energy Management) regularly commissions surveys of the attitudes and behaviour of private citizens with regard to energy, and periodically it also commissions more detailed surveys relating to a particular appliance.

Since 1986, SOFRES, an institute specialised in this discipline, has been carrying out these surveys on behalf of ADEME.

The purpose of the survey is to take stock of changing attitudes in households with regard to their use of energy and to assess the impact of ADEME's policies relating to the home. The study is carried out in two stages:

An initial survey is carried out in 10 000 households throughout the country and allows information to be collected on : attitudes and opinions of households with regard to the use of energy in their homes, actions taken or to be taken, classification data (main features of the home, equipment in the home, main features of the heating system).

The second survey is addressed solely to households which state, during the first stage of the survey, that they have carried out work in their home, during the previous year, to reduce energy consumption and/or improve comfort.

The questionnaire covers the following aspects: description of the work carried out during the year surveyed, tax allowances and/or grants applicable to certain kinds of energy saving work (knowledge, demand), applications for loans to finance this work, satisfaction with the work carried out).

In addition to these questions which are asked regularly, every 3 years we carry out a more detailed survey relating to a specific piece of equipment used to manage energy in the home (adjustment, insulation, ventilation).

The subject studied in greater detail from 1998 to 2000 is ventilation in the home, in order to gain a better understanding of the expectations and reasons for satisfaction or dissatisfaction of households and to take these into account when trying to improve the products on offer.

The results which are presented in this paper are mainly the results of the survey conducted in 1998. Data on the building stock in France and preliminary results of the surveys conducted in 1999 and 2000 have been added.

2 - Ventilation systems installed

In 1998, the building stock in France includes 28,6 10⁶ homes :

56% are detached houses, 44% are apartment buildings.

67% were built before 1975, 33% were built after 1975

Ventilation systems installed in homes depend on the legislation which was in force at the time they were built, and on whether any further work has been carried out since construction. As a result there is a great diversity of systems. We therefore felt that it was necessary to ask the question in such a way that it would be clear for the households surveyed and would allow responses to be classified in a way which would make the results useful. In the rest of this paper, ventilation systems are therefore defined by short descriptions which correspond to the replies given to the following question:

Do you have a ventilation system in your home (apart from opening doors and windows), i.e. air entry vents in the lounge and bedrooms and air extract vents in the kitchen, bathroom and toilets?

- *YES, natural ventilation (air vents with no fan)*
- *YES, simple mechanical ventilation (ventilation vent with a fan which expels air through a ventilation shaft)*
- *YES, balanced mechanical ventilation (with a fan which blows air from the outside into the home, through a ventilation duct, and an extractor which expels air through a second duct).*

- *NO, we have no ventilation system.*
- *I don't know.*

26.7% of homes currently have no ventilation system. Overall, natural ventilation is predominant, although mechanical ventilation is increasingly common in more recent buildings. The percentage spread of the various systems varies according to the age of the buildings and to whether they are detached homes or apartments (figs. 1 and 2).

Furthermore, it is clear that ventilation systems are associated with the type of heating (central, individual, etc.) and the energy used (gas, electricity, fuel-oil, etc.) The development of independent heating systems which has been recorded over the past several years is particularly worrying given that 71% of independent appliances using petroleum products are installed in homes which have no ventilation system.

Figure 1 - Ventilation systems and types of buildings

	% Total	% of apartment buildings	% of detached homes
- Have a ventilation system	73.3	81.1	67.2
of which:			
- Natural ventilation	45.6	57.2	36.6
- Simple mechanical ventilation	23.2	20.3	25.5
- Balanced mechanical ventilation	4.0	3.3	4.6
- Have no ventilation system	26.7	18.9	32.8

Figure 2 - Ventilation systems and year in which the home was built

	% Total	% 1948 or earlier	% 1949-1974	% 1975-1981	% 1982-1988	% 1989 or later
- Have a ventilation system	73.3	51.5	76.9	86.4	90.1	94.0
of which:						
- Natural ventilation	45.6	38.1	62.5	45.0	28.9	22.6
- Simple mechanical ventilation	23.2	11.7	12.4	32.8	49.4	62.0
- Balanced mechanical ventilation	4.0	1.5	1.7	7.8	10.6	9.0
- Have no ventilation system	26.7	48.5	23.1	13.6	9.9	6.0

Air flow adjustment device in mechanical ventilation systems

56.9% of households which have a mechanical ventilation system have an adjustment device. The device most commonly relates to the kitchen (92.1%), followed by the bathroom / washroom (55.4%), the toilets (21.8%) and all rooms via a general adjustment device (1.6%). Paradoxically, factors which are associated with a lower rate of adjustment equipment: older buildings (/recent), apartment (/detached house), occupancy status: tenant (/owner), are also associated with longer periods of use at maximum flow (fig. 3).

Figure 3 - Use of mechanical ventilation systems at maximum flow

	% in summer	% in winter
Regularly	42.9	51.5
more than 2 hrs/day	22.4	17.7
1 - 2 hrs/day	6.3	12.2
0.5 - 1 hrs/day	7.6	13.7
less than 0.5 hrs/day	6.5	7.9
Occasionally	33.3	38.9
Never	23.9	9.6

Switching-off of mechanical ventilation system

Almost a quarter of households fitted with mechanical ventilation systems often or fairly often switch off their system (1/3 of households which can do so). (fig. 4).

Figure 4 - Switching off the mechanical ventilation system

	%
Are able to switch off the system	76.8
fairly often	12.3
rarely	13.8
never	38.5
Are unable to switch off the system	23.2

Blocking of vents

Among households which own a ventilation system (whether natural or mechanical), 13.4% state that they have blocked off the vents. It is interesting to note that this habit is less common in homes built after 1982 (fig. 5).

Figure 5 - Blocking of vents and year of construction

	% Total	% 1948 or earlier	% 1949-1974	% 1975-1981	% 1982-1988	% 1989 or later
- Have blocked off aeration vents	13.4	12.4	18.5	12.5	6.2	7.2
in the:						
- kitchen	6.8					
- bathroom, washroom	5.3					
- lounge, dining room, sitting room	2.7					
- toilet	1.4					
- bedroom	1.2					
Have not blocked off aeration vents	86.6	87.6	81.5	87.5	93.8	92.8

Opening of windows during the heating season

Ventilation systems are normally designed to fulfil requirements without the need to open windows. The results show that the fact of having a ventilation system or not has no major bearing on the practice of opening windows. There is evidence however that homes which have a balanced system open their windows less than those which have a simple mechanical system, which in turn open their windows less than homes which have a natural ventilation system. The date of construction has no major bearing on the practice of opening windows. Windows are opened slightly more in apartments than in detached houses.

Furthermore, it appears that in homes fitted with mechanical ventilation systems, the more maximum flow is used in the kitchen, the more windows are opened. Ownership of a cooker hood in the kitchen does not significantly modify the practice (people who have one open their windows slightly more). (figs. 6 and 7).

Figure 6 - Opening of windows during the heating season (October-April) by type of dwelling

Generally speaking, do you open some windows during the heating season (October-April) to ventilate your home?	% Total	% Apartment Buildings	% Detached Houses
Regularly	72.4	75.1	70.2
of which:			
- more than 1 hr/day	23.1	27.6	19.6
- 0.5 - 1 hrs/day	28.6	28.0	29.0
- less than 0.5 hrs/day	20.7	19.5	21.6
- Occasionally	25.4	23.0	27.4
- Never	2.2	1.9	2.5

Figure 7 - Opening of windows during the heating season and ventilation systems

	% Total	% with no ventilation	% with ventilation	% natural ventilation	% s.f. mech. vent.	% bal. mech. vent.
Regularly	72.4	71.8	72.9	76.0	68.2	64.1
of which:						
- more than 1 hr/day	23.1	24.0	22.9	26.5	16.8	15.9
- 0.5-1 hrs/day	28.6	27.6	29.1	30.5	27.1	24.8
- less than 0.5 hrs/day	20.7	20.2	20.9	18.9	24.4	23.4
- Occasionally	25.4	26.1	24.8	22.4	28.6	30.8
- Never	2.2	2.1	2.3	1.6	3.0	5.1

3 - Satisfaction with ventilation

Satisfaction increases with the age of the head of the household, the household income, the number of rooms and the surface area of the dwelling.

The date of construction has less of a bearing on the results than the above factors (age of the head of the household, household income, etc.) but it shows that the regulations introduced in 1982-83 have had a positive impact.

Satisfaction according to the system installed varies as expected (except for dual flow ventilation which produced similar reactions to single flow ventilation but with a greater number of "very satisfied" households and fewer "quite satisfied"). The scale of the variation however remains relatively small, particularly as regards socio-economic criteria: 50.3% "satisfied" among the "under 25s", 90.8% among the over 65s.

A greater number of those who are able to switch off their ventilation systems declared themselves satisfied than those who are unable to do this, but the most satisfied of the former are the ones who use this facility "rarely" or "never".

Furthermore, we have noted that those who clean their vents are more satisfied than those who don't (but the more seldom they clean the vents the more satisfied they are).

People who block off their air vents are the less satisfied, but the survey results don't show whether the obstruction of vents is a consequence of dissatisfaction or the reason for dissatisfaction. (figs. 8, 9 and 10).

Figure 8 - Satisfaction with ventilation and type of building

	% Total	% Apartment Buildings	% Detached Houses
Satisfied	81.1	73.2	87.4
of which: very satisfied	23.5	17.7	28.1
fairly satisfied	57.6	55.4	59.4
Dissatisfied	18.8	26.8	12.6
of which: fairly dissatisfied	14.5	20.5	9.7
completely dissatisfied	4.4	6.3	2.9

Figure 9 - Satisfaction with ventilation and date of construction

Generally speaking, are you satisfied with the ventilation (airing) of your home?	% Total	% 1948 or earlier	% 1949-1974	% 1975-1981	% 1982-1988	% 1989 or later
Satisfied	81.1	78.9	78.3	83.8	88.6	87.4
of which: very satisfied	23.5	21.9	20.4	25.4	26.6	34.8
fairly satisfied	57.6	57.0	57.9	58.4	62.0	52.7
Dissatisfied	18.8	21.1	21.7	16.2	11.4	12.6
of which: fairly dissatisfied	14.5	16.0	15.9	12.9	10.0	11.1
completely dissatisfied	4.4	5.1	5.8	3.3	1.5	1.5

Figure 10 - Satisfaction with ventilation and ventilation system

Generally speaking, are you satisfied with the ventilation (airing) of your home?	% Total	% with no ventil.	% with ventil.	% natural ventil.	% s.f. mech. ventil.	% bal. mech. ventil
Satisfied	81.1	75.5	83.7	81.1	87.9	87.3
of which: very satisfied	23.5	21.2	24.5	20.7	29.4	39.9
fairly satisfied	57.6	54.3	59.1	60.4	58.5	47.4
Dissatisfied	18.8	24.5	16.3	18.9	12.1	12.7
of which: fairly dissatisfied	14.5	17.1	13.1	15.0	10.0	10.1
completely dissatisfied	4.4	7.4	3.2	3.8	2.2	2.6

4 - Problems encountered

Question asked: Do you encounter problems connected with ventilating (airing) your home (dampness, condensation, etc.)? What are they? (figs. 11, 12 and 13).

Figure 11 - Problems encountered and date of construction

	% Total	% 1948 or earlier	% 1949-1974	% 1975-1981	% 1982-1988	% 1989 or later
Have problems	22.3	25.3	22.8	21.5	18.1	16.3
of which:						
condensation from humidity	14.8	12.8	10.7	8.9	8.7	6.5
dampness on walls	10.5	18.5	15.3	13.3	9.5	8.4
persistent odours	6.5	7.5	6.5	6.6	4.5	4.8
ventilation noise	2.8	1.5	1.9	4.6	4.6	4.4
cold draughts	0.4	0.3	0.7	0.4	-	0.1
ventilation causes dust, stains	0.1	0.1	0.1	0.2	-	0.3
others	0.5	0.3	0.4	1.0	0.7	0.4
Have no problems	77.7	74.7	77.2	78.5	81.9	83.7

Figure 12 - Problems encountered and ventilation system

	% Total	% with no ventil.	% with ventil.	% natural ventil.	% s.f. mech. ventil.	% bal. mech. ventil
Have problems	22.3	25.4	20.9	21.8	19.8	17.5
of which:						
condensation from humidity	14.8	13.1	9.5	10.2	8.6	7.4
dampness on walls	10.5	19.6	12.8	14.4	10.1	10.1
persistent odours	6.5	7.7	6.1	6.6	5.1	6.0
ventilation noise	2.8	0.5	3.5	1.4	6.7	9.2
Have no problems	77.7	74.6	79.1	78.2	80.2	82.5

The problems reported by the respondents are fairly minor but very frequent.

Generally speaking, the frequency of problems is well correlated with satisfaction (but with a few exceptions - see below).

The frequency of problems reported decreases with the age of the head of the household, the household revenue, the number of rooms and the surface area of the dwelling.

The number of people in the household considerably increases the frequency of problems encountered for all kinds of problems except ventilation noise, which is an exception to the general rule because dissatisfaction was affected very little by this factor.

Figure 13 - Problems encountered and form of heating

	% Total	% Collective Central Heating	% Individual Central Heating	% Integrated Electric Heating
Have problems	22.3	24.2	18.8	26.2
of which:				
condensation from humidity	14.8	8.6	9.3	12.4
dampness on walls	10.5	15.0	12.3	17.3
persistent odours	6.5	9.5	5.1	7.0
ventilation noise	2.8	3.6	1.6	4.4
cold draughts	0.4	1.0	0.3	0.1
ventilation causes dust, stains	0.1			
others	0.5			
Have no problems	77.7	75.8	81.2	73.8

Owners state fewer problems (15.2%) than tenants (34.3%).

Even though construction dates play an important part, in the sense that the more recent a dwelling, the higher the level of satisfaction, the fewer problems are detected, the moving date has an inverse effect: more problems in homes occupied only recently. There are several possible interpretations for this: getting used to nuisances, indirect effect of age on mobility, justification for the choice of a certain kind of dwelling.

It would appear that mechanical ventilation limits "air quality" problems (humidity, dampness, odours) but entails problems with noise.

People who can switch off their mechanical ventilation system report fewer problems than those who can't switch it off, but the ones who use this facility "rarely" or "never" report the fewest problems.

As regards mechanical ventilation, there seems to be a link between the problems reported and the blocking off of air vents. A much larger number than average of the people who report blocking off their vents report problems with noise (vents in bedrooms) or draughts (vents in lounges, sitting rooms).

As regards the most widespread forms of heating (collective central heating, individual central heating and integrated electric heating), although the number of respondents "satisfied" with individual central heating (85.3%) was higher than those "satisfied" with integrated electric heating (81.2%) and collective central heating (73.5%), the greatest number of problems was reported by people with integrated electric heating systems (almost 40% higher than individual central heating).

Households which believe that all their windows are hermetically sealed report fewer problems (18.2%) than those which have no hermetically sealed windows (35.1%), but both are equally satisfied.

The drying of laundry in the kitchen or another room in the home which is lived in (excluding the bathroom) is linked to a greater number of problems (dampness, condensation).

5 - Energy management work carried out

11.7% of the households questioned carried out energy management work during the previous year.

Of these, just 4.2% of homes carried out work on the ventilation system (2.7% of the total number of work projects). These figures are too low for any statistical analysis to be meaningful. Essentially they relate to the installation of a mechanical ventilation system.

Just to compare work carried out on ventilation with other kinds of work, 31.1% and 11.3% of homes respectively replaced doors and windows with double-glazed doors and windows or fitted seals.

Within the context of this survey of the energy management work carried out, households were asked about their level of satisfaction with the work, and about their satisfaction based on various criteria (improvement of comfort, quality of the work, improvement of ventilation, etc.). The households appeared to be generally satisfied, with the lowest level of satisfaction being reported with regard to "improvement of ventilation".

6 - Conclusion

The results of this survey shed an interesting light on the current situation. They provide useful information for current discussions about the ventilation STATUTE. Some of the data should also make it possible to take better account of behaviour in the work currently being carried out to establish calculation rules within the context of the New Building Regulations in France.

An analysis of the results which takes the date of construction into account shows that there has been positive development, but there is room for improvement which requires all the parties involved to be mobilised : developers, manufacturers, installers, maintenance engineers, etc.

These results also demonstrate the importance of user behaviour and show that there is a need for professionals to consider the user's need to take ownership of his system.