i'Tec_R3
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Keywords: Cooler

Survey on coolers installed in livestock feed plants in France - Ventilation

This technical sheet follows sheet no.88 and presents part of the results obtained during the survey on coolers, carried out in 2012. The section detailed below concerns more specifically the ventilation.

1. Estimated air flow

The air flow put into movement by the fan was requested in the survey. The obtained responses show median air flows estimated by industrial companies at 15,500 m³/h for vertical coolers and 22,050 m³/h for horizontal versions, or a difference of 30% between the 2 types (Table 1).
It can be noted that the number of responses provided by industrial companies is lower for this question than for previous ones, with a response rate of 55% to 65% depending on the type of equipment installed. It would appear, therefore, that this information is not always known by the industrial companies.

Vertical	Horizontal
15 500m3/h	22 050m3/h
102 coolers out of 186 or 55%	49 coolers out of 75 or 65%

Table 1 : Median air flow estimated by the industrial companies and number of responses provided by type of cooler

This Figure 1 confirms the superiority of air flows on horizontal models and Figure 2 shows that there may be a link between the pelleting flow and the air flow for vertical coolers. However, this trend is not found for horizontal models.

Over the years, it appears that air flows have progressively increased for vertical and horizontal models, with median flows for the vertical coolers of:

- 9,900 m3/h during the 1970s
- 15,000 m3/h during the 1980s
- 18,000 m3/h during the 1990s and 2000s

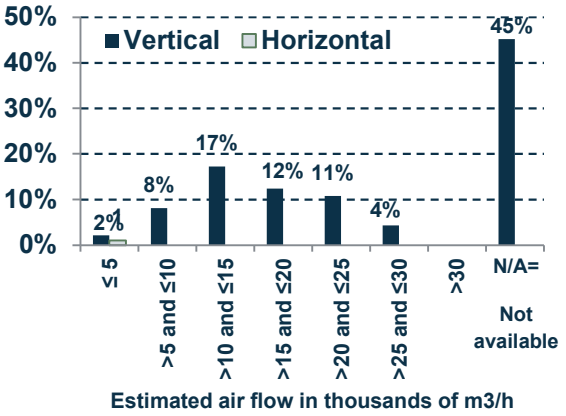

Figure 1 : Distribution of air flows estimated by the industrial companies as a percentage of the number of vertical and horizontal coolers

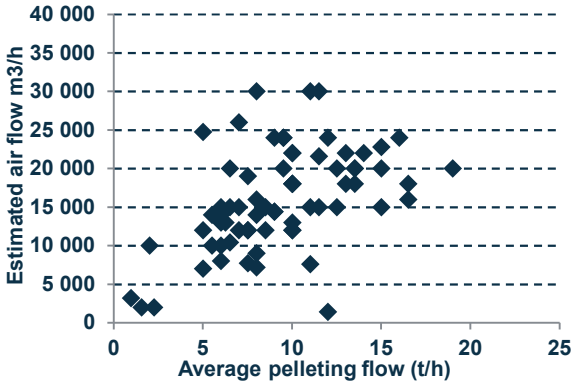

Figure 2 : Air flow according to the pelleting flow for vertical coolers

and for the horizontal coolers of:

- 22,150 m³/h during the 1970s
- 25,000 m³/h during the 1980s
- 30,000 m³/h during the 1990s

2. Regulation of air flow

2.1. Presence of speed controllers

More than 1/3 of process lines are equipped with a speed controller on the fan motor (39% of vertical

coolers and 35% of horizontal coolers according to the Figure 3). Amongst the vertical models, 40% of coolers from the 2000s are equipped, compared with 26% from the 1990s and 46% from the 1980s. This figure shows that speed controllers are not necessarily installed on recent models. The same observation can be made for horizontal models.
In addition, for both vertical and horizontal models, speed controllers are slightly more present on models with media filtration than with cyclones, but the difference is only slight.

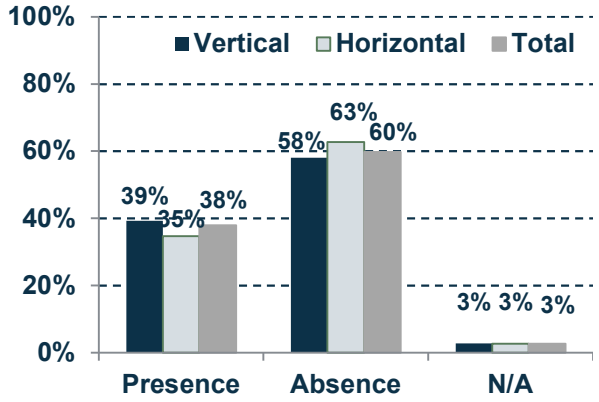

Figure 3 : Presence of speed controllers on the fan motor according to the type of cooler

2.2. Presence of regulation and regulation mode

The air flow is regulated on 20% of vertical coolers and 9% of horizontal models (Table 2). In both cases, regulation is carried out at 70% by a speed controller located on the fan motor and 30% by dampers adjusted according to the fan motor current.

	Regulation of air flow	Regulation mode
Vertical	20%	70% by speed controller 30% by action on damper
Horizontal	9%	

Table 2 : Presence of an air flow regulator by type of cooler and type of regulation adopted

For vertical models on which speed controllers are installed, regulation by air flow or by temperature difference are found in equal shares. It also seems that some regulation is based on ambient air temperature or the temperature of pellets in the housing.
For horizontal models, regulation, where it exists, is always based on a measure of temperature difference if a speed controller is present (7 cases only).

3. Fan motor power

The fan power is around 35 kW on average, and surprisingly, is not linked to the type of cooler, although as noted previously, the air flows are higher for horizontal coolers.
An analysis of the power by period or air flow does not show any specific trends.

Vertical	Horizontal
35 kW	34 kW

Table 3 : Average power of fan motors by cooler type

4. Damper on the aeraulic circuit

On more than 2/3 (72%) of vertical coolers and more than half of horizontal coolers, dampers are installed on the aeraulic circuit. These figures are slightly reduced to 64% and 46% when the process has a speed controller on the fan motor (Figure 4).

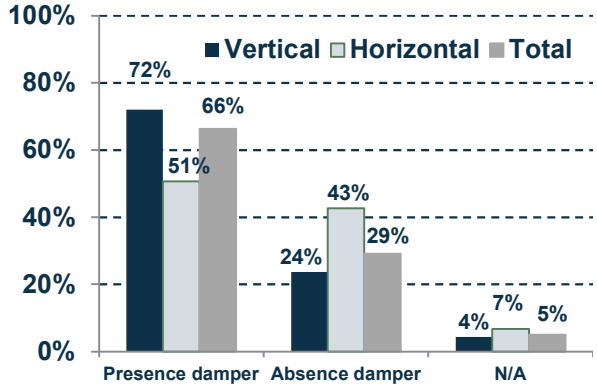

Figure 4 : Presence of damper on the aeraulic circuit according to the type of cooler

For nearly half of the processes concerned (41%), the damper may be adjusted according to 3 or more positions (Figure 5). For vertical models, the most common number of positions is 2.

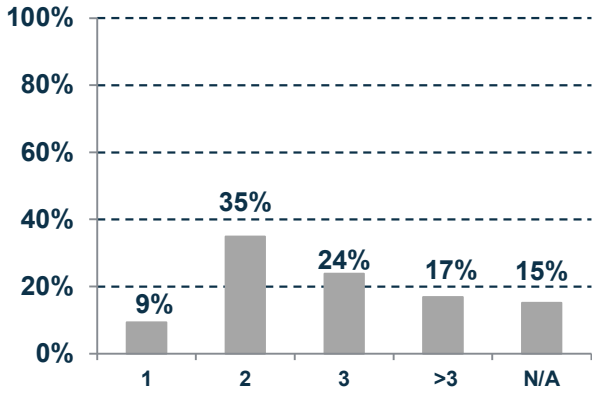

Figure 5 : Number of damper positions as a percentage of the coolers equipped

5. Air inlet used by the cooler

On average, 14% of air inlets are at the exterior. Vertical coolers are more concerned than horizontal ones as only 5% of horizontal models use external air for cooling, compared to 17% of vertical models (Figure 6). For the latter, 50% of exterior air inlets are installed on process lines dating from the 1990s. New installations are not, therefore, more equipped than older ones. It is important to note that for coolers installed on thermal treatment processes, air is taken from the exterior in 73% of cases.

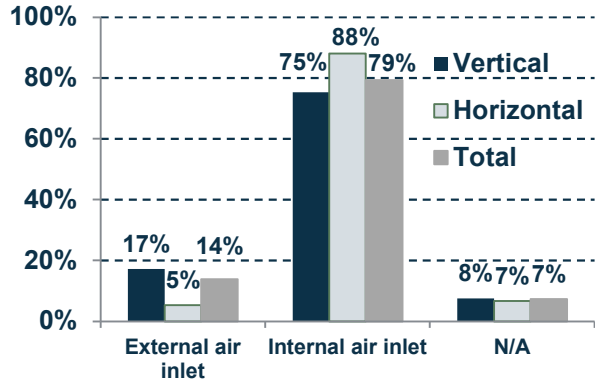

Figure 6 : Location of the air inlet according to cooler type

6. Filtration

Media ensures air filtration in 62% of processes from the survey panel compared to 34% for cyclones. There is, however, a disparity between vertical and horizontal coolers as, in most cases, filtration is by media for vertical coolers (68%) and by cyclone for horizontal ones (53%) (Figure 7).

The cooler installation date also has an impact on the type of filtration chosen for vertical models, 70% of machines installed in the 2000s have media filtration against 63% by cyclone for installations during the 1970s. However, cyclones have not completely been disregarded as 2 out of 5 processes dating from 2010-2012 have cyclones.

For horizontal models, the presence of media filtration is increasingly frequent. 96% of processes from the 1970s are equipped with cyclones compared to 89% of processes equipped with media filtration for installations dating from the 1990s.

Out of 262 responses obtained in total, 4 cases of cyclofilters or the association media+cyclone are mentioned, or 1.5% of the panel.

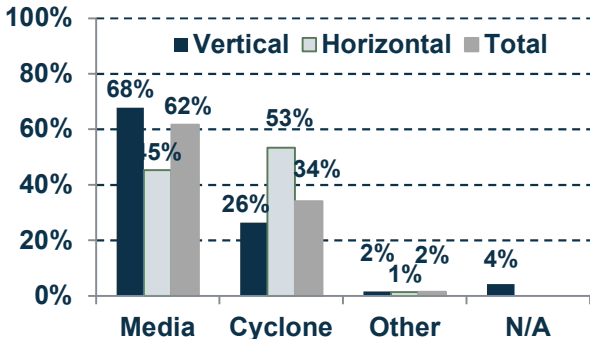

Figure 7 : Type of filtration installed according to cooler type

7. Conclusions

The responses obtained on cooler ventilation show that:

- Industrial companies do not necessarily know the air flow
- It is 30% higher for horizontal coolers. The product-air exchange surface, which is higher for horizontal models, may explain this finding.
- It would appear that there is a link between air flow and pelleting flow on the one hand, and air flow and process installation period on the other.
- The average fan power is 35 kW, without a link to air flow or cooler type.
- More than 1/3 of processes have air flow regulated by a speed controller (70% of cases) or by dampers which limit the passage of air (30%).
- 2/3 of processes have dampers adjustable to 2 positions or ≥3 positions depending on the cooler type.
- 14% of processes carry out the cooling using external air. Vertical processes and, more specifically, thermal treatment processes are more concerned than the others.
- In 62% of cases, filtration is by media, and 34% of cases by cyclone.

Ventilation

Expected air flow: .....m³/h

Speed controller : Yes ..☐ No .....☐

Regulation of air flow: Yes ..☐ No .....☐

Regulation mode according to set point:
of air flow ..... ☐ of t° difference .☐

Others: .....

Damper : Yes ..☐ No .....☐
Number of positions: 1 ☐ 2 ☐ 3 ☐ +3 ☐

Air inlet : Interior factory ..... ☐ Exterior factory ☐

Fan motor power: .....

Type of filtration:
Cyclone ..... ☐Filtration media ..... ☐

Other: .....

Figure 8 : Extract from the questionnaire on which the I'Tec R1