

# Survey on coolers installed in livestock feed plants in France

## 1. Panel representativeness

To update the industrial data on the cooling sector in France, Tecaliman conducted a survey of all its correspondents in the profession during the first half of 2012.

The questionnaire included 4 sections. The first concerned the technical characteristics of the coolers, the second, process ventilation, the third, the conditions of use of the processes and finally, the last dealing with the strengths/weaknesses of the installations. This first technical sheet covers the first section and describes the cooler installations (the questions asked can be found at the end of the sheet). A second will cover the following sections of the questionnaire and, in particular, cooler use.

Each questionnaire corresponds to a cooler, so a respondent may have returned to Tecaliman as many questionnaires as the number of processes installed at the site.

During this survey, 262 responses were obtained, representing 262 coolers. These 262 machines are spread over 79 sites, or 27% of the total French equipment.

On average, 3.3 coolers are installed per site. 2/5<sup>th</sup> of the responding sites have 3 or 4 processes in their factory and 1/3 of respondents have 2 or fewer processes, as indicated in Table 1.

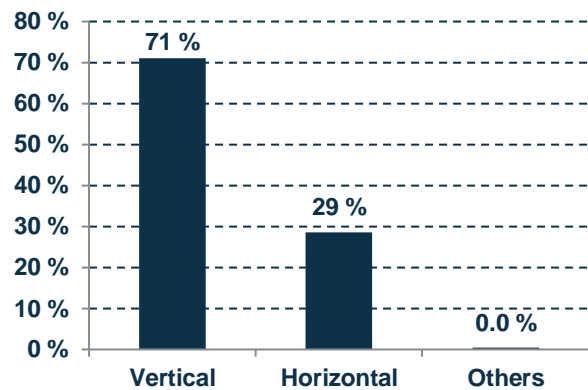
**Table 1 : Number of sites according to the number of coolers installed on the concerned site**

Number of processes per site	Number of sites
1 to 2	27
3 to 4	41
5 to 6	7
>6 processes	4

## 2. Types of Coolers

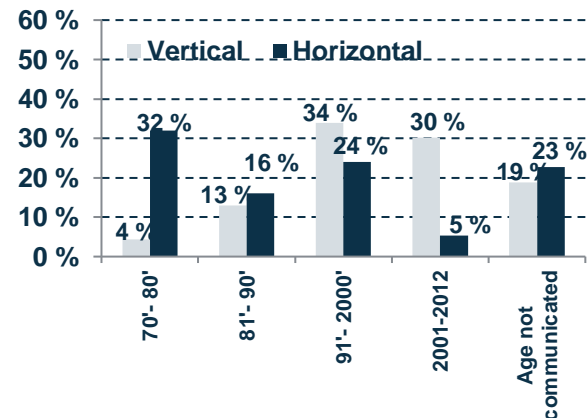
Out of the responses obtained, there are 186 vertical coolers and 75 horizontal coolers. This

corresponds to 71% of vertical coolers and 29% of horizontal coolers (Figure 1). Only one questionnaire mentioning another type of cooler was returned to Tecaliman. This was a circular-type cooler, installed at the beginning of the 1990s, after a meal thermal treatment process. This cooler will not be covered in these sheets for clarity and ease of reading of the figures and tables.



**Figure 1 : Type of coolers installed as a percentage of the total responses**

The vertical coolers were installed primarily during the 1990s. Thus, 64% of vertical coolers date from 1990-2000 compared to 29% of horizontal coolers.



**Figure 2 : Distribution of vertical and horizontal coolers by installation period**

Amongst the coolers installed from 2001 to 2012, 93% are of the vertical type compared to 25% in the 1970s. These figures demonstrate the growth trend in vertical models in French installations.

### 3. Cooler configuration

Most of the vertical coolers have one single level (54%) whilst most horizontal coolers have 2 passages. Nearly 35% of vertical coolers have 2 levels, but the questionnaire does not mention the type of use of these 2 levels (one level in use, use of the upper level only for transitions between batches or continuous cooling on the 2 levels).

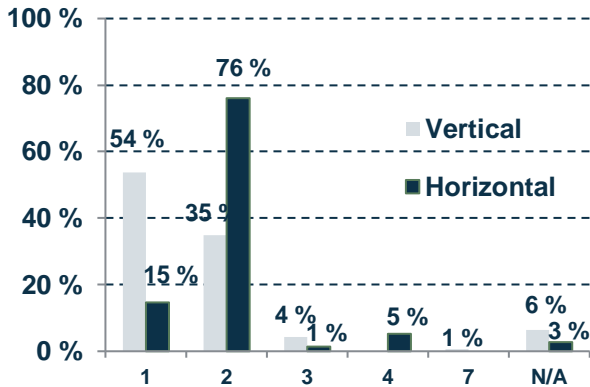


Figure 3 : Distribution of vertical and horizontal coolers by the number of levels/passages

In the 2000s, 24 one-level coolers were installed compared to 29 two-level coolers. It would seem that the implementation of two-level coolers is becoming more widespread in the profession. With regard to vertical coolers, 8 machines are equipped with 3 levels. Only one is used for treating meal, and half of them date from the 1990s. As expected, the 7-level cooler is used for producing thermally treated meal.

### 4. Cooler thermal insulation

Thermal insulation of coolers is more widespread on vertical models (40% thermally insulated) than horizontal ones (only 20% thermally insulated), as shown in Figure 4.

On the 4 models installed in the 2000s, 2 are thermally insulated, whereas in previous periods, 77% to 89% of machines installed were not.

With regard to vertical coolers, out of 56 machines of less than 12 years of age, 34 - or more than half - are thermally insulated. Over the previous periods, the trend was the opposite, with 54% to 87% not thermally insulated.

The current general trend is, therefore, to install thermal insulation.

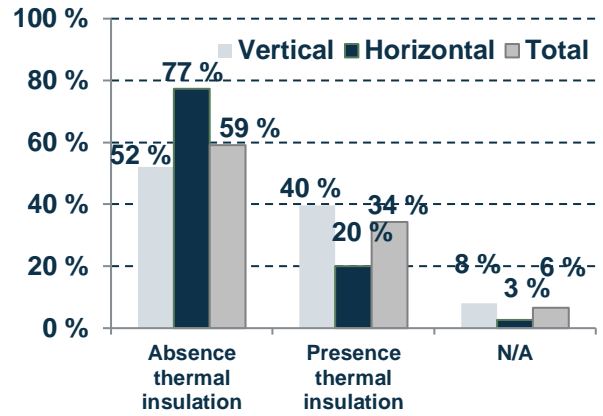


Figure 4 : Distribution of vertical and horizontal coolers according to the presence or not of thermal insulation

### 5. Distributors and levellers

More than 4/5<sup>th</sup> of coolers have distributors. The figures obtained for vertical and horizontal models are fairly similar (83% and 87% on the Figure 5).

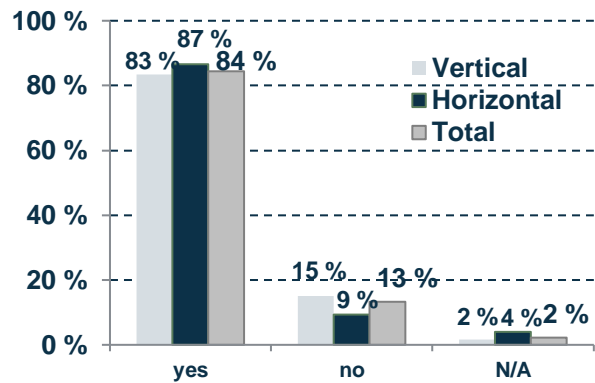


Figure 5 : Distribution of vertical and horizontal coolers according to the presence or not of a distributor

On the vertical coolers, nearly half are equipped with a rotating distributor (46%), 19% with a tilting distributor and 34% with a static-type distributor. For horizontal models, the most common distributor is the tilting type.

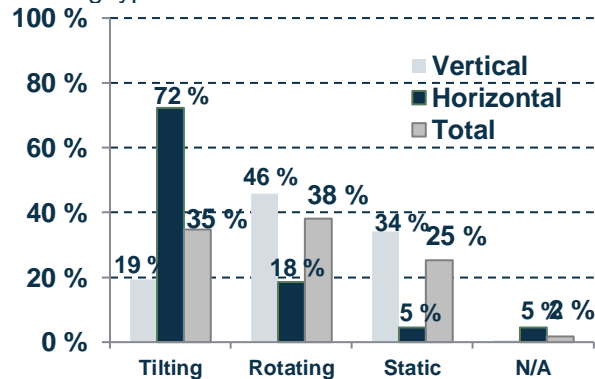


Figure 6 : Distribution of vertical and horizontal coolers equipped with distributors, according to the type of distributor installed

For vertical coolers,

- 45% of models equipped with a rotating distributor date from the 2000s and 30% from the 1990s.
- 45% of models equipped with a tilting distributor date from the 1990s and 30% from the 1980s.
- Finally, 40% of models equipped with a static distributor date from the 1990s and 20% from the 2000s.

It is clear that rotating type distributors are currently spreading throughout the profession, whilst not completely dismissing static distributors. Tilting distributors are, however, rarer.

Levelling systems are absent on more than half of coolers, both vertical and horizontal. Only around ¼ of vertical machines are fitted with this type of equipment. However, 34% of counter flow machines put in service in the 2000s have a levelling system compared to only 20% of those installed in the 1990s.

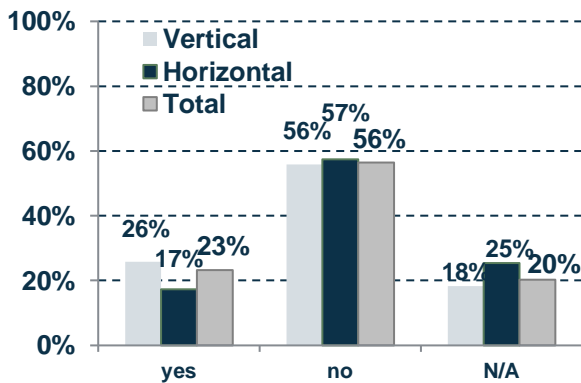


Figure 7 : Distribution of vertical and horizontal coolers according to the presence or not of a levelling system

## 6. Extractors for vertical coolers

The extraction of pellets on vertical coolers can be done from bars, also called grids. A mechanism operates the lateral movement of half the grids letting the product flow into the hopper under the cooler. The second type of extractor corresponds to rotating flaps. These flaps are inclined at the same time to the bottom and open spaces to free the feed. The responses obtained show that extraction is mainly carried out from grids (78%). Rotating flaps come next with 10% of the total machines. The "Others" category, notes out of 15 cases, 6 machines with a rotating base (one single site) and 7 coolers equipped with 2 types of extractors. These are 2-level machines.

Amongst the most recent machines (installed during the 2000s), product extraction takes place in ¼ of cases by rotating flaps and in more than 60% of cases by grids. It would seem, therefore, that the installation of rotating flap systems is currently progressing in the profession.

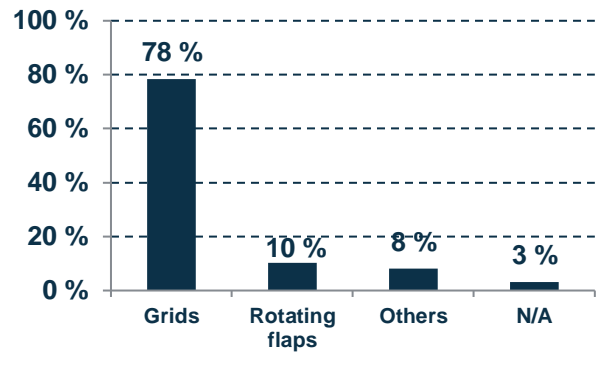


Figure 8 : Types of extractors installed on vertical coolers

For the 11 coolers used for treating meal, 6 are equipped with rotating flap extractors and 4 with grids.

## 7. Cooler environment

### 7.1. Upstream operations

Around 9 coolers out of 10 are installed after a pellet mill, according to the survey (Figure 9). Out of the 186 vertical coolers, 10 follow a thermal treatment, 5 a thermal treatment followed by a mill and 1 comes after a coater (petfood).

Out of the 75 horizontal models, 2 follow an extruder, 1 follows a coater and 3 come after a mill supplied by a thermal treatment process.

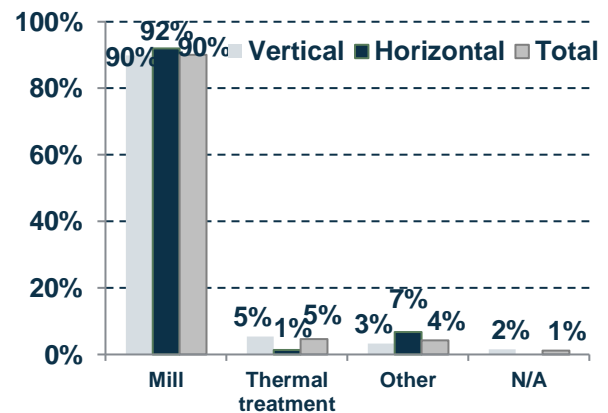


Figure 9 : Types of equipment installed upstream of the vertical and horizontal coolers

### 7.2. Downstream operations

After the cooler, there are almost as many crumblers as sievers. The presence of a coater after the cooler corresponds to questionnaires for which the other boxes (crumbler and/or sieve) are also ticked.

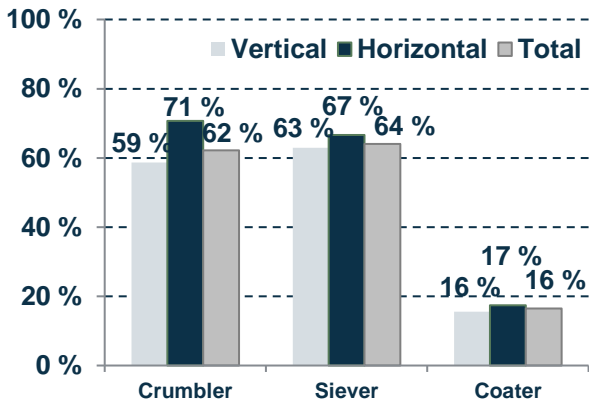


Figure 10 : Types of equipment installed downstream of the vertical and horizontal coolers

One single case corresponds to meal coating on a thermal treatment process.

The total of vertical and horizontal coolers exceeds 100%, as the just cooled and dried feed can find different equipment along a same process, depending on its presentation (pellets, crumbles).

## 8. Adequacy of cooler dimensioning with their use

More than 2/3 of coolers are adapted to the industrial companies' needs. This figure does not change according to the type of equipment (Figure 11). Cooler age does not seem to affect the responses.

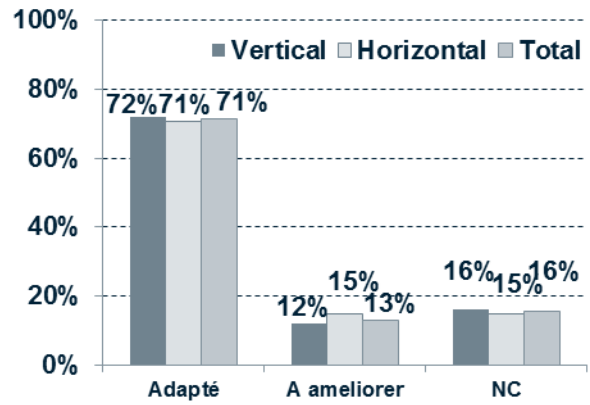


Figure 11 : Distribution of vertical and horizontal coolers according to the adequacy between the equipment dimensioning and its use

## 9. Conclusions

Tecaliman would like to thank the companies that responded to this survey. The responses obtained have enabled us to target the characteristics of coolers on which to base the choice of processes to study as part of the cooler programme (OPSERA).

In conclusion, the most common cooler currently for animal feed is a vertical, thermally insulated machine with rotating distributor and extraction with grids.

### Cooler characteristics

#### Type of cooler:

Vertical  No of levels: .....

Horizontal  Number of passages: .....

Other: .....

Manufacturer: .....

Model (type): .....

Year of installation: .....

Line flow ..... t/h to ..... t/h

#### Operation directly upstream of the cooler:

Mill  Hydrothermal treatment

Other: .....

#### Operation directly downstream of the cooler:

Crumbler  Siever  Coater

Other: .....

Thermal insulation: ..... Yes  ..... No

Distributor: Yes  No

#### Type of distributor:

Tilting  Rotating  Static

Leveller: Yes  No

#### Type of extractor:

With bars (grids)  Rotating flaps

Other: .....

#### Installation dimensioning:

Adapted to needs  ... To be improved

Figure 12 : Extract from the questionnaire on which the technical sheet is based