Tecaliman
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**i'Tec_L4**
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# Survey of liquid usage at animal feed plants - Other incorporation stations and production-related liquid typology

## 1. Focus

This survey was conducted to further insight into industrial practices concerning liquid usage at feed production plants, and to attempt to classify feedstuffs-processes-liquids-incorporation rates. This datasheet follows on from **i'Tec_L3** and discusses incorporation stations other than the mixer, as well as production-related liquid typologies and their corresponding incorporation rates.

## 2. Station-specific incorporation

### 2.1. Molasser

Logically, the main liquids incorporated in the molasser are molasses and vinasse up to a rate of of 6 to 7% (Table 1).

The main liquids incorporated in the molasser for each production typology are firstly molasses, in any production, and vinasse, which is added to ruminant feedstuffs (Table 2).

| | | |
|---|---|---|
| **Molasses** | 49.1 | 7 |
| **Acids** | 7.5 | 6 |
| **Vinasse** | 30.2 | 6 |
| **Oil** | 5.7 | 4 |
| **Formaldehyde** | 1.9 | 1.5 |
| **Water** | 1.9 | > 2.5 |

**Table 1: Liquids and maximum incorporation rates at the molasser based on survey replies**

| Liquids | Plant distribution (%) | | | |
|---|---|---|---|---|
| | Poultry (32 plants) | Ruminants (31 plants) | Pigs (30 plants) | Rabbits (16 plants) |
| **Molasses** | 12.5 | 45.2 | 30.0 | 18.8 |
| **Acids** | - | - | 6.7 | - |
| **Vinasse** | 3.1 | 38.7 | 6.7 | 6.3 |
| **Oil** | - | 3.2 | - | - |
| **Formaldehyde** | - | 3.2 | - | - |
| **Water** | 3.1 | 3.2 | 3.3 | - |

**Table 2: Percentage of plants that incorporate liquids at the molasser according to feed production**

### 2.2. Press conditioner

The main liquids incorporated at the press conditioner are also molasses and vinasse (Table 3). The liquids incorporated at this station for each type of production are similar to those incorporated at the molasser (Table 4).

| Liquids | % plants | Max. qty (%) |
|---|---|---|
| **Molasses** | 22.6 | 7 |
| **Vinasse** | 20.8 | 8 |
| **Formaldehyde** | 1.9 | 0.5 |
| **Water** | 3.8 | ≥ 0.5-1.5% |

**Table 3: Liquids and maximum incorporation rates at the press conditioner based on survey replies**

| Liquids | Plant distribution (%) | | | |
|---|---|---|---|---|
| | Poultry (32 plants) | Ruminants (31 plants) | Pigs (30 plants) | Rabbits (16 plants) |
| **Molasses** | 6.3 | 35.5 | 13.3 | 15.6 |
| **Vinasse** | 3.1 | 32.3 | 3.3 | 3.1 |
| **Formaldehyde** | - | 6.5 | - | - |
| **Water** | 3.1 | - | 3.3 | - |

**Table 4: Percentage of plants that incorporate liquids at the press conditioner according to feed production**

### 2.3. Press

Only 4 plants out of the 53 respondents incorporate liquids at the press, 3 of which incorporate molasses (Table 5), mainly for ruminant feeds (Table 6).

| Liquids | % plants | Max. qty (%) |
|---|---|---|
| **Oil** | 5.7 | 5 |
| **Vinasse** | 1.9 | 4 |
| **Flavouring** | 1.9 | ≥0.1 -0.5 |

**Table 5: Liquids and maximum incorporation rates at the press based on survey replies**

| Liquids | Plant distribution (%) | | | |
|---|---|---|---|---|
| | Poultry (32 plants) | Ruminants (31 plants) | Pigs (30 plants) | Rabbits (16 plants) |
| **Oil** | 6.3 | 3.2 | 3.3 | - |
| **Molasses** | - | 3.2 | - | - |
| **Flavouring** | - | 3.2 | - | - |

**Table 6: Percentage of plants that incorporate liquids at the press according to feed production**

## 2.4. Coater

**Coaters** are mainly used to incorporate oils and enzymes (Table 7). This type of incorporation is generally reserved for poultry feed (Table 8).

| Liquids | % incorporating plants | Max. qty (%) |
|---|---|---|
| **Oil** | 45.3 | **5** |
| **Enzymes** | 28.3 | **0.033** |
| **Molasses** | 1.9 | **≥0.5-1.5%** |

**Table 7: Liquids and maximum incorporation rates at the coater based on survey replies**

| Liquids | Plant distribution (%) | | | |
|---|---|---|---|---|
| | Poultry (32 plants) | Ruminants (31 plants) | Pigs (30 plants) | Rabbits (16 plants) |
| **Oil** | 37.5 | 9.7 | 6.7 | 6.3 |
| **Enzymes** | 15.6 | - | - | - |
| **Molasses** | - | 3.2 | - | - |

**Table 8: Percentage of plants that incorporate liquids at the coater according to feed production**

## 2.5. Finished products unit uptake

One single plant (out of 53) incorporates liquids at the finished products unit uptake. This is a flavouring used in ruminant or pig feeds.

# 3. Liquids incorporated by production and station typology

The following results do not include the data for the 13 plants that did not specify their production type.

## 3.1. Poultry feed – 32 plants

Nine plants out of the 32 add molasses and vinasse to their poultry feed, either at the level of the mixer, or the molasser or the press conditioner. On closer inspection however, the survey results show that at 4 plants, several species were indicated on the same line, which suggests that the answer did not necessarily apply to poultry feed. At the other 5 plants, the poultry feed was clearly specified opposite the molasses and/or vinasse line. In this case, incorporation rates were meaningful as they exceeded 2.5% (Table 9). Press conditioners (Table 10) or presses (Table 11) are rarely used as a liquid incorporation station during poultry feed production. Conversely, coating is frequently used to add small quantities of enzymes and large quantities of oils (Table 12).

| Liquids | <0.1% | ≥0.1 - 0.5% | ≥0.5-1.5% | ≥1.5-2.5% | >2.5% | Nb of plants |
|---|---|---|---|---|---|---|
| **Molasses** | | | | | 4 | **4** |
| **Vinasse** | | | | | 1 | **1** |
| **Water** | | | | | 1 | **1** |

**Table 9: Liquids incorporated at the molasser - poultry feed**

| Liquids | <0.1% | ≥0.1 - 0.5% | ≥0.5-1.5% | ≥1.5-2.5% | >2.5% | Nb of plants |
|---|---|---|---|---|---|---|
| **Molasses** | | | | | 2 | **2** |
| **Vinasse** | | | | | 1 | **1** |
| **Water** | | | 1 | | | **1** |

**Table 10: Liquids incorporated at the press conditioner - poultry feed**

| Liquids | <0.1% | ≥0.1 - 0.5% | ≥0.5-1.5% | ≥1.5-2.5% | >2.5% | Nb of plants |
|---|---|---|---|---|---|---|
| **Water** | | | | | 2 | **2** |

**Table 11: Liquids incorporated at the press - poultry feed**

| Liquids | <0.1% | ≥0.1 - 0.5% | ≥0.5-1.5% | ≥1.5-2.5% | >2.5% | Nb of plants |
|---|---|---|---|---|---|---|
| **Oils** | | | 1 | 2 | 10 | **13** |
| **Enzymes** | 6 | | | | | **6** |

**Table 12: Liquids incorporated at the coater - poultry feed**

The main liquid incorporation stations for poultry feed are the mixer and the coater (Table 13). The main liquids incorporated are oil (0.5%->2.5%), methionine (<0.1%-2.5%), lysine (0.1%->2.5%), water (0.5%->2.5%) and enzymes (<0.1%).

| Stations | Liquids | | | |
|---|---|---|---|---|
| **Mixer** | Oil | Methionine | Lysine | Water |
| **Coater** | Oil | Enzymes | | |

**Table 13: Poultry feed: main stations and liquids**

## 3.2. Ruminant feeds – 31 plants

The second incorporation station for this type of feedstuff downstream of the mixer is the molasser. The liquids involved are molasses and vinasse (Table 14) with incorporation rates of over 2.5%.

| Liquids | <0.1% | ≥0.1 - 0.5% | ≥0.5-1.5% | ≥1.5-2.5% | >2.5% | Nb of plants |
|---|---|---|---|---|---|---|
| **Molasses** | | | | | 14 | **14** |
| **Vinasse** | | | | | 11 | **12** |
| **Water** | | | | | 1 | **1** |
| **Oil** | | | | 1 | | **1** |
| **Formaldehyde** | | | | 1 | | **1** |

**Table 14: Liquids incorporated at the molasser - ruminant feeds**

| Liquids | <0.1% | ≥0.1 - 0.5% | ≥0.5- 1.5% | ≥1.5- 2.5% | >2.5% | Nb of plants |
|---|---|---|---|---|---|---|
| **Molasses** | | | | | 11 | **11** |
| **Vinasse** | | | | | 10 | **10** |
| **Water** | | | 2 | | | **2** |

**Table15: Liquids incorporated at the press conditioner - ruminant feeds**

The third station is the press conditioner (Table15), also used to incorporate molasses and vinasse at rates above 2.5%.

Various stations are used to incorporate molasses and vinasse in these feedstuffs (Table 16). There does not appear to be any preferred station. This probably depends on plant facilities and equipment. Plants rarely use the press as a liquid incorporation station (3 plants out of 31 - Table 17).

| Incorporation location(s) for molasses and vinasse | Nb of plants |
|---|---|
| Mixer | **8** |
| Molasser | **8** |
| Press conditioner | **7** |
| Mixer + Molasser | **2** |
| Molasser + Press conditioner | **4** |
| Mixer + Molasser + Press conditioner | **1** |

**Table 16: Incorporation of molasses and vinasse at ruminant feed stations**

| Liquids | <0.1% | ≥0.1 - 0.5% | ≥0.5- 1.5% | ≥1.5- 2.5% | >2.5% | Nb of plants |
|---|---|---|---|---|---|---|
| **Oil** | | | | 1 | | **1** |
| **Flavouring** | | 1 | | | | **1** |
| **Molasses** | | | | | 1 | **1** |

**Table 17: Liquids incorporated at the press - ruminant feeds**

| Liquids | <0.1% | ≥0.1 - 0.5% | ≥0.5- 1.5% | ≥1.5- 2.5% | >2.5% | Nb of plants |
|---|---|---|---|---|---|---|
| **Oil** | | | | 1 | 2 | **3** |
| **Molasses** | | | 1 | | | **1** |

**Table 18: Liquids incorporated at the coater - ruminant feeds**

Plants rarely use the coater as a liquid incorporation station during the production of ruminant feeds (4 plants out of 31 - Table 18). Lastly, one single plant incorporates flavourings at the finished products unit uptake.

| Stations | Liquids | | | |
|---|---|---|---|---|
| **Mixer** | Oil | Molasses | Water | Formaldehyde |
| **Molasser** | Molasses | Vinasse | | |
| **Conditioner** | Molasses | Vinasse | | |

**Table 19: Ruminant feed: main stations and liquids**

The main liquid incorporation stations for ruminant feeds are the mixer, molasser and the press conditioner (Table 19). Molasses and vinasse are mainly incorporated at only one of these 3 stations.

The main liquids incorporated are oil (0.5%->2.5%), molasses (1.5%->2.5%), vinasse (1.5 %->2.5 %), water (0.5%->2.5%) and formaldehyde (0.5%-1.5%). Lastly, formaldehyde is only used in the production of ruminant feeds.

## 3.3. Pig feeds – 30 plants

The second main station used to incorporate liquids into pig feeds is the molasser, used to incorporate molasses in particular (Table 20). This station records incorporation rates in excess of 2.5%. Plants rarely use the press conditioner as a liquid incorporation station during the production of pig feeds (5 plants out of 30 - Table 21).

| Liquid | <0.1% | ≥0.1 - 0.5% | ≥0.5- 1.5% | ≥1.5- 2.5% | >2.5% | Nb of plants |
|---|---|---|---|---|---|---|
| **Molasses** | | | | | 9 | **9** |
| **Acids** | | | 2 | | | **2** |
| **Vinasse** | | | | | 2 | **2** |
| **Water** | | | | | 1 | **1** |

**Table 20: Liquids incorporated at the molasser - pig feeds**

| Liquid | <0.1% | ≥0.1 - 0.5% | ≥0.5- 1.5% | ≥1.5- 2.5% | >2.5% | Nb of plants |
|---|---|---|---|---|---|---|
| **Molasses** | | | | | 4 | **4** |
| **Vinasse** | | | | | 1 | **1** |
| **Water** | | | 1 | | | **1** |

**Table 21: Liquids incorporated on the press conditioner - pig feeds**

Only one plant incorporates oil on the press at rate in excess of 2.5%.

Lastly, plants rarely use the coater as a liquid incorporation station during the production of pig feeds (3 plants out of 30 - Table 22) and one plant incorporates flavourings at the finished products unit intake.

| Liquid | <0.1% | ≥0.1 - 0.5% | ≥0.5- 1.5% | ≥1.5- 2.5% | >2.5% | Nb of plants |
|---|---|---|---|---|---|---|
| **Oil** | | | | | 3 | **3** |
| **Enzymes** | 1 | | | | | **1** |

**Table 22: Liquids incorporated on the coater - pig feeds**

The main liquid incorporation stations for pig feed are the mixer and the molasser (Table 23). The main liquids incorporated are oil (0.5%->2.5%), molasses (1.5%->2.5%), methionine (0.1%-2.5%), lysine (0.1%->2.5%), water (0.5%->2.5%) and acids (0.1%-2.5%).

| Stations | Liquids | | | | |
|---|---|---|---|---|---|
| **Mixer** | Oil | Methionine | Lysine | Water | Acids |
| **Molasser** | Molasses | | | | |

**Table 23: Pig feed: main incorporation stations and liquids**

## 3.4. Rabbit feeds – 16 plants

The sample of rabbit feed plants is smaller than for other types of production. The second main station used to incorporate liquids into rabbit feed downstream of the mixer is the molasser. In this case, molasses incorporation rates exceed 2.5% (Table 24).

| Liquid | <0.1% | ≥0.1 - 0.5% | ≥0.5- 1.5% | ≥1.5- 2.5% | >2.5% | Nb of plants |
|---|---|---|---|---|---|---|
| **Molasses** | | | | | 6 | **6** |
| **Vinasse** | | | | | 2 | **2** |

**Table 24: Liquids incorporated at the molasser - rabbit feed**

| Liquid | <0.1% | ≥0.1 - 0.5% | ≥0.5- 1.5% | ≥1.5- 2.5% | >2.5% | Nb of plants |
|---|---|---|---|---|---|---|
| **Molasses** | | | | | 5 | **5** |
| **Vinasse** | | | | | 1 | **1** |

**Table 25: Liquids incorporated at the press conditioner - rabbit feed**

The next station is the press conditioner (Table 25), also used to incorporate molasses at rates in excess of 2.5%. As with ruminant feeds, the molasses incorporation station varies from one plant to the next for rabbit feed production (Table 27). There does not appear to be any preferred station. This most probably depends on the plant available facilities and equipment.

| Incorporation location(s) for molasses | Nb of plants |
|---|---|
| Mixer | **2** |
| Molasser | **4** |
| Press conditioner | **3** |
| Molasser + Press conditioner | **2** |

**Table 26: Incorporation of molasses at each station - rabbit feed**

Lastly, only 2 plants use the coater during the production of rabbit feed in order to incorporate oil at rates of 0.5 to 1.5% for one, and in excess of 2.5% for the other.

| Stations | Liquids | |
|---|---|---|
| **Mixer** | Oil | Water |
| **Molasser** | Molasses | |
| **Press conditioner** | Molasses | |

**Table 27: Rabbit feed: main stations and liquids**

The main liquid incorporation stations for rabbit feed are the mixer, molasser and press conditioner. The main liquids incorporated are oil (0.5%->2.5%) and molasses (>2.5%).

# 4. Conclusion

To sum up, the mixer is the main liquid incorporation station. The molasser and the coater are the next stations most frequently used for the incorporation of liquids. The press conditioner, press, and the finished products unit uptake are outlying stations, only used at certain facilities.

Industrials principally seek to incorporate molasses and oils; several incorporation stations are used in order to increase incorporation rates.

The feedstuffs that most often incorporate liquids are poultry feeds - mainly oils - and ruminant feeds for molasses.