Saving energy with liquid methionine when pelleting

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In the feed mill, pellet production is generally the most energy consuming step. Therefore, any potential area of optimisation is beneficial to pursue.

In fact, several studies by Adisseo have shown that the addition of a liquid source of methionine (OH-Methionine) may lead to power savings of up to 13 percent when compared to the powder form (DL-Methionine) when pelleting.

Energy savings when pelleting

It has previously been reported that feed millers using liquid methionine instead of powder, experience energy savings when pelleting. To confirm this statement, Adisseo conducted two trials in Tecaliman, the French technical center for Feed, in their pilot pellet mill: a first one in 2016 and a second one in 2020.

They assess the pelleting behavior of complete feed by varying formula and methionine sources (liquid or powder) on equimolar basis given the concentrations of each methionine product (DL-Methionine at 99 percent concentration and liquid OH-Methionine at 88 percent concentration).

The amount of electricity consumed by the press whilst pelleting is obtained by measuring the instantaneous power absorbed (kW) by the motor each second. Only the values recorded when pelleting conditions (production rate and temperatures) were stable have been included. This amount is then divided by the real output rate (t/h) to calculate the specific energy consumption (kWh/t).

In the second trial, the results are expressed in net specific consumption by deducing the idle operation of the machine (which represents about 10 percent of total energy consumption).

Electricity consumption decreases by between 2.5 and 7 percent.

Feed batches are prepared using the same diet based on wheat (40%), soybean meal (30%) and corn (23%). DL-Met, OH-Met, oil and/or water are added at different inclusion rates. DL-Methionine (DL-Met) and liquid OH-Methionine (OH-Met) are first added at a standard dose on equimolar basis (0.20 % for DL-Met and 0.23% for liquid OH-Met), then liquid OH-Met is added at higher doses to highlight the effect of the additive.

The trial points to an effective reduction in energy consumption with liquid OH-Methionine. In general, the addition of high levels of liquid OH-Met (more than 0.23%) diminishes the power consumption in all cases. When standard doses (0.23%) of liquid methionine are used, the reduction phenomenon is particularly observed when no other liquids are added to the formulation (Figure 1 – Dry feed).

Here, a seven percent reduction is obtained. As expected, the

Table 1. Main composition of studied formula

	Formula A and Control	Formula B	Formula C	Formula D	Formula E
Main characteristics	Wheat based	Corn based	Same than A + 1% oil	Same than A + 3% oil	Same than D + 1% water
Wheat	44.87		43.87	41.87	40.87
Corn	22.00	64.48	22.00	22.00	22.00
Soybean meal	22.88	30.86	22.88	22.88	22.88
Extruded soybean	7.86	2.27	7.86	7.86	7.86
Dicalcium phosphate	1.10	1.10	1.10	1.10	1.10
Calcium carbonate	0.95	0.95	0.95	0.95	0.95
Salt	0.35	0.35	0.35	0.35	0.35
Vegetable oil			1.00	3.00	3.00
Water					1.00*

*Water added at TECALIMAN

addition of oil reduces the overall energy consumption. When three percent is added (Figure 1 – Oil three percent), savings when using liquid OH-Met instead of DL-Met account for four percent.

For the trial, the pellet quality is generally maintained. Values range at 91% ± 0.8% for durability (Eurotest-SABE device) and at 34 N/pellet ± 3.3 N/pellet for hardness (Schleuniger) for feed without oil.

Replacing powder with liquid methionine

For the trial conducted in 2020 in Tecaliman, different types of formula (wheat-based formula and one based on corn) are produced, as shown in Table 1.

Each formula is supplemented by either liquid OH-Methionine or DL-Methionine on an equimolar basis to obtain 2.5 kg of active substance per ton of feed. Each configuration (composition & methionine source) is repeated three times.

For formula A, C and D, a significant decrease of net energy consumption of respectively: 8, 13 and 12 percent is observed when methionine is brought as liquid OH-Methionine vs DL-Methionine.

No significant effect has been determined between methionine sources on specific net electricity consumption for formula B and E. As the formula E contains the highest contents in oil & water, its composition softens the potential differences, thus the effect of methionine sources may be negligible.

We cannot explain why no significant difference is observed on formula B. On pellet hardness, durability and rate of fines, no impact is determined between pellets.

The same conclusions are drawn in the field with two trials in Malaysian feed mills where the two sources of methionine in 2015 are compared. Liquid OH-Met and DL-Met are added in the mixer in 2 independent batches of the same formulation and tonnage. The first trials demonstrate savings up to three percent in favour of liquid OH-Met.

In a second feed mill a formulation composed of a corn and soybean base, of water and water-based liquids (0.25 percent) and of palm oil (three percent) is used.

The data showed power consumption when pelleting to be 2.5 percent lower when using liquid OH-Met instead of DL-Met.

Increased flow rate and lower power consumption

Overall, feed mill and pilot trials show for liquid OH-Met with values up to 13 percent less compared to DL-Met. This advantage is not seen in every case, but the electricity consumption for pelleting is a least the same than for feed with DL-Met or even lower.

Seeing this advantage from another angle, it means that, at a constant power, the flowrate of the pellet mill may be increased by a few percent when using liquid methionine compared to DL-Met. For the feed miller, these potential savings will reflect on the cost of feed production.