Optimisation of liquid feeding systems

by Erwan Le Bras, Olmix, ZA du Haut du Bois, 56580 Bréhan, France.

Many external factors are involved in feeding optimisation including, genetics, sexing, density in the pen, group size, temperature and, obviously, the hygiene status (Fig. 1).

Controlling each of these parameters and their interactions does not mean that feed utilisation is optimal. In liquid feeding system, we have put a final, but essential parameter of influence into the distribution loop – feed homogeneity.

Providing an adequate ration

Optimal feed utilisation means providing an adequate ration (quantity and quality) according to the physiological stage of the animal to obtain a qualitative and remunerative carcase, which can fulfil the requirements of both pig producers and customers.

However, from field observations, liquid feeding systems can lead to growth and fatness heterogeneity among the same batch of animals. That generates a higher average age at slaughter and, consequently, economic losses.

Liquid feed offers many advantages including:

- Fast and easy distribution.
- Less feed wastage.
- Prevents dust emission and its detrimental effect on the respiratory tract.
- Reduces the incidence of stomach ulcers.
- Transferring the ration on long distances.
- Improved feed palatability.

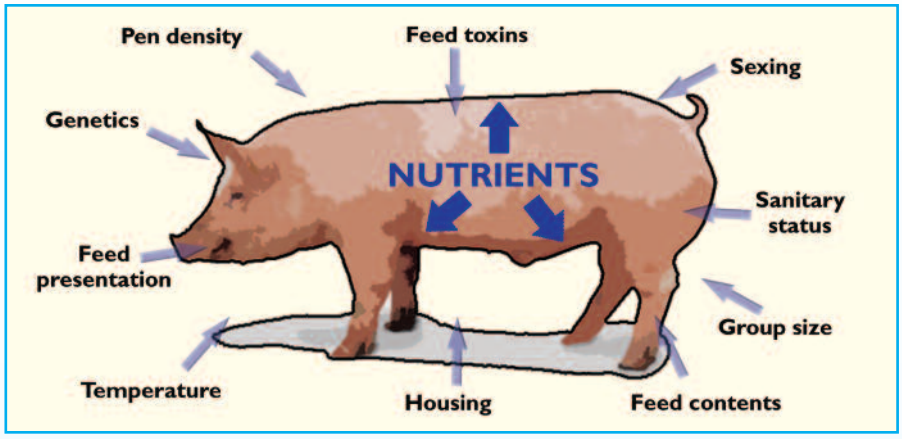

Fig. 1. Factors influencing feed optimisation in fattening pigs.

- Improved carcase quality, by controlling feed intake.

To profit from these advantages, it is important to control intrinsic factors of the liquid feeding system to optimise feed utilisation for the pig because liquid feed can also be a source of troubles which have become a major concern in swine production.

This means that the feed offered to every pig must have an adequate dilution rate, a precise distribution, as well as a homogeneous ration with no feed sedimentation.

Indeed, important disparities in size and density among the different feed compounds (minerals, dry matter, nitrogen and water) means that not all particles have the same speed circulation within the mixing tank and the pipes.

Several factors are increasing heterogeneity:

- A high dilution rate (more than 3.5 litres per kg of feed).
- Long feeding loops.
- A large diameter of the pipes.
- Pump power.

In practice, high dilution rates are used (up to 3.5 litres per kg of feed) in liquid feeding systems for pigs to facilitate the circulation in the pipes. It also allows the farmer to satisfy water and nutrients needs in one distribution.

However, nutritionists consider that drinking and eating at the same time decreases enzymes and digestive juices efficiency. The decrease in water content of the meal can

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These samples were made in the same conditions, at the same values. The photographs show that the control samples (left) are very heterogeneous in feed content and MSoup (right) allows a largely better homogeneity of the liquid feed.

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be compensated by an intermediary distribution of water between two feed distributions.

High dilution rate limits the dry matter intake by saturation of the voluntary feed intake and, so, limits the expression of the genetic potential of the animals. In term of economic losses, a high dilution rate leads to an increase in digestive disorders, heterogeneity in the same group of pigs and an additional amount of effluent.

A well adjusted system distributes a certain weight of liquid feed – but is the composition homogeneous all along the loop?

In field trials Olmix has demonstrated, by sampling haphazardly some valves along the feeding loop, that the distributed volume can be the same but the composition is completely different. Olmix, in a desire to offer natural innovations to farmers to solve the problem of liquid feed heterogeneity, has created MSoup which, in official field trials, has proven its efficacy.

MSoup combines the natural properties of montmorillonite and diatomite with specific emulsifiers. The ingredients act in synergy to create a three dimensional network between the feed particles in the liquid phase.

These links ensure a homogeneous suspension of the different components (fibres, minerals and proteins) and postpones significantly their sedimentation.

Sampling procedures used by the Chambres d'agriculture de Bretagne to control feed homogeneity alongside the trough.

Moreover, a lubricating film is created between the pipe wall and the particles that reduces the contact and improves the suspension fluidity which allows a reduction of the dilution rate down to 2.4 litres per kg of feed.

Field trials

The most recent proof is a trial implemented in partnership with the Chambres d'agriculture de Bretagne (French regional public agricultural institution) which confirmed the positive effects of MSoup on liquid feed homogeneity.

From 108 samples and three different liquid feed systems tested, results show that liquid feed composition with MSoup is more homogeneous all along the feeding loop and also, more homogeneous within the trough.

Variability on mineral content among samples only reaches 4% with MSoup against 7.3% without MSoup – an improvement of 45% in the homogeneity.

In a trial implemented in a French born-to-finish unit, sedimentation tests highlighted big differences in the distribution.

Indeed, in the first photograph (previous page), we can see that after a few hours of sedimentation the fifth bottle clearly shows a very poor content in dry matter. The second photograph is a typical example of what may be observed all along the feeding loop with MSoup – homogeneity is largely improved.

Sedimentation all along the feeding loop is what we observe in the field. Therefore, to quantify the benefits of MSoup, a field trial was implemented in France in 2006. The unit included 200 sows with wean-to-finish houses. The objective of the trial was to measure the effect of adding 10kg of MSoup per ton of feed on zootechnical performances of fattening pigs.

The performances obtained during the trial were compared with performances of the last three batches. Management and feeding strategy were similar. In total, 1,012 fattening pigs were included in the trial. The

Parameters	Historical performances	MSoup performances	Difference	Variation (%)
Number	575	437	-138	/
Age at start (days)	62.2	62.3	0.1	0.2
Age at slaughter (days)	175.9	172.6	-3.3	1.9
Interval between 1st and last departure (days)	37	14	-23	62
Initial weight (kg)	25.79	22.77	-3.02	11.7
Final weight (kg)	112.2	111.6	-0.6	0.5
DWG (g)	764	812	48	6.3
Mortality (%)	2.3	0.2	-2.1	91
Daily consumption (kg)	2.29	2.33	0.04	1.7
FCR	3.00	2.87	-0.13	4.3

Table 2. Field results.

dilution rate was around 2.7 litres per kg of feed.

Table 2 shows the improvement of the pigs' technical performance with MSoup:

- +6.3% (48g) on daily weight gain (DWG).
- -2.1% of mortality or 0.56 additional pig sold/sow/year.
- -0.13 points on feed conversion ratio (FCR).
- -3.3 days of age at slaughter and so, a shorter occupation of the barn and more cost effective use of the buildings.

It was also noticed that the interval between the first and the last departure of the pigs to the slaughterhouse was decreased.

With MSoup the interval was an average of 14 days, whereas this interval was previously 37 days. The homogeneity of the feed induces uniformity of the pigs which means less time has to be spent in sorting the pigs.

All these technical improvements have repercussions on economic results.

The Chambres d'agriculture de Bretagne and IFIP (Institute of the French pig sector) calculated the difference in relation to the difference in technical results from 2005.

It was calculated that an improvement of -0.1 on fattening FCR generates €1.4 more per 100kg of carcase.

Also, an improvement of -10 days at slaughter age and -1% on fattening mortality rate respectively induces over €1.7 and €1.0 per 100kg of carcase. According to these figures, the results of that trial show a net gain of €2 per pig.

Conclusions

In conclusion, homogeneity of the ration is a key factor for optimal feed utilisation! However, nutrient demixing is a natural process that can lead to high variation in the ration composition alongside the feeding system.

Olmix has developed MSoup to link the particles and to avoid liquid feed heterogeneity that causes growth heterogeneity among the same batch of pigs, as well as digestive problems.

From the trial, we can demonstrate that MSoup brings a better homogeneity of the liquid feed and leads to better growth, a reduced mortality rate, a better FCR and increased benefits. ■