

Expanded structurized feed for pigs

Description of the production process and the product properties

An "expanded structurized feed" is a compound feed which has been exposed to hydrothermal treatment by an expander and which has been produced as a granulate, without pelleting.

KAHL EXPANDAT®

- hygienic
- biological
- structurized
- homogeneous



The processing parameters such as moisture, temperature, pressure, and electro-mechanical energy input in the expander influence the nutritive and physical feed characteristics. Crumbling equipment following the

expander produce a uniform granular structure, a prerequisite for good flow properties which allow it to discharge, without problems, from silos or automatic feeders.

The heat-treated product is free from pathogenic germs and easily dissolves in water due to its porous structure.



Description of the process and the applied process parameters

The process with the applied process parameters temperature, product moisture, and energy input (kWh/t) is shown in fig. 1.

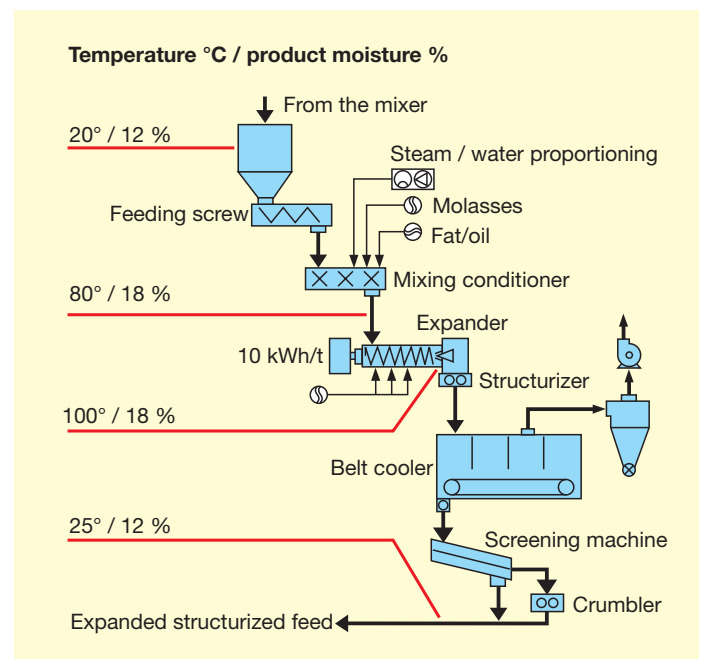


Fig. 1: Production of Expandat®

For preconditioning the product by adding steam, water, and other liquids such as molasses or fat a mixing conditioner is used with a conditioning time of 0.5 to 2 minutes, depending on the granular size of the feed. For hydrothermal pressure treatment and for agglomerating the feed to larger product lumps an annular gap expander is used. The expander is followed by a structurizing machine with screen inserts. Screen perforation and speed determine the granular size. For subsequent cooling a modified belt cooler is used, which is designed to suit the high specific surface of Expandat®:

- specific surface pellets 5 mm = 450 m²/m³
- specific surface Expandat = 3250 m²/m³

The final structure of the product is determined by a screening machine followed by a crumbler.

Results and discussions

■ Bulk density:

The bulk density is reduced by 10 to 20 % depending on the treatment intensity. This must be considered when designing and operating feeding plants. The animal requires an acclimatisation phase, if it has not been fed on Expandat from weaning.

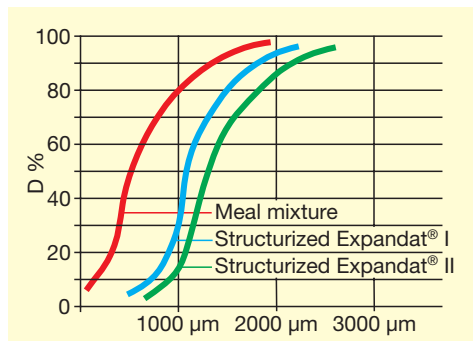
■ Flow characteristics in silos and automatic feeders:

Similar to pellets Expandat is classified as "easy flowing", as tests with a shear instrument confirm.

■ Granular size structure:

Compared with coarse feed meals the percentage of fines has been reduced considerably. The particle size spectrum is "narrower", i.e. the percentage of particles having the same size is higher, see fig. 2.

Fig. 2: Granular size structure of pig feed



■ Feed hygiene:

By means of the thermal treatment pathogenic bacteria and mould fungi are eliminated, see table 1.

	Broiler feed		Pig feed	
	Raw material Meal 20 °C	Expander 100 °C	Raw material Meal 27 °C	Expander 110 °C
Total aerobic count/g	12,100,000	30,000	16,500	9,000
Colliform bacteria/g	110,000	0	400	0
E-Coli bacteria/g	400	0	90	0
Mould fungi/g	7,000	0	450	0

Table 1: Hygienic treatment of compound feed with the KAHL annular gap expander

■ Starch modification:

Depending on the treatment intensity a starch modification of 50 - 60 % can be achieved, which is desirable for piglet feed for example.

■ Solubility in water:

The dissolving power of Expandat® in water is 50 % better than that of mealy or granulated feed. When mixing the liquid feed a pumpable and mixing stable feed

solution is produced within a very short time, in which the particles do not separate, if the plant is out of operation.

All pig sties receive a feed solution of the same DS concentration, no matter what the distance from the mixing plant is.

■ Dry substance concentration:

Due to the increased water absorption the DS content in the liquid feed can be increased by 3 to 4 %. Assuming a water/feed ratio of 3:1 in the case of traditional liquid feed, the energy concentration increases from 3.26 to abt. 3.62 MJ/kg liquid feed in the case of crumbled Expandat® with a ratio of 1:2.6, see table 2.

Table 2: Influence of the DS content in liquid feed on the energy concentration and the required energy content in dry feed

Feed:water	1:2.4	1:2.6	1:2.8	1:3.0
DS, %	25.60	24.20	22.90	21.80
MJ ME/kg liquid feed with 13 MJ/kg dry feed	3.82	3.62	3.42	3.26

Source: SVS 3/91 p. 33

■ Nutritional effect:

Expander treatment leads to an increase of the digestibility of the components, particularly of the fat and crude fibre fraction, and thus to an increase of the metabolizable energy, see table 3.

Piglet feed with a 30 % wheat bran ration. Results of a digestion test		
Digestibility	not expanded (%)	expanded (%)
Organic substance	77.4	77.5
Crude protein	76.6	76.3
Crude fat	70.1 a	72.7 b
Crude fibre	35.5 a	49.8 b
ADF	33.8	40.3
NDF	55.0	56.2

Investigation results in Denmark showed that expanded structurized feed

reduces the susceptibility of pigs to parakeratosis and gastric ulcers by 50 % due to reduced feed consumption.

Table 3: Increase of the digestibility of piglet feed by means of expander treatment

Conclusions

Expanded structurized feed is an interesting alternative to pig feed in form of meal, pellets, or crumbled pellets. Due to its physical properties the Expandat® is particularly appropriate for liquid feeding. The thermal treatment ensures hygienic feed combined with an enhancing of the components.