Moisture: the ‘secret’ ingredient for good quality pellets

Good conditioning is the result of three variables: moisture, temperature and time. These parameters can all have a significant positive impact on:

- Biosecurity (kills bacteria, e.g. Salmonella)
- Physical pellet quality and efficiency of the feed production
- Digestibility and palatability of the feed
- Improved nutritional quality of ration and increased profitability for farmer

Conditioning time and temperature are well known parameters used in feed mills all over the world, but optimum moisture content is often underestimated. The moisture content should be between 15% and 18%. The best way of adding moisture is via the steam system - the smaller the steam particles are the faster they penetrate in to your meal mix.

Steam Conditioning

Although water conditioning can be used, particularly on small units, it is not recommended. Steam is much more efficient and avoids creation of wet spots in the pelleted product. We therefore concentrate on this method, as it is used by virtually all commercial feed mills. When using a conventional barrel conditioner the "quality" of steam must be as dry as possible. For high temperature/ sterilizing conditioners, a certain amount of super-heated steam may be required.

Steam pressure must remain constant and this is achieved by a pressure reducing valve (see Figure 1). It allows for pressure fluctuations upstream (caused by the firing of the boiler) but keeps pressure constant downstream. This valve, which you can use to change pressure according to the ration being processed, should be located approximately 20 ft (6 metres) upstream from the conditioner and in a position where it can easily be adjusted. It is considered that this distance is necessary so that the steam can stabilise after pressure reduction. In some cases, where the reducing valve is too close to the conditioner, The result is a mixture of superheated and wet steam, with the superheated steam being carried through (particularly in the barrel type) without giving up its heat and moisture.

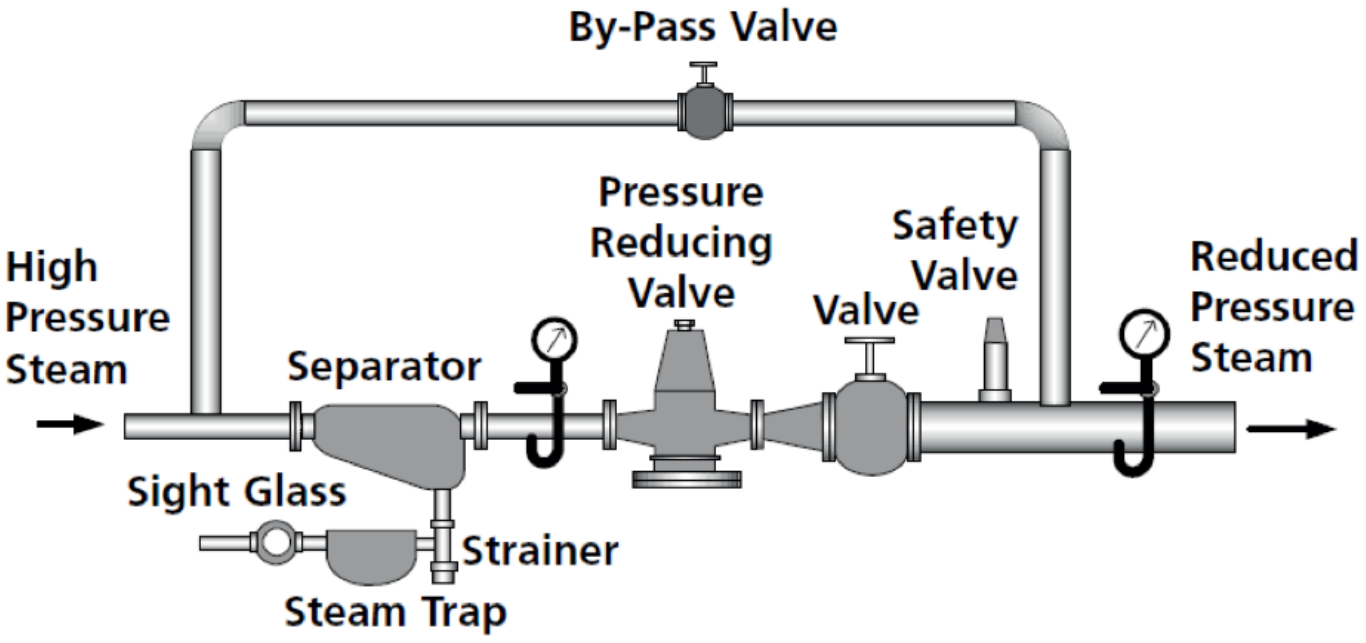

Figure 1: Steam installation prior to conditioner

Pipe Sizes and Steam Velocity

Velocity of steam entering the conditioner can also affect the efficiency of mixing with the meal. Steam velocity and quantity determine the pipe bore size which should be used. However, we have noticed in a number of plants that full benefit is not obtained from the steam (particularly low pressure steam) because the bore of the steam pipe after the reducing valve is too small.

The tables 1 and 2 below enable you to check whether your pipework can cope with the quantity of steam you require. We recommend that the steam velocity after the pressure reducing valve should be around 20 m/sec. Knowing that no more than 45 kg of steam are generally required per hour per tonne of pellets produced, you can check the size of pipe being used in your mill, by referring to the lowest steam pressure you will need. (See our pressure recommendations, table 3). For example, if your press can produce a maximum of 8 tonnes per hour of pellets, then it could be demanding up to 360 kg per hour of steam, and the table shows that when using at, say, 1 bar downstream of the reducing valve (our recommended pressure for high starch rations), then a pipe bore of 80 mm will be required. This bore will be more than adequate for the higher pressure steam needed for less starchy rations.

Note

- All steam pipes must be lagged
- Ensure all steam traps are working (a sight glass after the trap shows if condensate is returning). Remember there will always be condensate which must be returned to the boiler
- Be prepared to change steam pressure to suit rations
- Consult your steam plant supplier if experiencing difficulties achieving the desired amount of steam

General note (for barrel conditioners)

To get hot moist meail - use low pressure steam

To get hot dry meal - use high pressure steam

Capacity of pipes passing dry saturated steam

Table 1: IMPERIAL Gauge steam pressures (lb/sq. in)

Pipe bore (in.)	15	20	30	45	50	65
	Capacity in lb/hr at 60 ft/sec.					
1	85	98	125	164	176	214
1 1/4	133	153	195	256	276	335
1 1/2	191	221	281	368	397	482
2	340	393	499	655	706	857
2 1/2	531	613	780	1 023	1 102	1 339
3	764	883	1 123	1 473	1 587	1 927
4	1 359	1 571	1 996	2 619	2 822	3 427
5	2 123	2 454	3 119	4 091	4 408	5 354

Table 2: METRIC Gauge steam pressures (bar)

Pipe bore (mm)	1	1.5	2	3	4	5
	Capacity in kg/hr at 20 m/sec.					
20	25	31	37	48	60	71
25	39	49	58	76	93	111
32	65	80	95	125	153	183
40	102	125	149	195	240	286
50	159	196	233	305	375	447
80	408	503	597	782	961	1 146
100	638	786	933	1 222	1 502	1 790
150	1 435	1 769	2 099	2 751	3 380	4 029

Table 3: Suggested operating conditions for pelleting various feed types*				
	Steam Pressure	Meal Temperature at exit of conditioner	Energy Input pellet press motor	Borregaard pelleting aid inclusion (guideline)
Ruminant Feeds	2.5-4 bar	75-85˚C	20-24 kWh/T	1-2%
Concentrates/ Mineral Feeds	4-5 bar	75-85˚C	20-24 kWh/T	1-2%
Pig Feeds	1-3 bar	75-85˚C	15-17 kWh/T	0.5-1.5%
Poultry Feeds	1-1.5 bar	85-95˚C	10-12 kWh/T	0.5-1.5%
Shrimp Feeds	2-2.5 bar	95-105˚C	24-28 kWh/T	0.25-0.5%

***Note:** these are guidelines only. Raw material variations might make it necessary to vary operating conditions. Steam pressure relates only to barrel type conditioner.

Example: Conditioning of broiler feed

If your steam settings are at 1-1.5 bar, you will gain 1% extra moisture every time the temperature is lifted by 12-15˚C. (Target temperature for broilers is 80°C and a moisture of 16 – 18%.)