Latest Feed Processing Technology

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3 March 2016, AFMA, Sun City
Development of feed processing technology is driven by requirements:

- From the feed customers, who specify the nutritional and physical quality of the feed to the feed producers.

- From the feed producers, who specify the technological capabilities and capacity of the machinery for present and future utilization to the machine suppliers.

- From the machine suppliers, who develop new advanced machinery, to fulfill the future market needs, to stay in the market or increase the sales in the market.
Examples of recently developed hammer mills

Hammer mills with 4 different screens in cassette
Maximum motor power 400 KW
Examples of recently developed hammer mills

High capacity hammer mill with max. 400 KW motor
Large screen area, 4 m²
Latest feed processing technology

- Nothing really new in machinery, the application is innovative
- Feed mills with production capacity of 20 batches per hour.
- Re-introduction of single ingredient grinding
- Hammer mills with automatic screen change, receipt controlled
- X number of dosing scales for reaching capacity
- Batch cycle for dosing, conveying and mixing is maximum 180 seconds.
- Conveying capacity dimensioned for these capacities
- Pellet mills are increasing in effective die surface and motor power.
- Automatic pellet mill operations, receipt controlled
- Energy saving by a wide introduction of frequency controllers.
X number of macro dosing scales for reaching dosing capacity

Standard design the full batch.
10 batches/hr

New capacity standard: 20 batches/hr.
Batch cycle dosing and discharging max. 180 seconds for each formula.

- Major ingredients have individual dosing scales.
- Small number of minor ingredients can share one dosing scale

Dosing screw capacity and dosing scale capacity related to maximum inclusion in formula.
Conveying cycle max 180 seconds

Conveying cycle from dosing scales to hopper over the mixer includes:

- Actual material conveying
- Emptying time of conveyor system, to make sure all ingredients have arrived at the hopper.

- Conveying capacity required up to 500 m³/hr
Mixing cycle max. 180 seconds
Only possible with twin shaft paddle mixer.

Sequence and time allowance of the mixing cycle:
- Filling: max 15 seconds, by bomb door
- Dry mixing: max 5 seconds
- Liquid additions: max 35 seconds
- Wet mixing: 110 seconds
- Discharging: max 15 seconds, by bomb doors
Dosing of mini and micro ingredients

Critical points:
1. Correct filling, no mistakes permitted
2. Accuracy of the weighing system
3. Accuracy in the dosing system, dosing screw speed controlled for fine dosing for the last quantity
4. Batch report study to learn deviations
5. Set tolerance parameters per ingredient
6. 2% rule. Minimum quantity = 2% of the max weighing hopper capacity.
7. No residue accumulation in discharge pipes to mixer or mixer hopper
8. No carry over contamination permitted.
9. Free from vibration and air movements

Risks:
1. Mistakes in filling
2. Very sensitive materials
3. Dosing scale weighing capacity too big
4. Discharge pipe inclinations cause carry over by caking and hanging

Cycle time calculations:
Same as for other dosing scales.
Under hopper need a knocker to empty completely
Screw conveyor too much carry over contamination
Dosing system OK
Filling of the hoppers not controlled high risk area
Area’s marked in Red need operational attention
Discharge to next screw conveyor and elevator or direct to mixer.
Understanding of the pelleting process

- Conditioners with long retention times up to 5 minutes for sanitation of the mash.
- Steam conditioning over 90 seconds doesn’t improve pelleting. Only for sanitation.
- Over dried corn, lower than 14% moisture is a limiting factor in the pelleting process. Hydrophobic properties.
- Relation of SME to STE.
- SME: specific mechanical energy
- STE: specific thermal energy
- Monitoring of roller slip
- Remote control of roller to die clearance,
- Receipt controlled automatic start up of the pellet mill
Increase of mechanical energy/ton feed will increase the pellet quality

Using the graphs above we can deduce that the quality in relation to the roll gap would look like the following graph.

**Roller gap as operational tool:**
- Mechanical energy per ton feed produced will increase
- Pellet mill will run at higher Amperage for same capacity
- Pellet quality will improve
- Die capacity can be reduced if motor load is already at maximum
- Die wear cost will increase also a little
- Remote roller gap control doesn’t need to stop the pellet mill.
Modern super conditioners by friction

Andritz feed processor

Boa compactor

Kahl Expander
Super conditioners with steam

DDC conditioner

Long time conditioners, up to 5 minutes

LTC 2300 with capacities up to 70 m³/h (2 min.)
and a retention time up to 4 min. (35 m³/h)
14300 cm² effective die area

Maximum motor power 560 KW

<table>
<thead>
<tr>
<th>Capacity</th>
<th>With steam addition</th>
<th>25-40 tph (EU)</th>
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<tbody>
<tr>
<td>Die</td>
<td>Dimensions</td>
<td>Diameter inside</td>
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<td></td>
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<td>ø1144 mm</td>
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<td></td>
<td>Effective press width</td>
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<tr>
<td></td>
<td>Effective press area</td>
<td>1.14 m²</td>
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Sanitation in Pelleting lines

- Sanitation for pellet mills, heated with hot air till 30 min after stopping the pelleting process.
- Sanitation for pellet mills, with hot air before starting the pellet mill, to create a temp of 70 °C to 95°C to eliminate salmonella
- Pellet mill doors and conditioner insulated and electrical heated.
- Coolers vertical sides and hoods insulated and heated to avoid condensation.
- Ducting and cyclones heated and insulated to avoid condensation.
- Cooler rooms completely isolated from feed plant environment
- Cooling air fully filtered by 3 step HEPA filters
- Mash is hold in the conditioner till reaching 70°C
Pellet mill with hygiene features

- Flash-off aspiration feeder screw
- Electric heating pads at the conditioner bodies and pellet mill inlet.
- Optional pellet mill door: electric pad heating.
- Pellet mill door aspiration for drying after finishing pelleting.
- No airlock between pellet mill and cooler. Cooler will aspirate the steam in the pelleting chamber.
Counter flow cooler

Max Temp product: ambient temperature + 5°C
Check pellet moisture
Hepa filters (High Efficiency Particulate Arrestance)
PPA  Post Pelleting Application

- Various
  - Andritz –Sprout, for Micro liquids
  - CPM system, commonly for oil spraying and enzymes
  - Atmospheric and vacuum paddle mixer coater. For all liquids including micro liquids
  - Spray on die, for oil only
  - Enzyme dosing unit. Micro liquid spraying.
More PPA

More:

Drum coater. Commonly for spraying oil
Presently most copied.

Kahl Roto-spray for spraying micro liquids
Truck transportation optimizing.
Truck planning is the basis for production planning.

2 step robot truck loading;
- top robot for weighing from selected silo.
- lower robot for discharging to selected truck compartment.

Other option: one robot weigher for weighing from selected silo and discharging to a copy hopper.
The set of copy hoppers fits to all compartments of the truck.
Copy hoppers will discharge simultaneous.
Truck loading, 32 tons, in 10 minutes.
Thank you