Conditioning for Pellet Quality & Feed Safety

Presented by

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Factors Affecting Pelleting and Pellet Quality
Factors Affecting Pelleting and Pellet Quality

- Formulation
- Conditioning
- Particle Size
- Die Specs
- Cooling
Factors Affecting Pelleting and Pellet Quality
Conditioning
Improved pellet mill conditioners

Fully computerized pellet mill operation

Loss in weight feeding

Process design acc. salmonella

Long time conditioners

Large size pellet mills

Mix compress

Double pelleting

HTST conditioning feed expander

Double conditioning

Controlled retention time conditioner
Conditioning Objectives

• Conditioning provides time for steam and other liquids to be absorbed.
• Will improve pellet quality and operating characteristic of the pellet mill.
• Uniformity of product.
Conditioning Objectives

Conditioning requires activation of natural binders through:

- Heat/Temperature
- Moisture
- Time

OPTIMIZES PELLET QUALITY
The correct conditioning of a feed compound for pelleting is necessary in order to obtain a good pellet quality and an effective utilization of the pelleting installation.
Rule-of-thumb

• For every 20 degree increase in the mash temperature, 1% moisture is added from the steam.

• Approximate maximum moisture content of the mash in the die chamber is 18%.
Steam Quality

- It does not matter what kind of conditioner you have if you have poor steam quality.
- Once you reach the moisture threshold of the pellet mill, you will not be able to increase steam addition any further and you have reached the maximum allowable temperature.
Conditioner Types

• Small Conditioner with Feed Screw
Conditioner Types

- ADJUSTABLE PADDLES
- STEAM BUSTLE AT INLET END – ALL STEAM ADDED SIMULTANEOUSLY
- LIQUID ADDITION DOWNSTREAM OF STEAM ADDITION
DUAL conditioner concept

- Water slurry
- Oil
- Steam
Cascade Conditioners

- Large volume conditioner with a large diameter shaft and individually adjustable stainless steel paddles.
- The shaft is mounted in pillow block bearings ensuring long life and low maintenance.
- Stainless steel trough with easily accessible cleaning/service hatches.
- The conditioner has an integrated steam manifold with adjustable steam valves down the length of the trough.
Cascade Conditioners
Cascade Conditioners

**Controlled steam and liquid addition**

- The unique multiple orifice steam injection manifold distributes steam to the raw material depending on the absorption capacity of the compound.
- Via injection nozzles molasses, fat etc. are added ensuring optimum absorption of steam and liquid additives thus giving maximum temperature and homogeneity in the conditioned compound.
- The ability of the conditioner to effectively mix raw materials and liquids makes it suitable for a wide range of mixing processes in pelleting and extrusion plants.
Applying liquids in parallel to steam
Improves absorbability of liquids

Addition of
Liquids with
Steam Injectors
- Steam and liquid injection
- Method of steam injection is important if uniformity of the distribution is to be achieved also critical for pasteurisation
Controlled Retention Time Conditioning

- **Retention time conditioner Type CRT**
  - Provides time for steam and other liquids to be absorbed – typically operating at 2 to 4 min.
  - The purpose of pasteurisation is to provide sufficient time to ensure uniform distribution of heat
  - Material flow first in first out principle is secured
  - High filling degree
  - Formatted to eliminate common salmonella strains and equivalent bacteria
  - Improve pellet quality and operating characteristic for pellet product uniform well absorbed, less blockage and smoother running
  - Conditioning is achieved at temperatures of up to 200°F
Controlled Retention Time Conditioning

- **Conditioner design**
  - Full flight stainless steel screw with variable speed drive
  - Clean design stainless steel construction
  - Self-cleaning PT 100 temperature probes gives constant accurate temperature control

[Images of the conditioner]

[Website Link] www.andritz.com
Controlled Retention Time Conditioning

- Large inspection doors giving full body access for clean and maintenance
Controlled Retention Time Conditioning

- Rotary pocket feeder
- A self-cleaning stainless steel rotary feeder with variable speed drive
- Gives an even feed to the pellet mill
Controlled Retention Time Conditioning

- Modular built conditioning systems
- Module I
  - Prebin
  - Feeder screw
  - Mixer conditioner type CM
- Module II
  - Retention time conditioner type CRT
- Module III
  - Retention time conditioner type CRT

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Feed Expander
Feed Expander

Loss in weight scaling
Conditioner
By pass
Feed expander
Wing crumbler
By pass

Feed screw
Steam
Liquid 1
Liquid 2
Steam
Pelletmill
To cooler

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Feed Expander

Process advantages:
• Increased addition of liquids, fat/oil, molasses to the compound before pelleting
• No negatively influence on pellet quality
• Increased possibilities to compose feed formulas without regard to the binding properties of the raw material
• Improved activating of the raw material’s natural binding abilities
• Improved productivity
• Less fines – less recirculation
• Larger capacity on the pellet mill
• Fewer blockages
• Longer lifetime for pellet mill wear parts
Feed Expander

**Product advantages:**

- Improved physical pellet quality/hardness
- Reduction/elimination of bacteria and mould etc. by heat treatment
- Reduction of growth inhibiting substances
- Improved digestibility of the feed compound
- Gelatinisation of starch (corn)
- Full fat soya

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## Feed Expander

- **Arguments for HTT conditioning**

<table>
<thead>
<tr>
<th>Poultry Feed</th>
<th>Pork Feed</th>
<th>Cattle Feed</th>
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<tbody>
<tr>
<td>Salmonella</td>
<td>Salmonella</td>
<td>Salmonella</td>
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<tr>
<td>Capacity</td>
<td>Capacity</td>
<td>Capacity</td>
</tr>
<tr>
<td>Physical feed quality</td>
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<tr>
<td>Increased flexibility</td>
<td>Increased flexibility</td>
<td>Increased flexibility</td>
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<tr>
<td>Increased productivity</td>
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<td>Increased productivity</td>
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<tr>
<td>Increased liquid fat addition</td>
<td>Increased liquid fat addition</td>
<td>Increased liquid fat addition</td>
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<tr>
<td>Crumbles directly</td>
<td>Crumbles directly</td>
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<tr>
<td>Improved feed conversion *)</td>
<td>Improved feed conversion *)</td>
<td>Improved feed conversion *)</td>
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<tr>
<td></td>
<td>More coarse structure in feed</td>
<td>By-pass protein from grain</td>
</tr>
</tbody>
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*) Yellow Corn/Soya formulations
Feed Expander

Feed Expander

- Functional principle
Feed Expander FEX

- Short burst of energy provides a high temperature and pressure the result of which is a high degree of starch modification = improved feed performance
Feed Expander FEX

• Installation examples
CM 2 HD – CRT Conditioning

- Gate to prevent steam back-flow
- Mass Flow based feeding
- Steam and liquid injection manifold
- Steam conditioning and liquid blend-in
- Gate for securing feed sanitation before pass-on
- CTR Retention Time Conditioner
- Pellet mill Equalizer Feeder
- Pellet mill By-pass (Forced feeder incl.)
Slide gate to prevent steam from backflow into the pre-bin

Standard F&B feed screw:

Primary heat source: Steam Multipoint injection manifold

Connection for excess steam relief

40 HP gear drive unit. Prepared for Frequency converter.

Reversible paddle shaft for optimum steam / feed interaction until pre-set temperature

Stainless steel barrel with heat tracing and insulation with Stainless steel cladding

Pneumatically operated gate for feed retention until set temperature
Pneumatically operated outlet gates for safe closing and even discharge.
Temperature sensors for feed & trough

Temperature sensors located in door for easy access and cleaning.

PT100 sensor housing for temperature measuring on casing

PT100 sensor housing for feed temperature measuring
Dampers to support the doors while servicing

Full opening for easy cleaning & paddle adjustment
• **Pre-heated** conditioner with insulated, electrically pre-heated and insulated conditioner barrel.

• **Pre set temperature** of all feed particles from 1st. second of feeding by steam injection until desired temperature (185 deg F) before pass on of feed from the conditioner.

• Cascade + CRT Conditioner = **Pre- set retention time** of all feed particles in pre heated and insulated barrel before pass on to the pellet press

• Cascade + CRT + **Pelletmill front pre-heated** and insulated is the best way to hygienic feed pellet production.

• Automation system secures functionality and trace-ability of all process inclusions and process temperatures.

Data log documentation for full sanitation conditioning from 1st. second
Step 1:  
Cascade conditioner securing 185 deg. F in all feed particles at line start-up, and optimum conditioning while running.

Step 2:  
CRT 1101 Conditioner  
First in First out, securing 60 to 120 sec. (variable) at selected temp. for all feed particles before entering the Pellet mill.
Integrated pneumatically operated leak free discharge gate between Cascade and CRT 1101

The gate first opens when entire volume of feed has reached pre-set conditioning temperature.
Cascade/ CRT Conditioning system

Discharge feeder from CRT retention time conditioner to pellet mill

Pellet mill with forced feeder incl. integrated by-pass and double wall insulated stainless steel front door.
• Cascade conditioner with adjustable paddles.

• Uniform filling for optimum conditioning.

• Multipoint steam injection and heated barrel insuring no condensation.

• Reversible shaft motion until pre-set temperature.
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Questions?

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