“Improving Production Efficiency”

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Improving Production Efficiency

Combination of Factors

✓ Ingredients

✓ Grinding

✓ Mixer Operation

✓ Pelleting System

✓ Mill Maintenance
Ingredient Specifications

- Ingredient Definition
- Nutrient Guarantees
- Desired Physical Characteristics
- Basis For Rejection
Ingredient Purchasing

Grain and feed ingredient specifications

- AAFCO Definition
- Typical Nutrient Analysis
- Physical Properties
- Basis for Rejection

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**Soybean Meal – Dehulled, Solvent Extracted**

AAFCO PRODUCT DESCRIPTION: Soybean Meal, Dehulled, Solvent Extracted is obtained by grinding the flakes remaining after removal of most of the oil from dehulled soybeans by a solvent extraction process. It must contain not more than 3.5% crude fiber. It may contain calcium carbonate or an anti-caking agent not to exceed 0.5% as defined in section 87 (Special Purpose Products) to reduce caking and improve flowability. The name of the conditioning agent must be shown as an added ingredient. When listed as an ingredient in a manufactured feed it may be identified as “Dehulled Soybean Meal.” The words “Solvent Extracted” are not required when listing as an ingredient in a manufactured feed.

AAFCO #84.7
IFN #5-04-612

**Nutrient Analysis**

<table>
<thead>
<tr>
<th></th>
<th>max</th>
<th>min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>12.5%</td>
<td>48.50%</td>
</tr>
<tr>
<td>Protein</td>
<td></td>
<td>1.0%</td>
</tr>
<tr>
<td>Fiber</td>
<td>3.5%</td>
<td></td>
</tr>
<tr>
<td>Ash</td>
<td>6%</td>
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</tbody>
</table>

**Physical Properties**

- Color: Light tan to a light brown.
- Odor: Fresh, typical of the product, not sour, musty or burned.
- Bulk Density: 36-40 lbs. per cubic foot.
- Sieve: 95% through #10 US

**Basis for Rejection**

1. Transportation method does not meet the FDA Regulations Governing the Transportation of Animal Proteins Prohibited From Use in Ruminant Feed
2. Product is adulterated or misbranded.
3. Contains product that got wet during shipping
Physical Characteristics

Communicate expectations and requirements to suppliers

Rejection Examples:

- High Moisture
- Poor Flowability
- Odor Not Consistent with Ingredient
- Foreign Material
- Inconsistent Particle Size
Bulk Ingredient

Requirement

✓ Ensure that all feed ingredients are received in a manner that preserves its identity and intended purpose.

✓ All equipment must be maintained to ensure efficient operation, eliminate cross-contamination

✓ Right stuff in the right bins
Grinding
Grinding

Benefits to Particle Size Reduction

✓ Increase pelleting rate
✓ Improve the mixing efficiency of ingredients
✓ Increase feed digestion
✓ Improve the binding ability between particles
✓ Increase particle homogeneity and prevent ingredient separation
Factors that Affect Grinding

At Feed Mill

- Grain Cleaning
- Grinding Equipment

Hammer mill

- Screen Size
- Screen Opening
- Air Systems
- Tip Speed
Factors that Affect Grinding

Grain Production

- Moisture
- Drying Conditions
- Storage Conditions
- Growing Conditions
- Genetics
Grinding

Screens should be replaced when:

- The hammer mill capacity decreases
- The product quality begins to deteriorate
- Capacity drops 10-15%
- Hole corn particles (Holes in the screen)

☑ Insure new screens have equal percentage of open area

☑ Lower hole number can reduce capacity 20%-40%
Correct Screen Pattern

Hammermill Screens

Hole Stagger

Correct

Incorrect

Hammer travel
Grinding

Replace Hammers when:

• Wear extends about 25% of width
• Grinding capacity is lost
• Motor amp load too high
• Excessive equipment vibration
• Broken hammers
• Loose on the pins
Grinding

Air Assist

- Replace/clean bags as needed
- Insure compressed air is dry
- Don’t pull too much air
- Plenum must be properly sized
- Bag house in good operating condition, no leaks
Mixing
MIXER CYLCE TIMES

- Major and Minor scale Discharge Time  30 sec
- Micro Addition Time  15 sec
- Dry Mix Time  30 sec
- Liquid Addition Time  45 sec
- Wet Mix Time  90 sec
- Mixer Discharge Time  10 sec

TOTAL: 220 sec
Improve Cycle Time

- Faster Liquid Addition
- Faster Scale Discharge
- Correct sized surge hopper
- Faster conveying
Mixing

Things To Check

- Is equipment cleanout adequate
- Are scales operating correctly
- Ingredients weighing within tolerance
- Is the mixer being filled correctly
- Are the liquid manifolds discharging evenly
- Adequate dry/wet mix times
- Confirm mixer surge cleanout time
Mixer Problems Examples

Horizontal (Ribbon) Mixers:

- Bent, broken, or missing ribbon sections
- Over filling/under filling
- Build-up on the center shaft(s) and/or ribbons
- A build-up of feed at one end or the other during mixing (often an indication of improper rotational speed)
Mixer Problems

Horizontal (Ribbon) Mixers:

- Excessive clearance between the outer ribbon and the mixer shell (a source of cross-contamination as well as poor mixing performance)
- Rotational speed too fast or too slow
- Incomplete clean-out after the batch is discharged
Mixer Profile

Validate changes

- Established procedures to ensure that maximum uniformity is obtained.
- Personnel should be trained and educated to understand the concept of uniformity.
- Appropriate testing should be conducted to ensure that uniformity objectives are met.
- Target CV’s of 10 or less
Pelleting
Pelleting

How the pelleting process affects your mill?

• Tons per man hour
• Labor cost
• Overtime
• Maintenance
• Equipment Utilization
• Energy consumption
Pelleting Factors

Ingredients

- Moisture, particle size

 Grinding

- Particle size

Mixing

- Uniformity

✓ Conditioning

- Steam, temperature, moisture and retention time requirements

✓ Pelleting

- Dies, Rolls,

Coolers (capacity)

- Air flow, bed level
Pelleting

Pellet Durability Factors

- Cooling: 5%
- Die Spec: 15%
- Formulation: 40%
- Conditioning: 20%
- Particle Size: 20%
Conditioning
Pelleting

Conditioning

- Higher pellet mill capacity
- Increased life of dies & rolls
- Better physical pellet quality
- Better conversion rate for bird/animal
- Consumption of electrical energy
- Sterilization *(FSMA STEP?)*
Conditioning

Reduced electrical energy use

• Steam reduces friction
• Lower pellet mill amps
• Lower energy bill
• Steam lubricates
• Steam softens the feed
STEAM SYSTEMS

- Boiler
- Header
- Pressure Reducing Valve
- Flow Control Valve
- Quick Shut off Valve
- Conditioner steam Inlet
STEAM SYSTEMS
Improve conditioning

What can we do?

• Check retention time/rpm

• Adjust picks/paddles

• Fill to 50-60 % full

  – Check steam line, header, traps, valves, insulation, condensate return, etc.
Pellet Die

Feeding the Die

- Spread the feed equally between the rollers
- Spread the feed evenly across the die face (front to rear)
- Prevent material from accumulating in the die cavity (routine cleaning)
- Prevent material from leaking past the feed cone (check clearance)
Pelleting

- **Wipers**: To take feed from the rear of the die and spread it back onto die surface

- **Deflectors**: To take feed off the feed cone spreading it evenly across the die face ahead of roll

- **Roll adjust**: To force the conditioned feed through the die
Pellet Die
Maximizing Capacity

- Die Spec
- Proper Die feeding
- Remove Tramp metal
- Conditioning
- Particle Size
Maintenance

WHY is maintenance important?

• Produce good quality feed
• Meet production requirements
• Reduce production downtime
• Reduce operating cost
• Meet regulatory requirements
• Protect company assets
Maintenance

Preventive Maintenance Scheduling

- Identify and number all equipment
- Establish maintenance needs for each
- Determine required intervals (daily, monthly, quarterly, yearly)
- Set a maintenance schedule for each
- Create a method to document and follow-up
- Train maintenance personnel
Maintenance

Critical Equipment

➢ Identify equipment that the mill **can not** run without

➢ Designate as priority maintenance and inspection

➢ Insure all possible spare parts are on shelf

➢ If replacement parts are not inventoried, know where to find them as well as delivery time

**BE PREPARED**
Maintenance

Focus Points

✓ Safety

✓ Quality

✓ Production
Maintenance

Quality & Production

➢ Ingredient preservation (diverters, distributors, slide gates, conveyors)

➢ Grind/particle size (hammer mill screens and hammers, air systems, roller setting)

➢ Mixing uniformity (mixer paddles/ribbon, discharge gates, over loading)

➢ Pellet quality (steam quality, die and roll condition, cooling, settings)

➢ Batching/dosing accuracy (scales, meters, controls)

➢ Feed identity (diverters, distributors, slide gates, conveyors)
Maintenance

What makes a good maintenance program?

1. Good people
2. Good training
3. Good process/system
4. Good documentation (FSMA)
5. Good follow-up

Plan  Predict  Prevail
Wrap Up

✓ Focus on the processes that improves productivity

✓ Must balance Efficiency with Quality

✓ Set Standards, Expectations, with no Exceptions

✓ Always Validate process and equipment changes

✓ Monitor and Measure

✓ Continuously quality improvement requires continuous commitment