

California Grain & Feed Industry Conference

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CALIFORNIA GRAIN & FEED ASSOCIATION

“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

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

Moisture	max	12.5%
Protein	min	48-50%
Fat	min	1.0%
Fiber	max	3.5%
Ash	max	6%

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 improve 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:

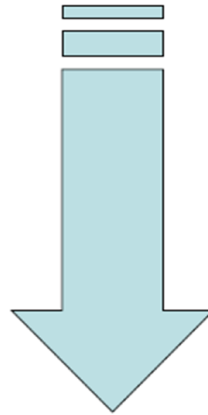
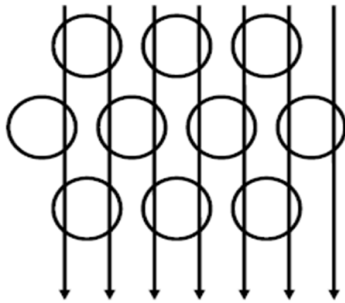
- The hammer mill capacity decreases
 - The product quality begins to deteriorate
 - Capacity drops 10-15%
 - Hole corn particles (Holes in the screen)
- ✓ ***Insure new screens have equal percentage of open area***
- ✓ ***Lower hole number can reduce capacity 20%-40%***

Correct Screen Pattern

Hammermill Screens

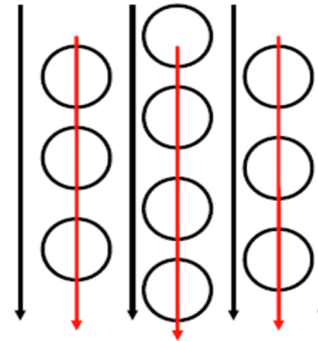
Hole Stagger

Correct



Hammer
travel

Incorrect



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	<u>30 sec</u>
▪ Micro Addition Time	<u>15 sec</u>
▪ Dry Mix Time	<u>30 sec</u>
▪ Liquid Addition Time	<u>45 sec</u>
▪ Wet Mix Time	<u>90 sec</u>
▪ Mixer Discharge Time	<u>10 sec</u>
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

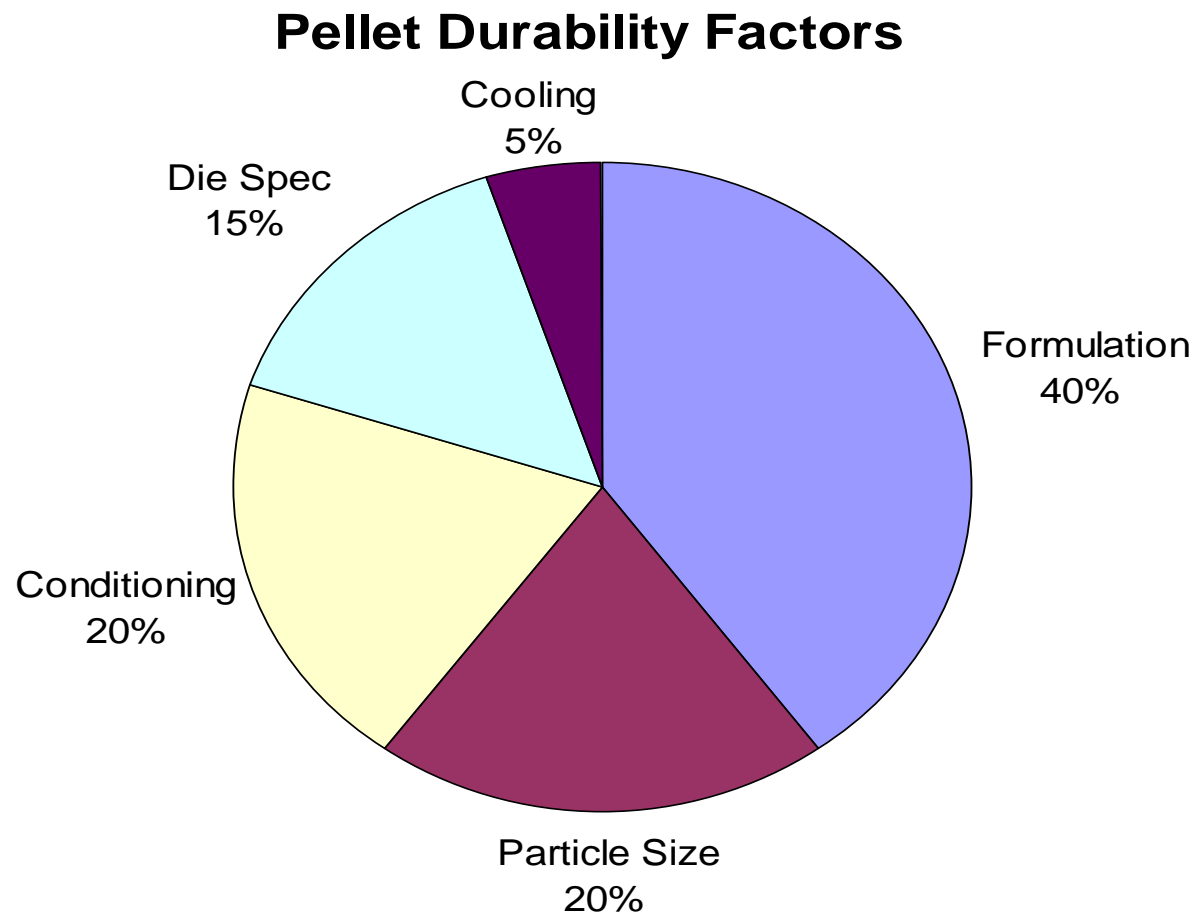
✓Pelleting

- Dies, Rolls,

Coolers (capacity)

- Air flow, bed level

Pelleting



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

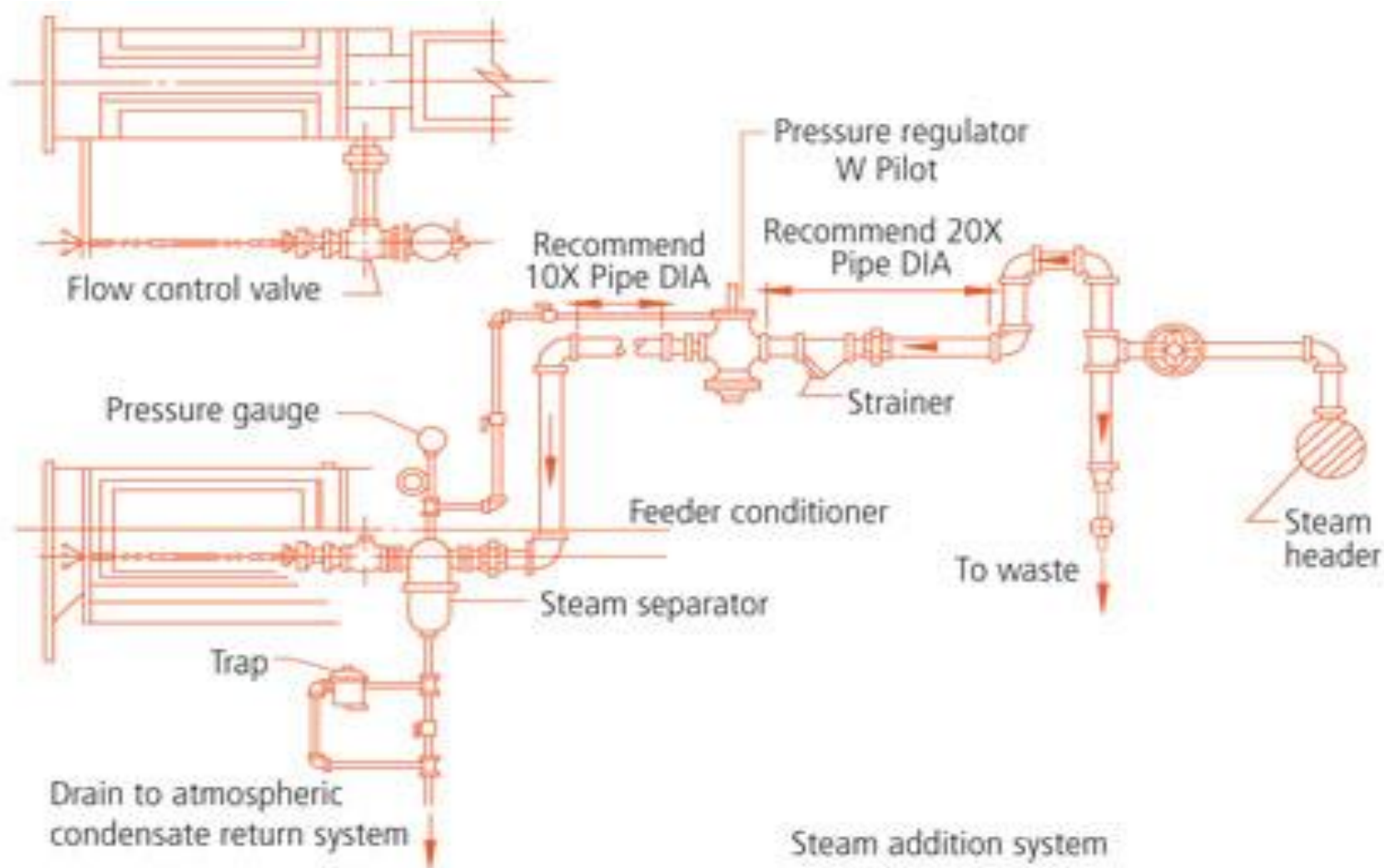
Reduced electrical energy use

- 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.

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 **S**tandards, **E**xpectations, with no **E**xceptions
- ✓ Always Validate process and equipment changes
- ✓ Monitor and Measure
- ✓ **Continuously quality improvement requires continuous commitment**

