



Receiving and Sampling for Feed Ingredients

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**EXCELLENCE
CENTER**

A  **SOY** program

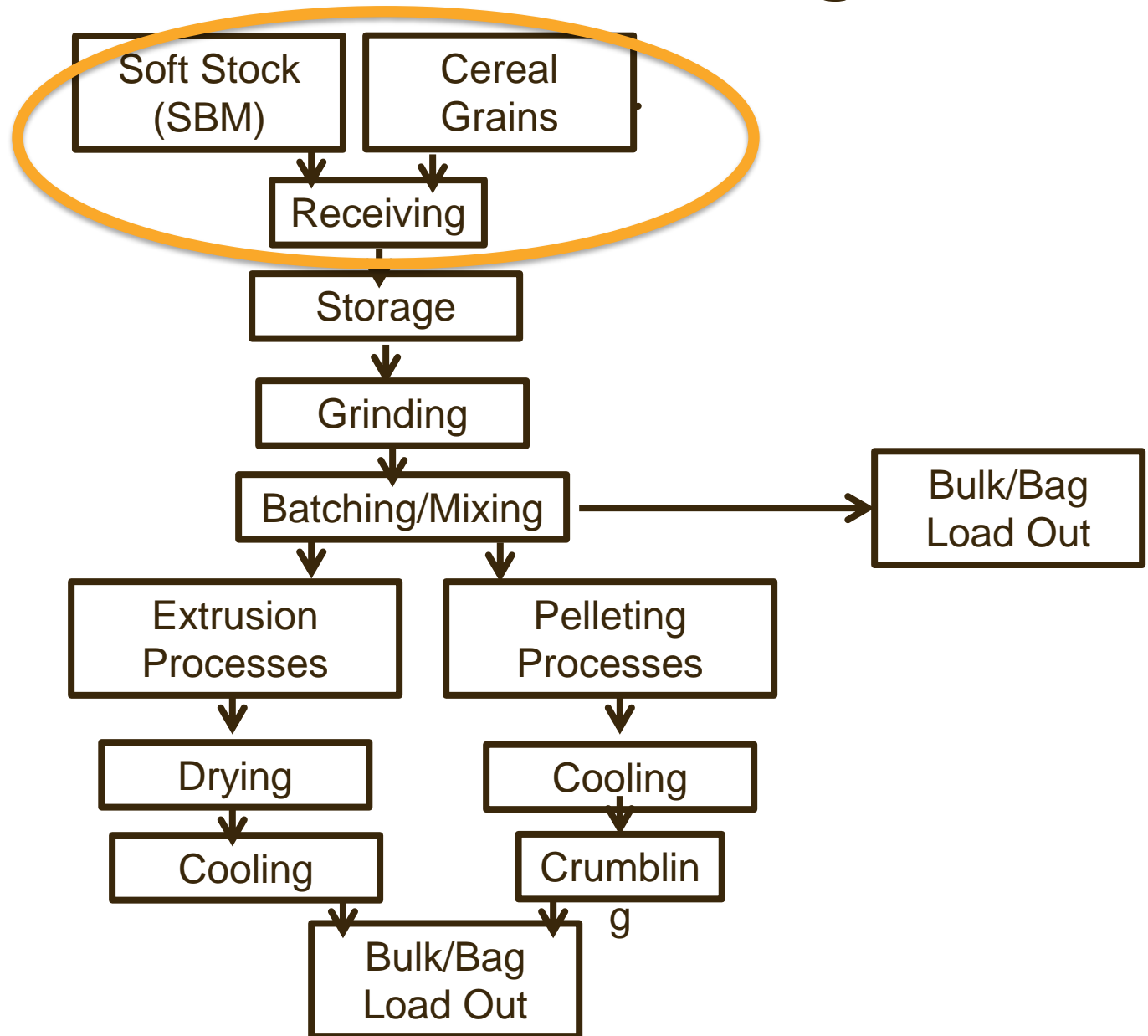
Learning Objectives

- Understand transportation of feed ingredients into a feed mill.
- Understand the receiving process in a feed mill.
- Understand how to sample feed ingredients.

Introduction

- The process of receiving feed ingredients is an essential part to produce quality feed since:
 - Sampling of feed ingredients to accept/reject and quantify quality.
 - Quantifies the amount of feed ingredient that enters the feed mill.
 - Helps organize where to storage each feed ingredient base on quality.
 - Essential part of the accounting process for management.

Animal Feed Processing



Feed Ingredient Receiving

- Unprocessed Grains
- Processed Bulk Ingredients (DDGS, wheat middling)
- Soft Feed Ingredients (SBM, canola meal)
- Heavy Feed Ingredients (minerals)
- Liquids
- Micro-ingredients

Feed Ingredient Receiving

- Ingredient receiving in bag
 - Additives
 - Fish Meal, SBM
- Ingredient receiving in bulk or bags
 - Cereal, soft stocks
 - Liquids (containers or bulk)



Ingredient Transportation

- Bulk ingredients – grains, soybean meal, wheat middlings, DDGs, minerals, trace mineral,



Hopper Bottom Trailer



Straight Axle Truck



Dump Trailer



Trucks used to transport bags

Ingredient Transportation

- Bulk Ingredients – Lysine, Salt



Pressurized Trailer

- Liquid Ingredients – Animal Fat, Choline, Molasses



Liquid Tanker Trailer



Portable liquid transportation options

Ingredient Transportation

- Rail
 - Ingredients
 - Corn – Unit Trains
 - SBM, Midds, DDGS, Minerals – Individual Cars
 - Fats – Tanker Cars – Separate Tracks



Ingredient Transportation

- Bulk cereal grains – corn, wheat



Barge loading process in rivers

Ingredient Transportation

- Ships
 - Loading Port
 - Weather Conditions
 - Government Officials
 - Unloading Crew



Unloading scales in port



Procedures for Receiving Ingredients

1. Weigh-in gross weight including product
2. Sample ingredient and do visual inspection
3. Perform quality control checks
4. Move to unloading position
5. Secure in position with chock or brakes
6. Check for leakage
7. Open gates properly and begin unloading
8. Clean and sweep containers
9. Sweep unloading area
10. Weigh-out unloaded vehicle

Receiving Center Equipment

- Scales
- Unloading Mechanisms
 - Truck Dumper
 - Hopper bottom trailers or RR cars
 - Mechanical Scoops
 - Front End Loader for barges
 - Dump pit
- Receiving hopper and conveyors
- Cleaning/screening devices
 - Magnets, Grain scalpers, Grain cleaners
- Elevator legs

Truck Scales



Scales – Your Cash Register

- Recommend quarterly testing of all truck scales
- If you have 2 or more truck scales, daily cross checks are recommended
- Never use a customer's truck to “cross check”
- Maintenance and calibration is essential
- Scales should be on isolated circuits, protected form RF, static and other electronic interference

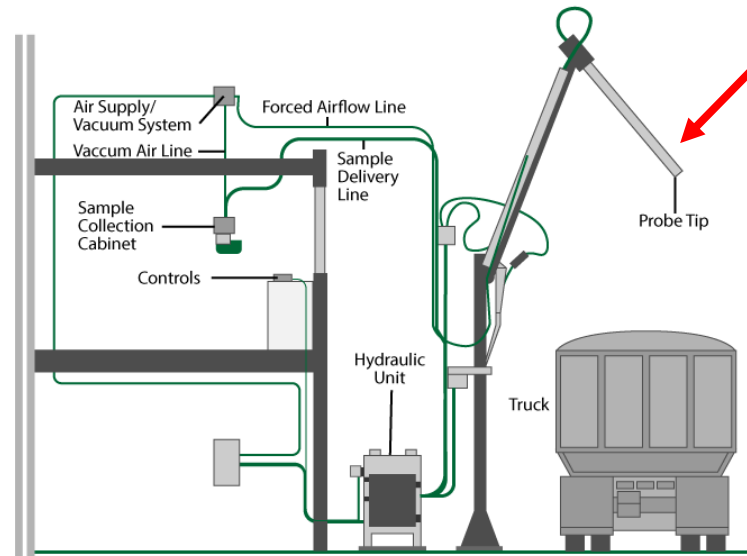
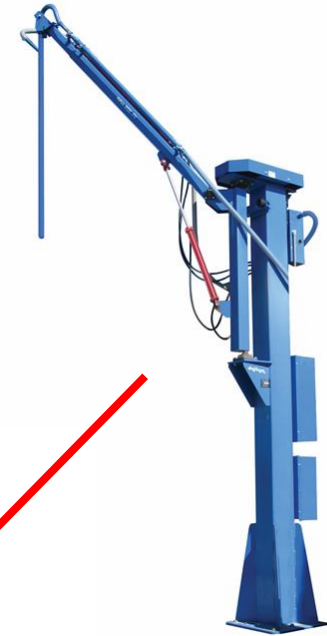
Sampling

- Objective: obtain a portion of the inbound ingredients that represents (use a sampling device) the entire lot
- Fewer samples and compositing reduces the information attained
- Opinions vary: at some point complex sampling schemes become impractical

Important Concepts In Sampling

- Need trained personnel
- Consistency in the measurements
- Keep records (data)
- A non-representative sample can cause problems
- Two key factors
 1. Location
 - The more the better
 2. Frequency
 - The more the better

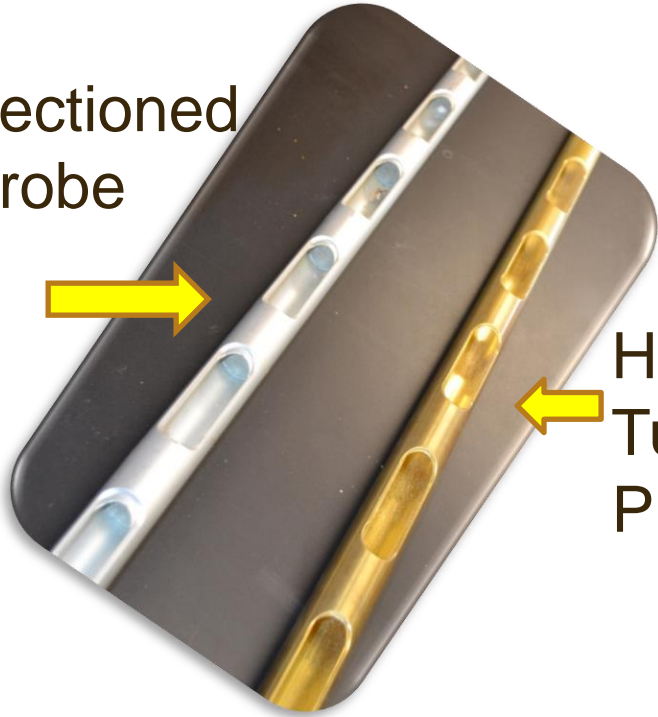
Sampling Equipment



Grain Sampling Probes

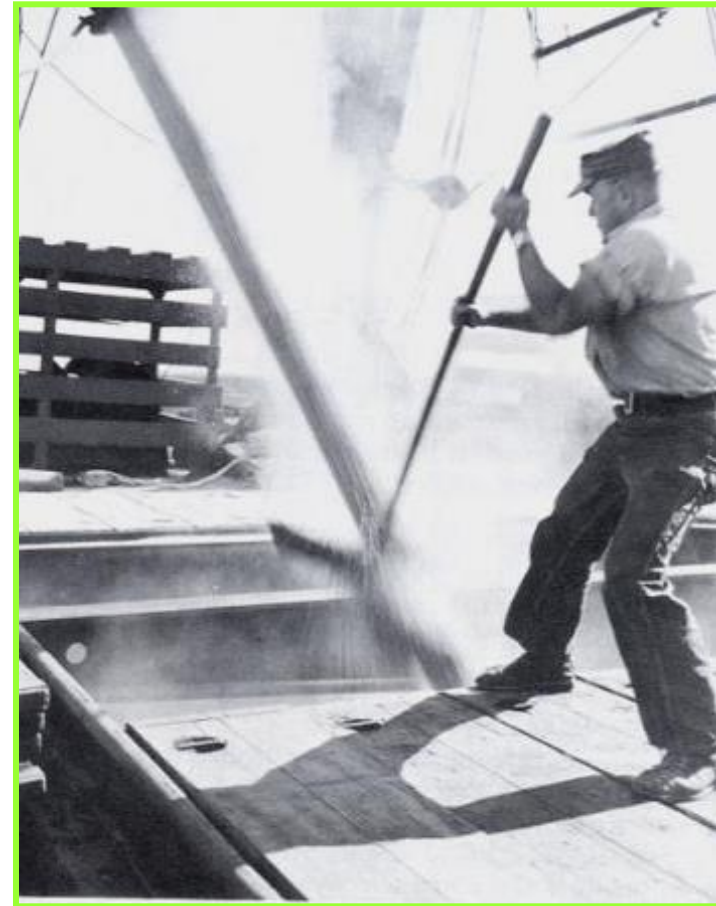
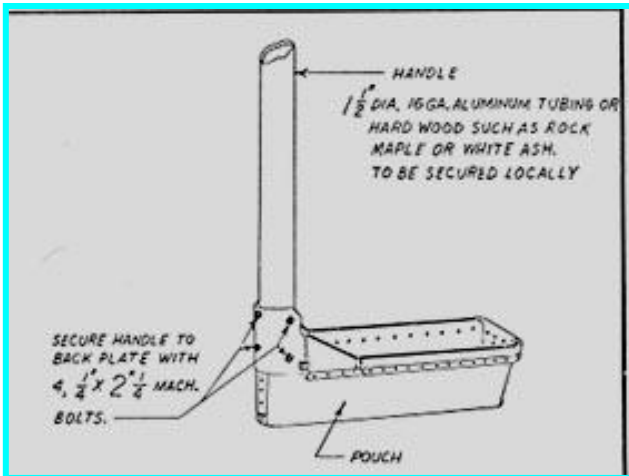


Sectioned
Probe



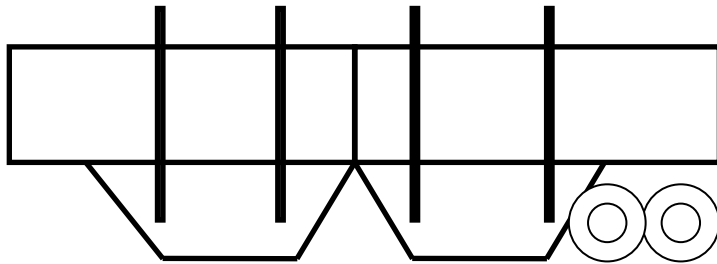
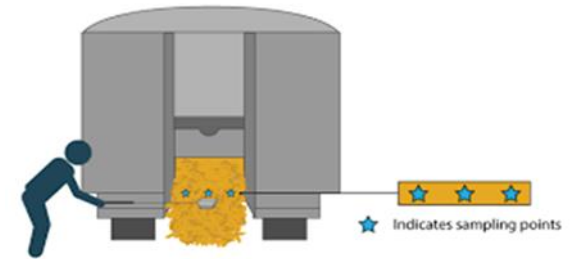
Hollow
Tube
Probe

Other Types of Sampling Equipment

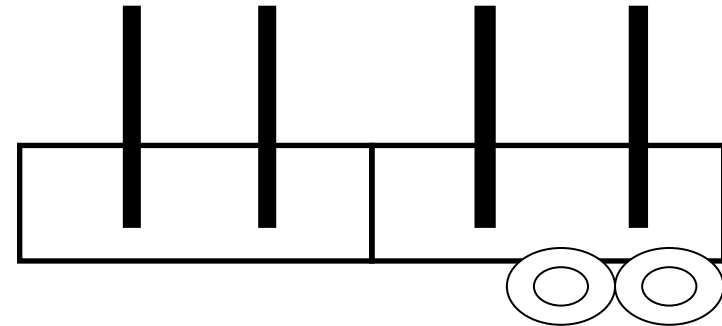
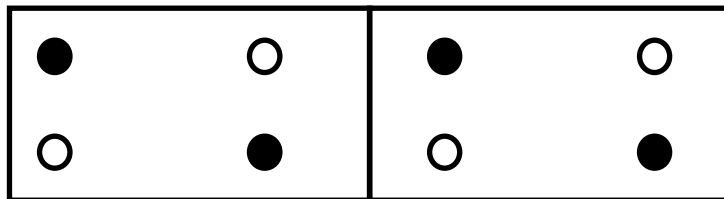


Sampling Procedures

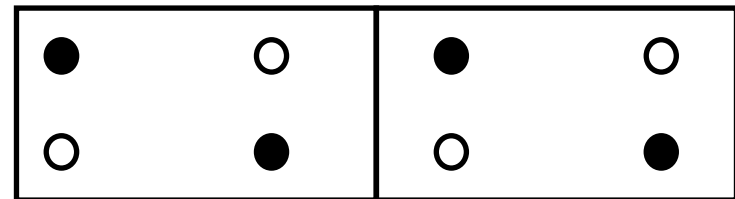
Avoid sampling only at the beginning of unloading



Grain Trucks



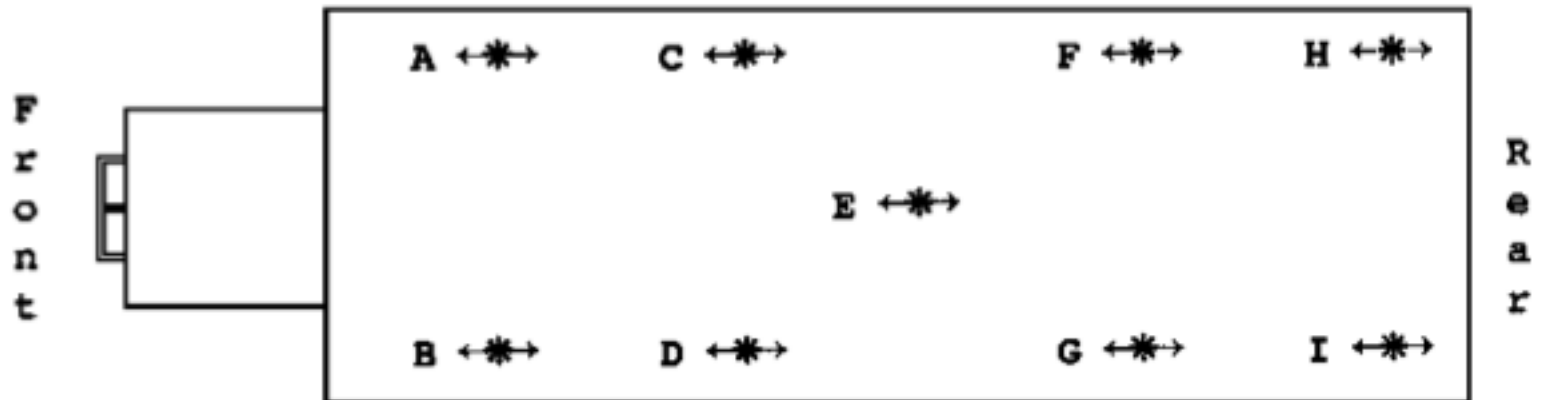
Flat Bed



Some Official Sampling Procedures

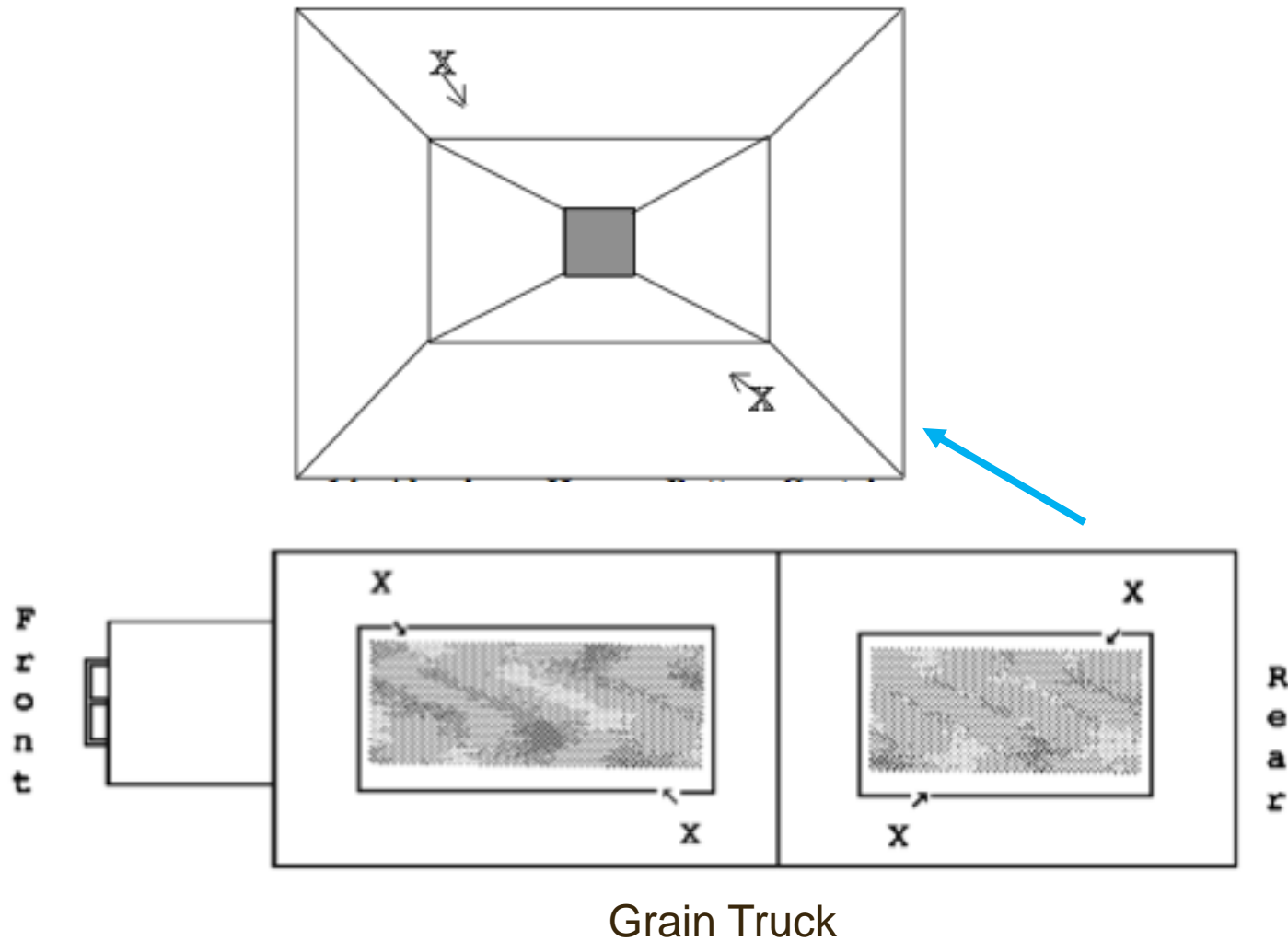
- Flat bed trucks of less than 1.2 m of Depth, use the following sampling scheme:

Flat Bed truck



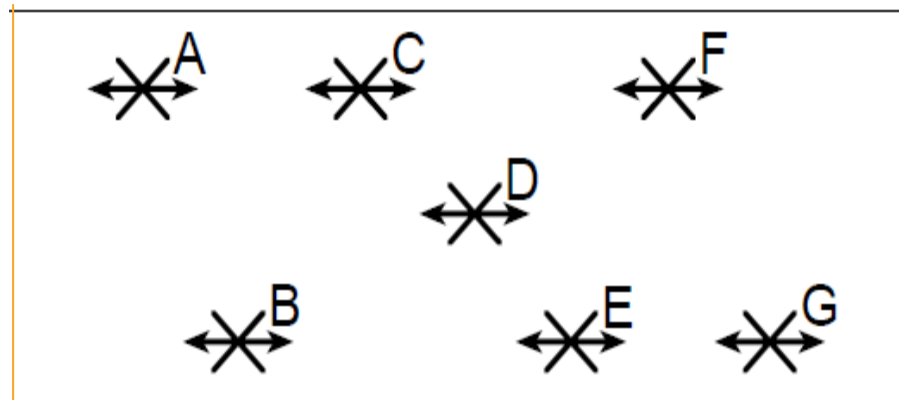
Source: Grain Inspection Handbook, USDA

Sampling Procedures Bulk Truck



U.S. Federal Grain Inspection Service (FGIS) Sampling Procedure

- **Point A:** 2 feet front front and side
- **Point B:** halfway from the front & center, 2 feet from the side
- **Point C:** $\frac{3}{4}$ front front & center, 2 feet from side
- **Point D:** Center
- **Point E, F & G:** Same as A, B and C but on the other half.

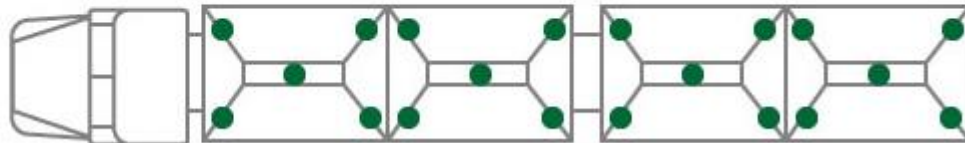
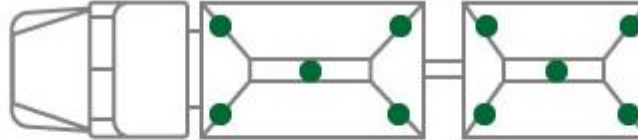
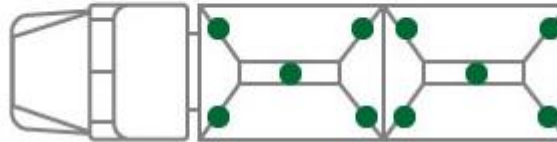
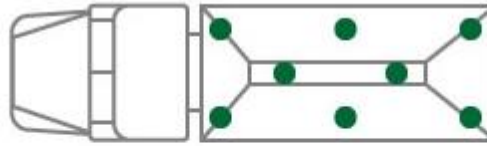


Examples of Sampling Schemes on Trucks

No. of probe samples:

- 8 minimum / single truck
- 10 minimum / partitioned truck or truck & trailer

Recommended sampling pattern, probe where indicated by ●



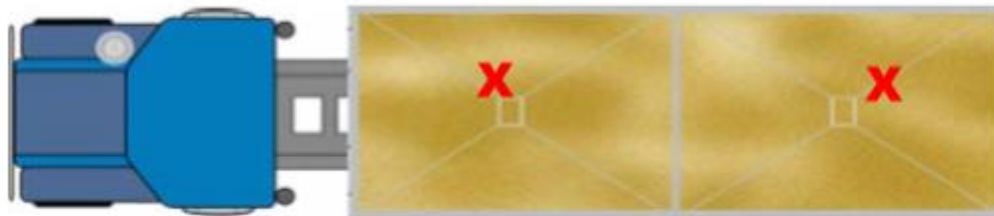
Example of Truck Sampling Scheme

Sampling points X



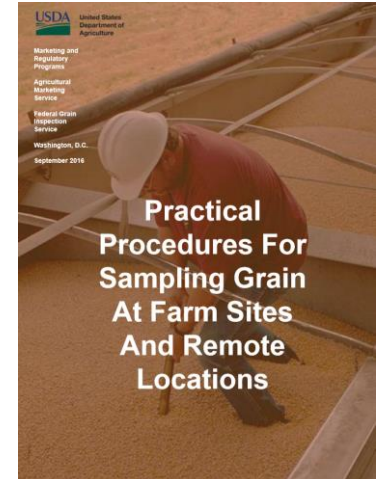
Flat Bottom Truck - 5' or 6' probe

Flat truck

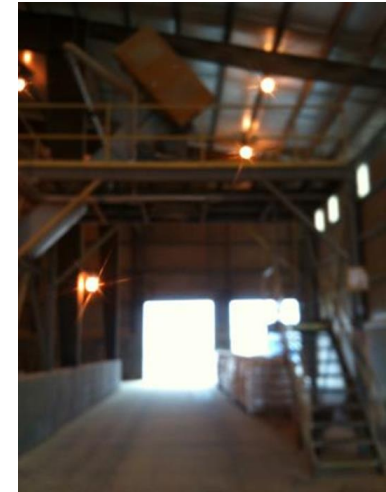
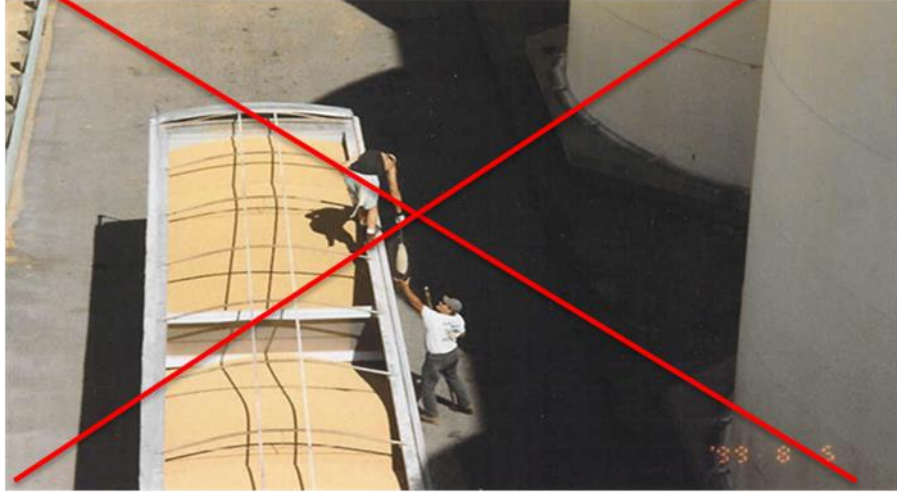


Hopper Truck - 6' to 10' probe

Grain bulk truck



Safety in Sampling



Hand Sampling in a Truck

- Take 5 to 10 samples during unloading
- Samples taken across the unloading flow
- Monitor unloading



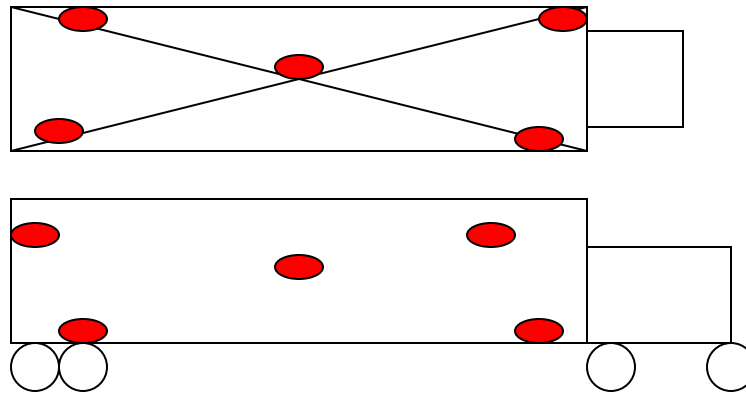
Bag Sampling Procedure



- Take one bag for every 10 bags
- Random sampling in every 10 bags
- Check weight of bags



Sampling Scheme for Trucks with Bags



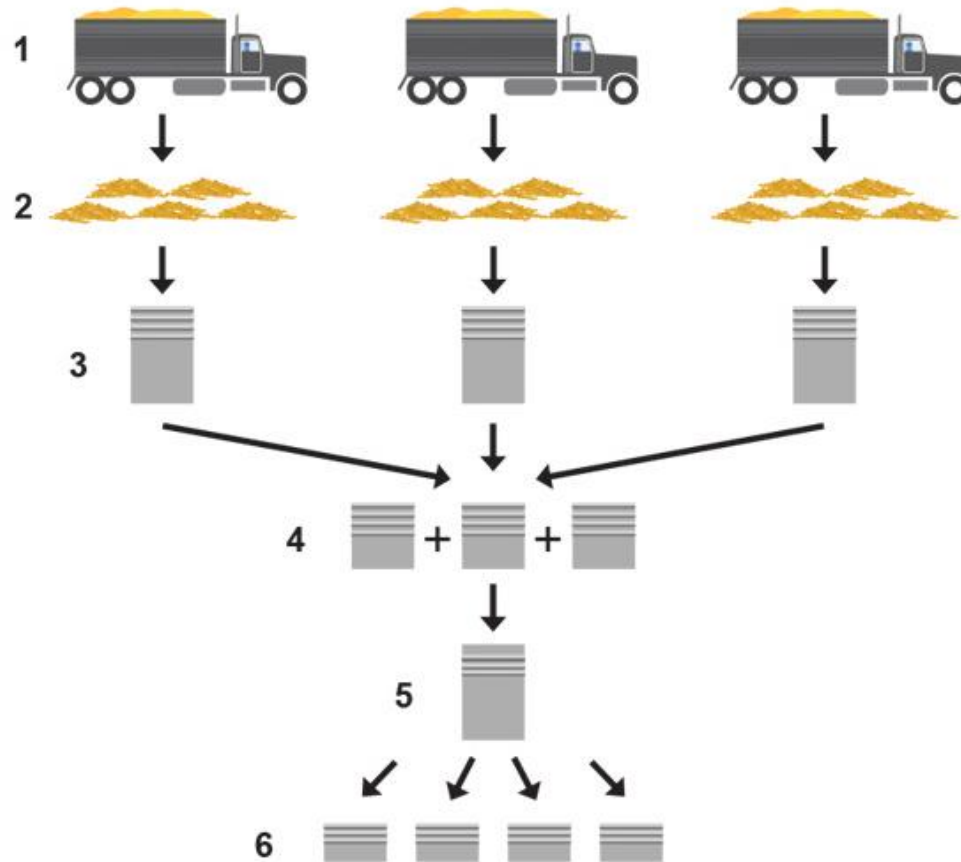
● Sampling Point

How to Prepare a Composite Sample?

- No official procedure or science
- Recommendation:
 1. Put sub-samples in 5-gallon buckets (15 kg)
 2. Mix collected sub-samples in one bucket or in a tarp
 3. Then divide it to the right the size for analysis



Example of Composite Sample Preparation



Sampling Considerations

- Take sub-samples from a lot and mix them to have a composite and representative sample.
- Minimum size of sample of 2 kg (5 pounds).
- Use clean plastic bags or container to put samples.
- Always keep half the sample as archive.

Liquid Sampling

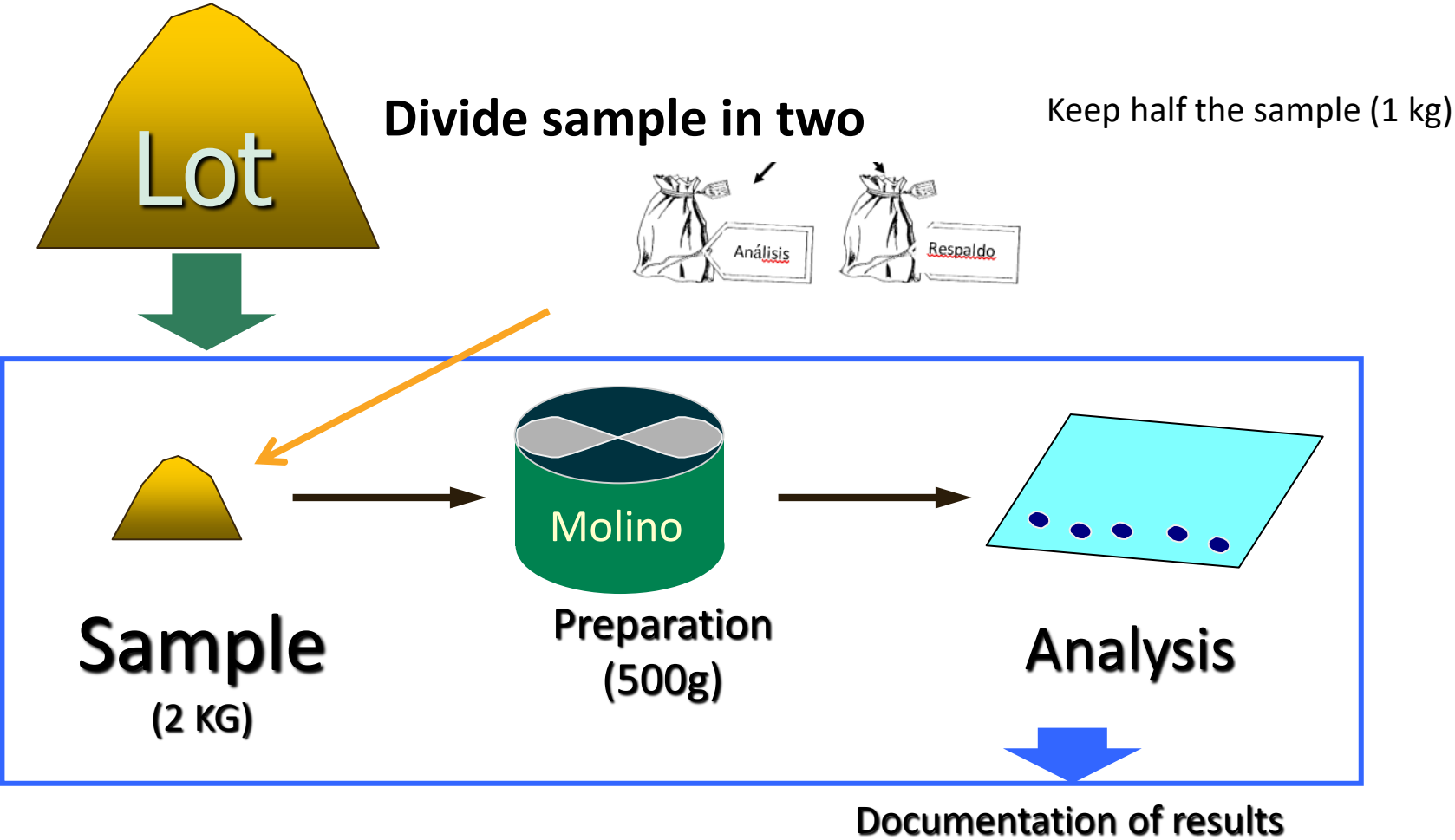
- Container or barrels
 - Take sample from 10% of container and get at least 500 ml



- Trucks with tanks (for fat and molasses)
 - Take sample before unloading
 - Let probe go all the way to the bottom of the tank
 - Take at least 1000 ml
 - Mix with other sub-samples

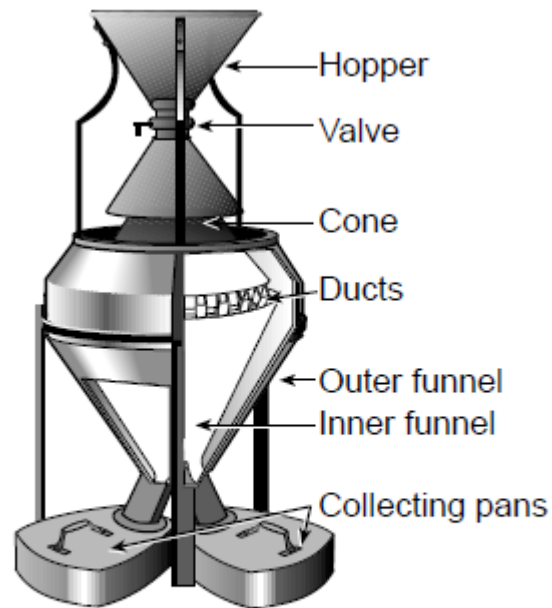


Receiving, Sampling and Analysis



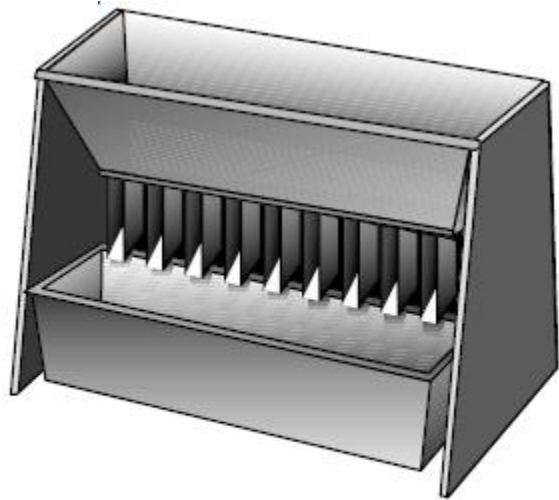
How to divide the Sample?

- For grain, use Boerner Divider



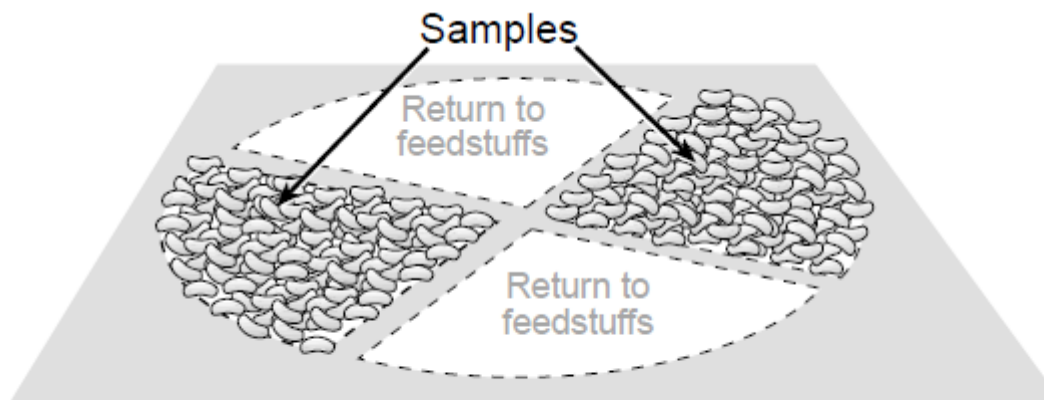
How to divide the Sample?

- For mash type feed ingredients like SBM or DDGS and finished feed
- **Riffle**



How to divide the Sample?

- For fibrous type ingredients like wheat middlings or pasture



Ingredient Assay Table

Ingredient	Protein	Moisture	Fat	Fiber	Calcium	Phosphorous	Sodium	Magnesium	Aflatoxin	Pepsin Digest	Urease	Microscopic	M.I.U.*	Brix	Frequency**
Corn	X	X							X						W
Cereal Grain	X	X													W
Soybean Meal	X	X		X							X				E
Middlings	X	X		X											W
Alfalfa	X			X											W
Rice Mill Feed	X		X	X											W
Corn Gluten Feed	X														E
Corn Gluten Meal	X														E
Fish Meal	X		X		X	X	X	X		X		X			E
Meat/Bone Meal	X	X	X		X	X	X			X		X			E
Poultry Meal	X	X	X		X	X	X			X		X			E
Peanut Meal	X	X		X					X						E
Peanut Hulls	X			X					X						W
Cottonseed Meal	X								X						E
Cottonseeds	X		X	X					X						W
Sunflower Meal	X			X											E
Safflower Meal	X			X											E
Bakery Meal	X		X									X			E
Molasses														X	E
Fat													X		E
Limestone					X			X							W
Feathermeal	X	X										X			E

* Moisture, Impurities, Unsaponifiables

**W = Weekly, E = Every Load

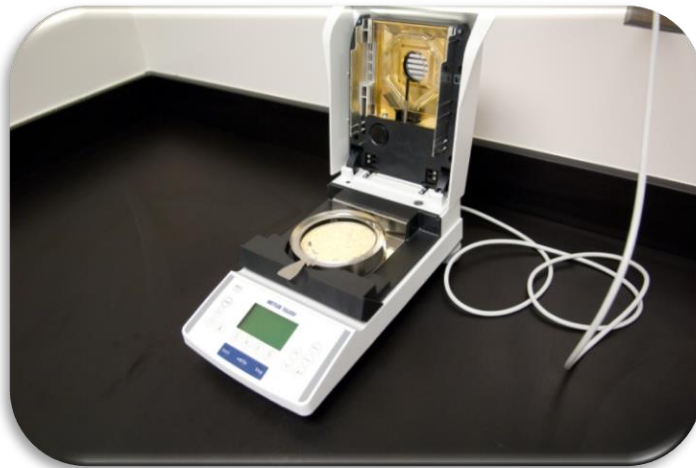
Examples of Quality Analysis



Cereal Grain Moisture



Corn Grading



Soft Ingredient Moisture



Mycotoxins

Example of Quality Analysis

- Particle size is typically specified based on material passing through a specific sieve.
 - DDGS – 95% thru #10
 - Soybean Meal – 95% thru #10
 - Limestone – 99% thru #12
 - Salt – 90% thru #8



Documentation of Samples

- Keep tags on sample
- Related identification number of sample for documentation of quality analysis results



40.6250	57.7500	29.5000
78.2500	77.2500	24.5000

Receiving

- Check Shipping Documents
 - Ingredient identification, supplier, hauler
 - Name and location of shipment destination
 - Delivery ticket
 - Lot number
 - Ingredient labeling
- Verify compliance with government regulations
- Confirm weights
 - Compare shipper vs. receiver
 - Check bag weights and number



Receiving Center Records

- Identify product received
- Quantity
- Name of supplies
- Date received
- Condition
- Signed receipt
- Manufacturers' lot number
- Expiration date on drugs and vitamins
- Where stored
 - bin, room, etc.
- Time and sequence of unloading

Receiving

- Employee responsibilities:
 - Be present during the entire process
 - Periodically check the quality during unloading
 - Do not leave the driver unattended
 - Weigh the truck before and after unloading
 - Complete Medication Receiving Report
 - Complete Receiving Report



Grain Unloading in Bulk



Dumping Pits



Truck & Trailer Lifts/Dumpers



- Truck lifts are used for flat bottom trucks that are not self-dumpers.
- Trucks and trailers are lifted until the material flows from the trailer.
- Safety Requirement
 - Driver must not be in the truck
 - Employees should not be near the raised platform



Receiving Pit Air System



Truck Pit



Rail Pit

- Truck pits generally have air systems.
- Rail pits generally rely on choke fed pits for dust control

Liquid Receiving Area



- Liquids are pumped from trucks to insulated tanks

Unloading of Bags

- Same procedures as in bulk feed ingredients
- Check of no ruptures of bags
- Handle with care to avoid damage
- Store in pallets



Prepare Your Own Checklist For Receiving

Checklist for Receiving Feed Ingredients	
Bulk Ingredients	Bagged Ingredients
<p>1. Shipping Documents</p> <p><input type="checkbox"/> Does the information contained on the bill of lading or shipping document match the order?</p> <p><input type="checkbox"/> Does the bill of lading/shipping document contain the correct address of our mill?</p> <p>2. Color</p> <p><input type="checkbox"/> Is the color normal?</p> <p><input type="checkbox"/> Is the load uniform in color?</p> <p>3. Odor</p> <p><input type="checkbox"/> Does the ingredient have the typical smell?</p> <p><input type="checkbox"/> Is there a musty, moldy, sour, burned or foreign odor present?</p> <p>4. Texture/Uniformity</p> <p><input type="checkbox"/> Are there lumps in the load?</p> <p><input type="checkbox"/> Is there any mold evident?</p> <p><input type="checkbox"/> Is there foreign material present?</p> <p><input type="checkbox"/> Is there any evidence that the shipment has become contaminated or damaged during shipment?</p> <p>5. Insects and Rodents</p> <p><input type="checkbox"/> Are there live or dead insects in the load?</p> <p><input type="checkbox"/> Is there any evidence of insect damage?</p> <p><input type="checkbox"/> Are there rodent pellets in the load?</p>	<p>1. Labels</p> <p><input type="checkbox"/> Is each bag properly identified and labeled?</p> <p><input type="checkbox"/> Does the label information match the bill of lading or shipping information?</p> <p>2. General Appearance</p> <p><input type="checkbox"/> Are the bags in good condition?</p> <p><input type="checkbox"/> Is there evidence of contamination, such as stained or wet bags?</p> <p><input type="checkbox"/> Are there live or dead insects visible?</p> <p>3. Color</p> <p><input type="checkbox"/> Is the color typical?</p> <p><input type="checkbox"/> Is the color uniform from bag to bag?</p> <p>4. Odor</p> <p><input type="checkbox"/> Does the material have the typical odor?</p> <p><input type="checkbox"/> Is there a musty, sour, burned or foreign odor present?</p>
<p>If the shipment does not meet the checklist requirements, contact a supervisor before unloading.</p>	

Conclusions

- Receiving systems should be designed for a wide variation of ingredients
 - Example: Grains, Soft Ingredients, Minerals, Liquids
- Design a QA check program to check the quality of inbound ingredients prior to unloading.
- Develop your own sampling scheme based on your conditions and type of ingredients.
- Dust control systems in the receiving area will reduce the time required for housekeeping.

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Thank you!

