Quality Assurance Considerations for Aquafeeds©

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ASA American Soybean Association International Marketing®

SOY-FED FISH
Farming the land to sustain the sea

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Feed Specialist Presentations

This presentation is one of a series of presentations prepared for the USSEC Feed Specialist program. Information is presented "as is" and is not intended to be definitive or complete, but as a starting point for presentations given in person. Please contact LManomaitis@ct.asaim.org if you are interested learning more.

Mark Newman, Feed Specialist (left) and Lukas Manomaitis, Technical Director (right)

Servicing the Global Aquaculture Market through:

- ✓ Technical support – the only commodity soy that provides worldwide technical support
- ✓ Holistic approach to aquaculture programs

International marketing activities for US Soybeans are supported by US soy farmers through the Soybean Checkoff program. US farmers believe and stand behind their product and its use worldwide.

TOTAL QUALITY

- **COMMITMENT FROM TOP MANAGEMENT**
  - **PHILOSOPHY : ACHIEVING CONSISTENT HIGH QUALITY HAS A COST**
    - **PERSONNEL**
    - **TIME**
    - **COST OF ANALYSES**

Control, Measure, Define

- **We cannot improve on what we cannot control:**
- **We cannot control what we cannot measure, and;**
- **We cannot measure what we cannot define.**

Dr.Kim Koch

Northern Crops Institute – North Dakota

Total Quality

Ingredient Purchasing

Ingredient Receiving

Ingredient Storing

Feed Formulation

Feed Processing

Feed Storage

BLOOD MEAL, SPRAY DRIED

Nutrient	%
Protein (min.)	85.0
Protein Digestibility, min.(by pepsin)	96.0
Fat	1.6
Fiber	1.0
Ash	5.8
Moisture (max.)	8.0
Lysine (min. available)	80.0

BREWER'S DRIED YEAST

Nutrient	%
Protein	40.0 - 45.0
Fat	0.5 - 1.5
Fiber	1.5 - 3.5
Ash	6.5 - 10.0
Moisture	7.0 - 10.0

CORN GLUTEN MEAL

(NOT TO BE CONFUSED WITH *CORN GLUTEN FEED)*

Nutrient		%
Protein	(%)	60.0 – 63.0
Fat	(%)	1.0 – 3.0
Fiber	(%)	1.0 - 2.5
Ash	(%)	1.5 – 2.0
Moisture	(%)	9.0 – 11.0

FEATHER MEAL - HYDROLYZED

Nutrient	%
Protein	85.0
Fat	3.0
Fiber	1.4
Ash	3.5
Moisture	7.0
Pepsin Digestibility	75.0 - 85.0

FISH MEAL

Type	Species	%Protein	%Fat	%Fiber	%Ash	%H_2O
White Fish	Cod	60 - 67	4 - 8	1.0	18 - 23	9 - 10
	Hake	62 - 68	4 - 8	0.7	17 - 22	9 - 10
	Pollack	66 - 72	4 - 8	0.8	12 - 18	9 - 10
Brown Fish	Anchovy	63 - 69	7 - 10	1.0	13 - 18	9 - 10
	Herring (whole)	67 - 72	8 - 12	0.7	9 - 12	9 - 10
	Mackerel	63 - 69	7 - 10	1.0	12 - 18	9 - 10
	Menhaden	61 - 64	8 - 10	1.0	16 - 19	9 - 10
	Salmon	62 - 70	7 - 12	1.0	10 -18	9 - 10
	Sardine	63 – 68	6 – 10	1.0	15 - 18	9 - 10
Other	Tuna	54 - 66	7 - 11	1.0	17 - 27	9 - 10

FISH MEAL

Analyses	Fresh		Moderately Fresh		Stale	
TVN (mg /100g)	10	25	30	60	75	150
Histamine (ppm)	<30	35	300	<800	800	900
Total Biogenic Amines (ppm)	<120	<400	1000	<2000	>2000	- -

FISH OIL

Component	Units	Anchovy	Cod	Herring	Menhaden
Protein	%	0.0	0.0	0.0	0.0
Fat	%	99.0 - 99.5	99.0 - 99.5	99.0 - 99.5	99.0 - 99.5
ω3 Fatty Acids	%	31.2	27.0	17.8	15.7
ω6 Fatty Acids	%	1.3	3.0	1.4	1.0
Free Fatty Acids	%	< 3	< 3	< 3	< 3
PV	meq/kg	< 10	< 10	< 10	< 10
20 hr AOM	meq/kg	< 20	< 20	< 20	< 20
Fiber	%	0.0	0.0	0.0	0.0
Moisture	%	0.5 - 1.0	0.5 - 1.0	0.5 - 1.0	0.5 - 1.0
Ash	%	0.0	0.0	0.0	0.0

POULTRY BY-PRODUCT MEAL

- **Also known as Poultry Offal Meal, but not to be confused with Whole Poultry Meal.**
- **Urea < 0.5%**
  - **(Check with non-protein nitrogen)**
- **Adulteration with raw feathers will reduce protein quality and digestibility.**
  - **(Apparent protein digestibility less than 50% could indicate adulteration.)**

POULTRY BY-PRODUCT MEAL

Nutrient		PBM – 60 IFN 5-03-798	PBM – 66 Low Ash	PBM – 69 Air Classified
Protein	%	60.0	66.0	69.0
Fat	%	13.1	9.0	14.6
Fiber	%	2.3	2.0	2.4
Moisture	%	6.0	7.0	4.5
Ash	%	15.7	14	9.5
Calcium	%	3.0	2.7	1.8
Phosphorus	%	1.7	1.5	1.0

SOYBEAN LECITHIN - COMPOSITION

Nutrient	%
Acetone Insolubles*	64
Triglycerides & Fatty Acids	35
Moisture	1

* Phospholipids (PC, PE, PI, PA, minor phospholipids, glycolipids, complexed sugars)

LIQUID LECITHIN COMPARED TO DRY, DEOILED LECITHIN

Nutrient	Liquid	Deoiled
Acetone Insolubles	64%	96%
Triglycerides & Fatty Acids	35%	3%
Moisture	1%	1%

2% liquid x 0.64 = 1.28% AI

1.33% Deoiled x 0.96 = 1.28% AI

SOYBEAN LECITHIN – QUALITY

Nutrient	%
Fat	>69.0
Acetone Insolubles	>50.0
Choline	2.3
Inositol	1.5
Phosphorus	2.0
Moisture	<1.0

SOYBEAN MEAL "HIGH PRO"

Nutrient	%
Protein	46.0 - 48.0
Fat	0.5 - 1.5
Fiber	3.0 - 3.5
Ash	5.5 - 6.0
Moisture	< 12.0

SOYBEAN MEAL - QUALITY

Analyses	
Trypsin inhibitor	< 3 mg activity/g
Urease, increase pH	0.0 – 0.23
Protein solubility index	>80 %
Ash	5.5 - 6.0 %
Moisture	< 12.0 %

TYPICAL DDGS COMPOSITION (NRC, 1994)

- **DRY MATTER** **93.0%**
- **CRUDE PROTEIN** **27.4%**
- **CRUDE FAT** **9.0%**
- **CRUDE FIBER** **9.1%**

- **<u>QUALITY CONCERNS</u>**
- **LYSINE DIGESTIBILITY**
- **MYCOTOXINS**

Ingredient Purchasing

Ingredients account for approximately 80% of the total cost of manufacturing complete feeds

- Commodities
- Branded Products
- Specialty Ingredients & Additives

QA Inputs

- Ingredient Specifications
- Supplier Evaluations
- Approved Supplier List

Ingredient Receiving

- Weighing
- Sampling
- Inspecting
- Storing & Labeling

Sampling Program Elements

1. Sampling Purpose
- *nutritional evaluation*
- *animal health problem*
- *sensory inspection*

2. Sample Material
- *whole grain*
- *ground ingredients*
- *liquid ingredients*
- *premix / additive*

3. Sample Size

4. Sample Equipment

5. Sample Procedure & Frequency

6. Sample Preparation & Retention

Types of Samples

Discrete Sample: also called a "grab" sample, is a small amount of material from a specific location

Composite Sample: a sample formed by combining numerous grab samples

Duplicate Sample: a representative portion of an existing sample

Retained Sample: a duplicate portion of a sample that is stored for later reference or use

Types of Samples

Reference Sample: a sample of known characteristics that is kept as a guide or comparison check, usually for visual inspections

Referee Sample: a sample taken, often by an impartial surveyor, and submitted for analysis for the purpose of resolving a dispute between buyer and seller

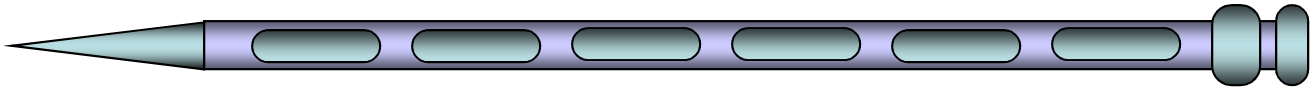
Official Sample: a sample taken by a government official for regulatory or grading purposes

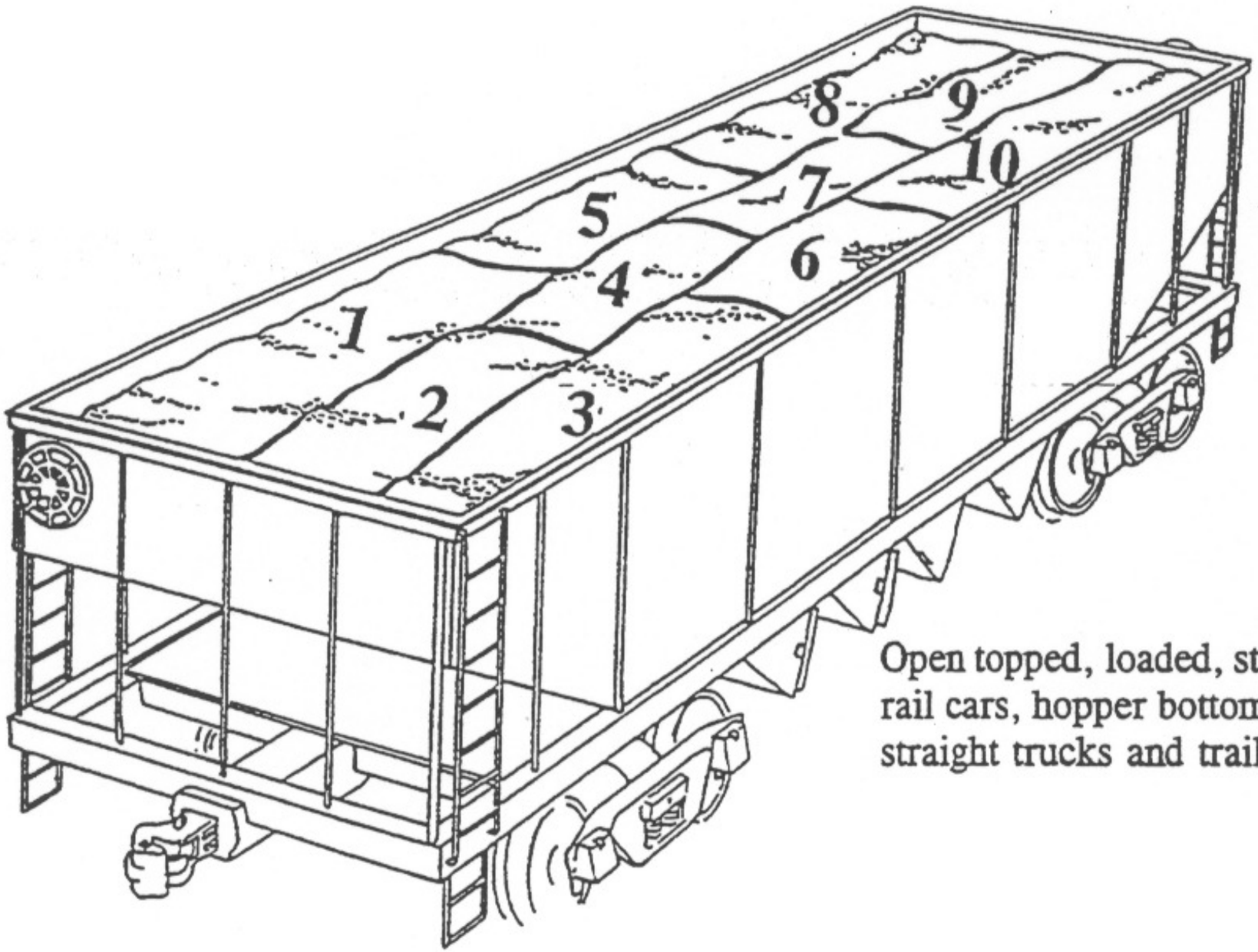
Purchasing Sample: a portion of an ingredient lot that a supplier gives to a purchaser to define the quality characteristics of a shipment of product

Sampling Equipment

Grain Probes

- Double Tube
- Open Handle
- Multiple Slots
  - straight
  - spiraled





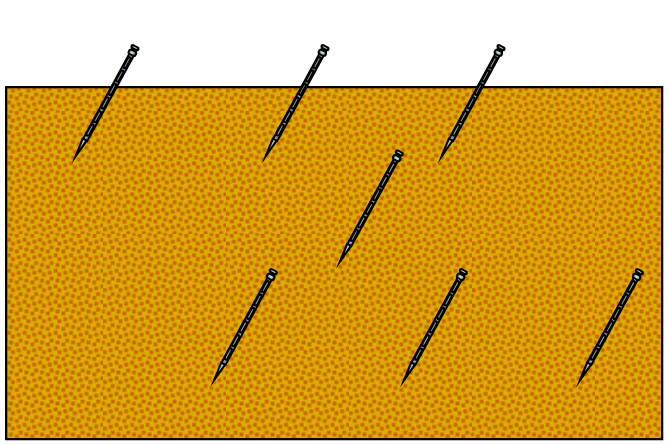
Open topped, loaded, stationary rail cars, hopper bottom trucks, straight trucks and trailers

Sampling Procedures

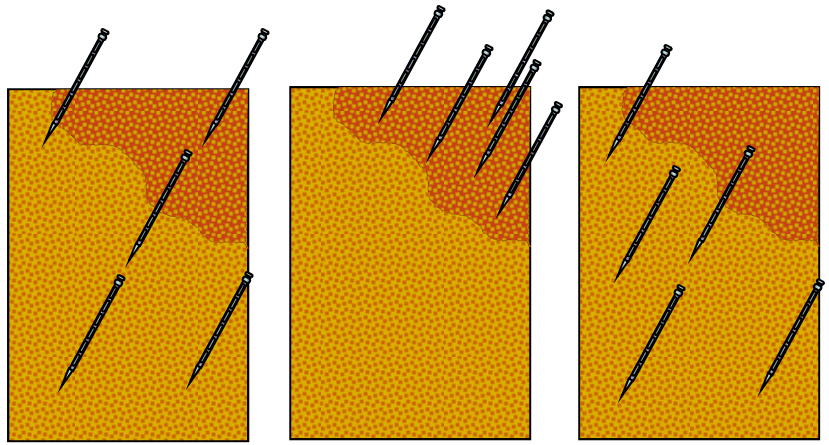
For nutritional evaluation

Grain Probes

- *Insert on a slight (10°) angle*
- *Establish sample patterns for shipments that are mixed or segregated*
- *Probe Slots closed on entry and removal*
- *Sample size should be at least 2 kg*



Mixed

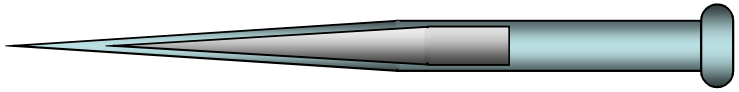


Segregated

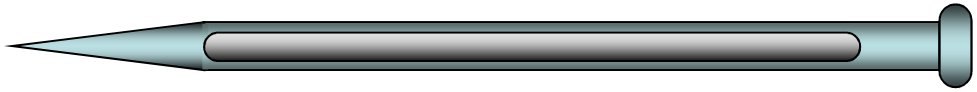
Sampling Equipment

Bag Triers

- Single Tube



- Double Tube



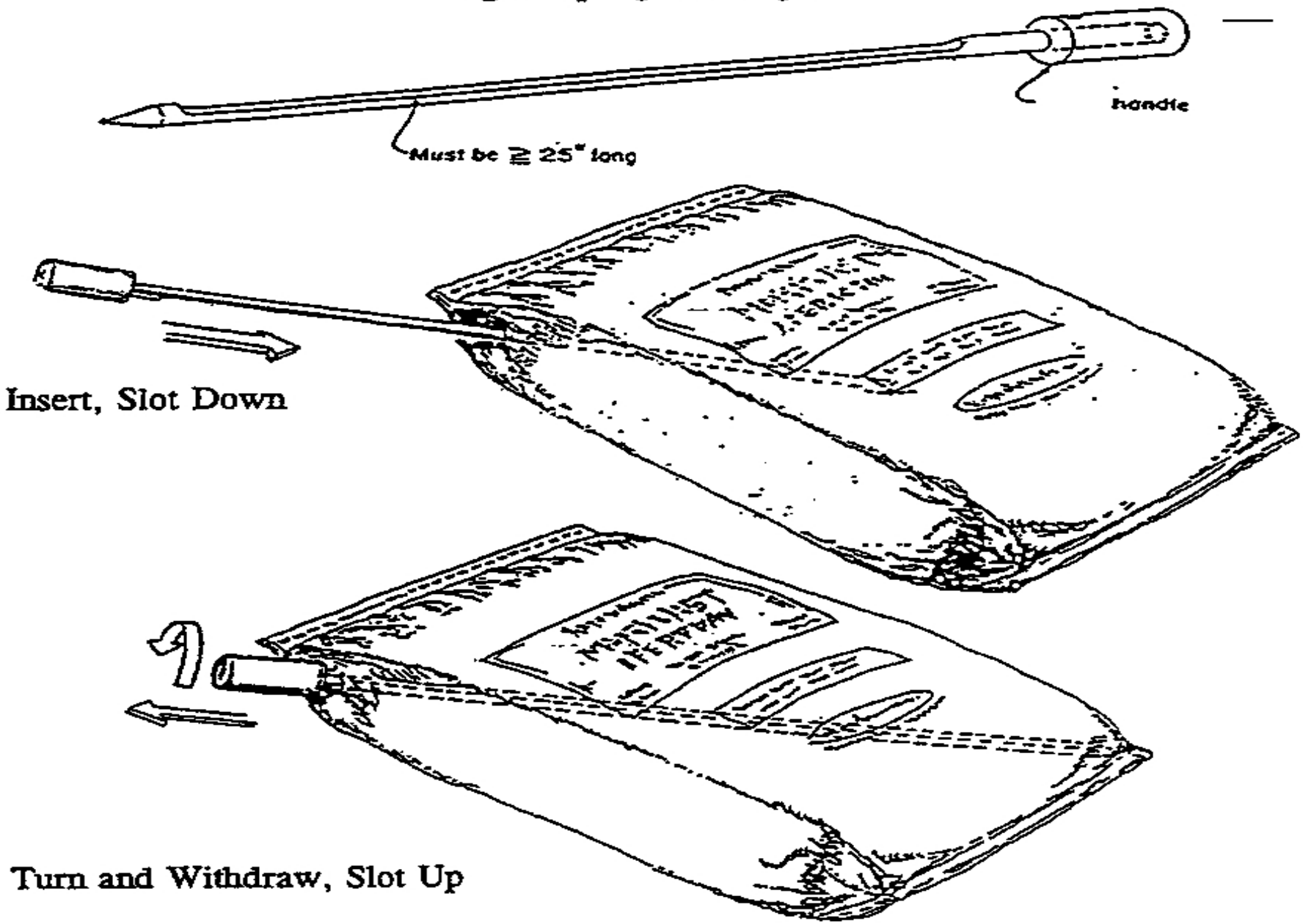
Sampling Procedures

For nutritional evaluation

Bag Triers

- *Lay bag flat on its side*
- *Insert the trier into one corner diagonally through to the opposite corner*
- *Take two samples from opposite corners on large bags*

Single Tube Trier
Bag Sampling Technique



Sampling Equipment

Liquid Samplers

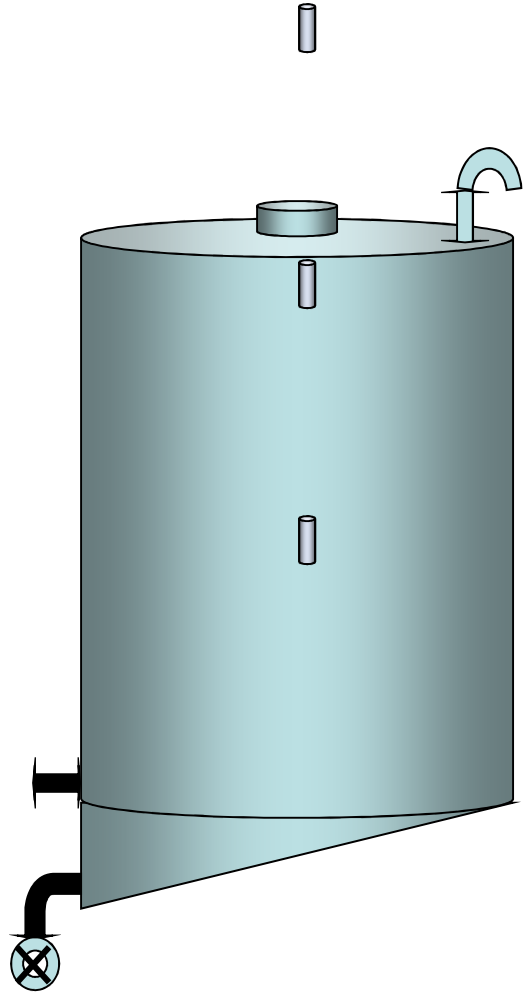
Bomb
or
Zone Sampler

Sampling Procedures

For nutritional evaluation

Bulk Tanks

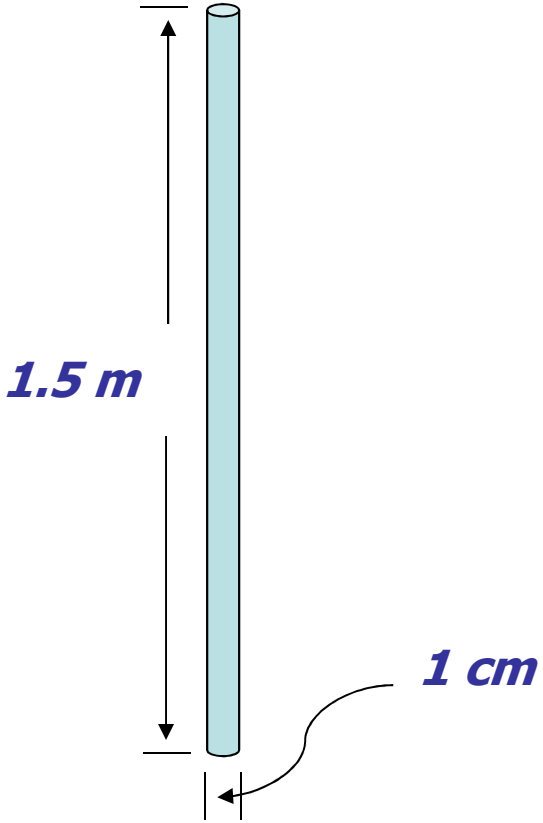
- *Stir (mix) liquid, if possible*
- *Take samples from top, middle, and bottom*
- *Collect a minimum of 500 ml in each sample*



Sampling Equipment

Liquid Samplers

Drum Thief

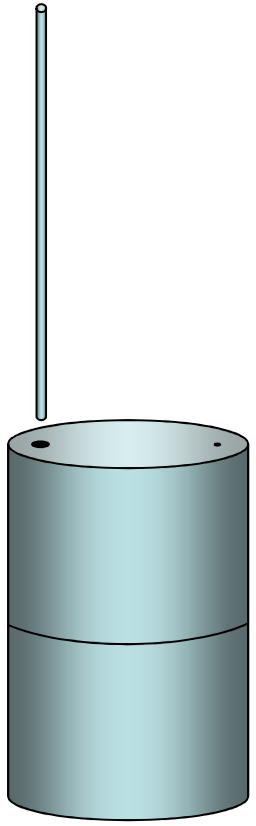


Sampling Procedures

For nutritional evaluation

Drums

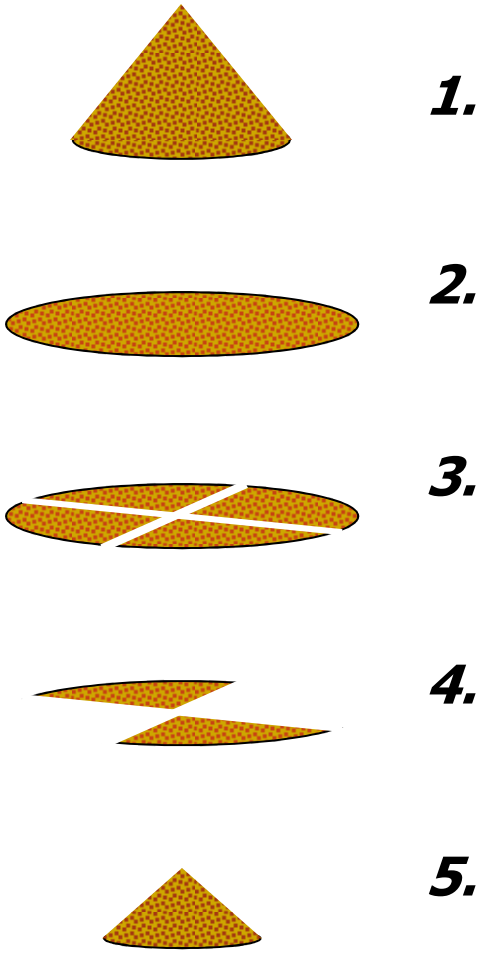
- *Stir (mix) liquid, if possible*
- *Take samples from top to bottom*
- *Collect a minimum of 500 ml in each sample*



Sample Preparation

Cone and Quartering

1. Pour entire sample onto a clean, flat surface
2. Flatten the pile of material
3. Divide into quarters
4. Discard two opposite quarters
5. Mix the remaining quarters
6. Repeat the process (steps 2 - 5) until the sample is reduced to the required size



Sample Preparation

Chute Riffling

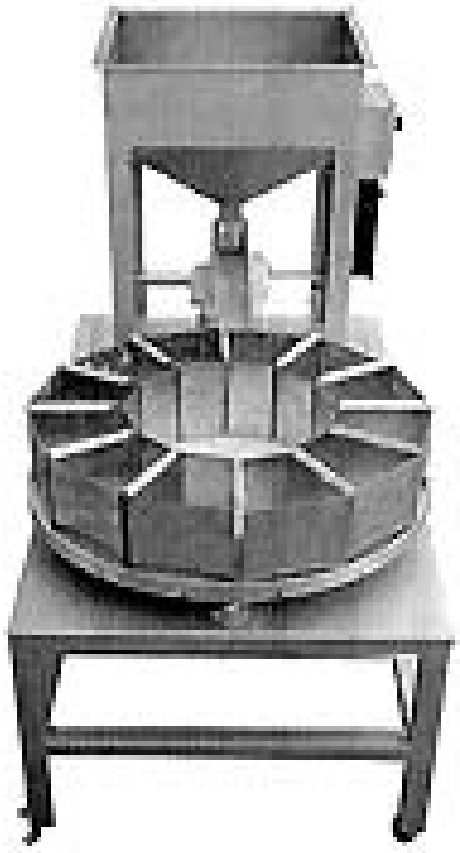
This device equally discharges the sample down chutes leading to two sample boxes. Sample size reduction is accomplished by:

1. ***Pouring the material through the riffle splitter***
2. ***Discarding the contents of one box***
3. ***Repeating the procedure (steps 1 & 2) until the desired sample size is obtained***

Sample Preparation

Spin Riffling

This device uses a hopper and vibrating feeder to deliver a continuous stream of material into a rotating circular tray.

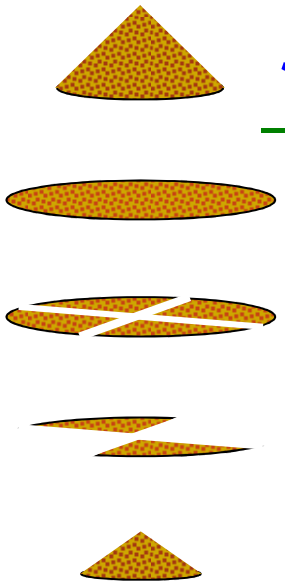


The rotational speed of the tray is set to allow at least 4 revolutions.

Sample size reduction is accomplished by subdividing the compartments on the tray in a manner similar to the cone and quartering procedure

Standard Deviation of Sample Size Reduction Methods

Method	Standard Deviation %
Cone & Quartering	6.8
Chute Riffling	2.1
Spin Riffling	0.1



Ingredient Inspection

Sensory Characteristics

- ***Visible moisture***
- ***Color***
- ***Odor***
- ***Texture***

Insect Infestation

Foreign Material

- ***Contamination***
- ***Adulteration***

Mold

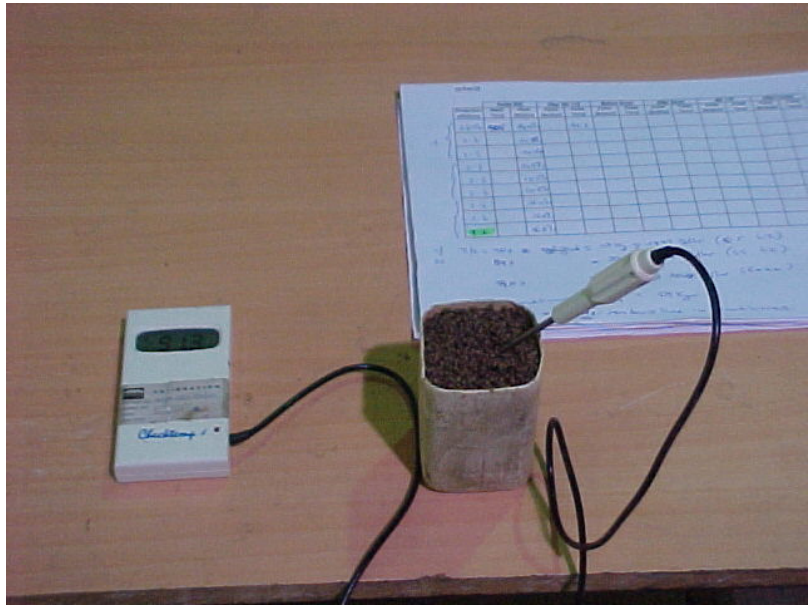

Ingredient Storage
• Dry
• Well ventilated
• Minimum temperature change
• Containment for control of pests

Feed Processing
Critical Control Points

- **Q.A. DEPARTMENT BASED**
- **MANUFACTURING DEPARTMENT BASED**
- **COOPERATIVE MIX**

Feed Processing
Critical Control Points

Grinding - particle size distribution



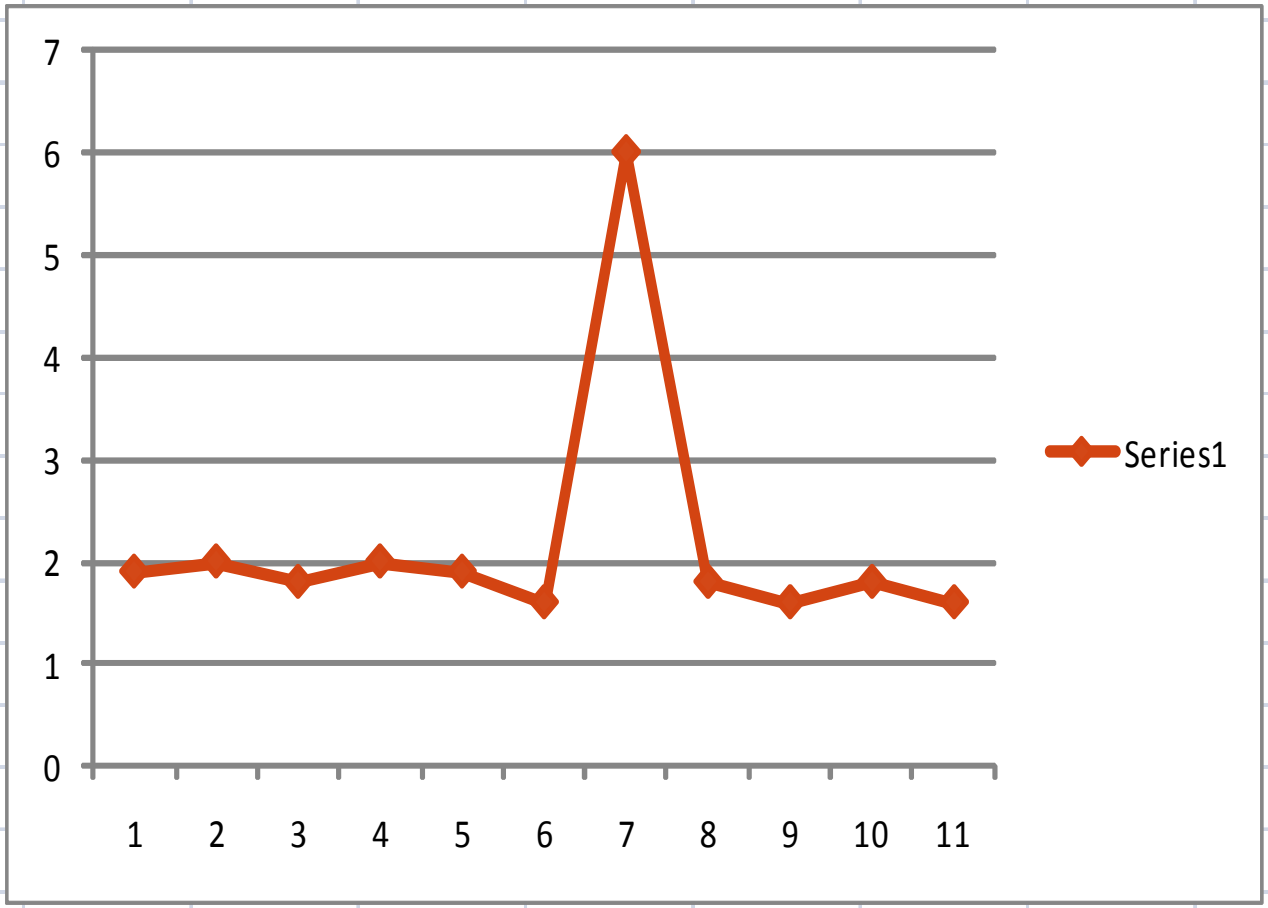
Mixing - homogeniety

Conditioning - temperature
- moisture

Extrusion / Pelleting - temperature
- moisture
- particle size

1.9	2	1.8	2	1.9	1.6	6	1.8	1.6	1.8	1.6

PARTICLE SIZE DISTRIBUTION GRAPH



Mean Particle Size (200 µ)

Shifts = 2 shifts per day

Feed Processing
Critical Control Points

Drying - temperature
- moisture

Cooling - temperature
- moisture

Packaging - temperature
- moisture
- particle size
- dust
- weight

The American Soybean Association International Marketing is committed to assisting the aquaculture industry of Asia to be profitable, environmentally friendly and sustainable

US Soybean meal

US Soy Optimized Aquafeeds

US Soy Oil

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