Feed Manufacturing Impacts on Performance

Brad Tipton, Director of Feed Mill Quality Assurance – Pilgrim’s USA

Feed Manufacturing Impacts on Performance

When feed performance in the field does not meet expectations, where do we look for answers?

- Everyone immediately blames the feed!
- Eventually it ends up being a farm management issue….

Common feed manufacturing opportunities that impact feed performance and/or animal health

- Formula Integrity
- Contamination
- Feed Schedule Adherence
- Stock Management
- Pellet Quality

A nutritionist cannot successfully formulate around feed mill opportunities!

Formula Integrity

Formula Integrity Opportunities

12B.005 Broiler Starter 0000 Non Medicated Production Version (1)

Chattanooga, TN BATCH FORMULA 03/24/26 AV

Ingr Alt Code	Ingr PI Code	Ingr Code	Ingredient Name	--16000Lb Batch -- Lbs	Scale	Percent
3-100043	710	300	Broiler Vitamins	4.00	4.00	0.0250
	I02	355	Bio-D	8.00	12.00	0.0500
3-134991	Y25	721	Dual App (0.5 l	4.00	16.00	0.0250
3-122522	701	405	Trace Minerals (	12.00	28.00	0.0750
3-127641	874	435	TBCC (CII)	3.44	31.44	0.0215
3-141951	V26	291	ThreoPro (85)	15.67	47.11	0.0979
3-138514	Y33	788	S.B.F. Butyrate	8.00	55.11	0.0500
3-150922	Z43	850	Optiphos/Hostazy	1.60	56.71	0.0100
			Scale 1 TOTAL:	56.71		
3-100030	506	210	Defl. Phosphate	89.00	89.00	0.5563
3-100032	503	230	Salt	59.40	148.40	0.3713
3-100028	992	200	Limestone	191.00	339.40	1.1938
			Scale 2 TOTAL:	339.40		
3-100126	101	5	Corn	9491.26	9491.26	59.3204
3-108471	205	100	Soybean Meal	5764.00	15255.26	36.0250
3-127953	528	150	Commerce Blend (	160.00	15415.26	1.0000
			Scale 3 TOTAL:	15415.26		
3-100035	732	180	Poultry Fat	80.00	80.00	0.5000
3-104991	988	385	Choline (75)	4.80	84.80	0.0300
3-108479	985	265	Lysine Liq (ADM	47.53	132.33	0.2971
3-100073	982	285	MHA (88)	56.30	188.63	0.3519
			Scale 4 TOTAL:	188.63		
			BATCH TOTAL:	16000.00		

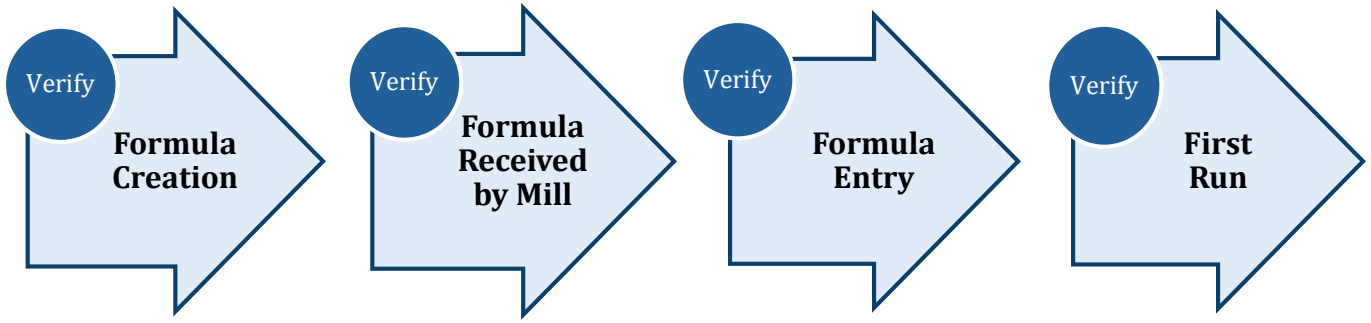
Does your facility have adequate protocols in place to ensure formula integrity?

Are formula inputs done manually or via automation?

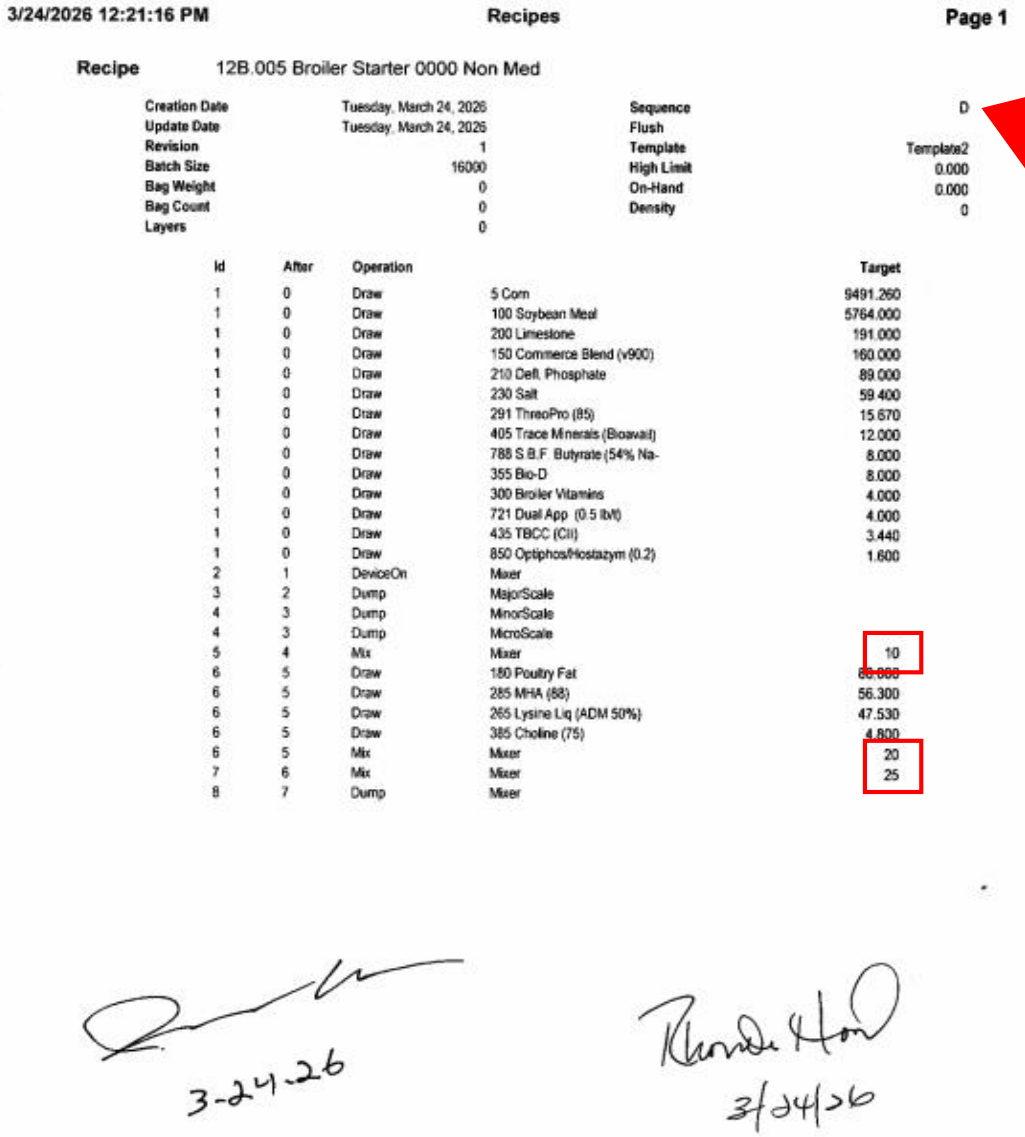
- Two person verification
- Nutritionist review of automation recipes prior to manufacture

Who can access the formulas in automation?

- Are you exposed to unauthorized changes or sabotage?
- How much do you trust the average panel operator?



Batch Formula Verification



3/24/2026 12:21:16 PM Recipes Page 1

Recipe 12B.005 Broiler Starter 0000 Non Med

Creation Date	Tuesday, March 24, 2026	Sequence	D
Update Date	Tuesday, March 24, 2026	Flush	
Revision	1	Template	Template2
Batch Size	16000	High Limit	0.000
Bag Weight	0	On-Hand	0.000
Bag Count	0	Density	0
Layers	0		

Id	After	Operation		Target
1	0	Draw	5 Corn	9491.260
1	0	Draw	100 Soybean Meal	5764.000
1	0	Draw	200 Limestone	191.000
1	0	Draw	150 Commerce Blend (v900)	160.000
1	0	Draw	210 Defl. Phosphate	89.000
1	0	Draw	230 Salt	59.400
1	0	Draw	291 ThreoPro (85)	15.670
1	0	Draw	405 Trace Minerals (Bioavail)	12.000
1	0	Draw	788 S.B.F. Butyrate (54% Na-	8.000
1	0	Draw	355 Bio-D	8.000
1	0	Draw	300 Broiler Vitamins	4.000
1	0	Draw	721 Dual App (0.5 lb/t)	4.000
1	0	Draw	435 TBCC (CII)	3.440
1	0	Draw	850 Optiphos/Hostazym (0.2)	1.600
2	1	DeviceOn	Mixer	
3	2	Dump	MajorScale	
4	3	Dump	MinorScale	
4	3	Dump	MicroScale	
5	4	Mix	Mixer	10
6	5	Draw	180 Poultry Fat	60.000
6	5	Draw	285 MHA (88)	56.300
6	5	Draw	265 Lysine Liq (ADM 50%)	47.530
6	5	Draw	385 Choline (75)	4.800
6	5	Mix	Mixer	20
7	6	Mix	Mixer	25
8	7	Dump	Mixer	

3-24-26

3/24/26

Sequence Code	Description	Sequences Prohibited from Following	Sequences that May Follow
A	Medicated Breeder/Pullet Feeds – BMD 50	C, D, E, F	A, B,
B	Non-Med Breeder/Pullet Feeds	F	A, B, C, D, E
C	Medicated Broiler Feeds	A, B, E	C, D, F
D	Non-Medicated Broiler Feeds		A, B, C, D, E, F
E	Final Non-Med Broiler Feeds	F	A, B C, D, E
F	Flush	A, B	C, D, E, F

If applicable, are all batching parameters verified as accurate prior to manufacture?

- Are dry and wet mix times accurate and adequate?
- Are scale discharge sequences and delays accurate?
- Are formula sequences adequate for contamination controls?

Is a first run verification completed on new formulas?

Mitigating Unauthorized Changes

Is your automated system designed with multiple permission levels?

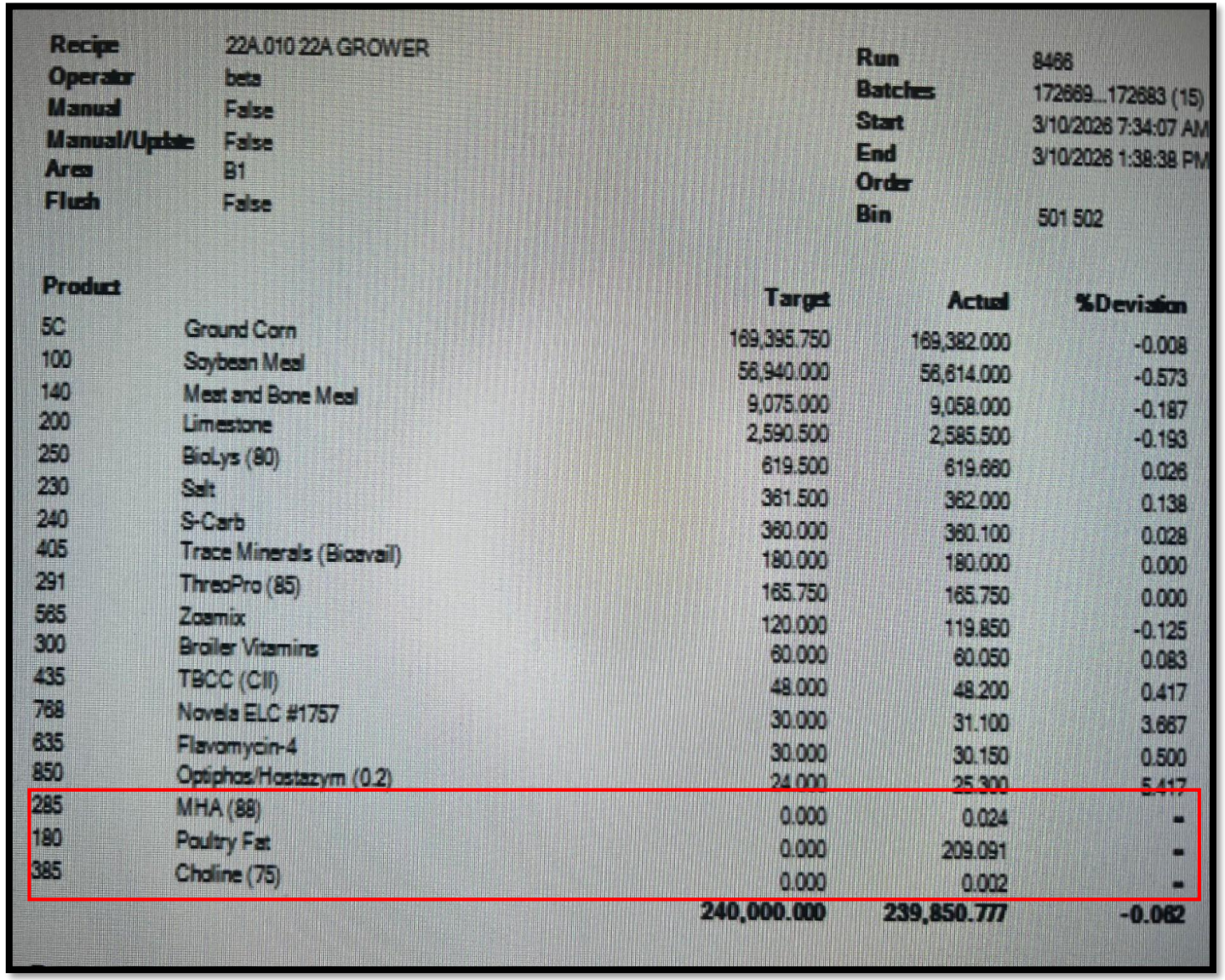
- Formulas and critical parameters should be accessed only by management

Are manufacturing reports reviewed by management daily?

- Batch/Run/Usage records
- Alarm logs
- Audit reports

Are variances that exceed established limits investigated for root cause?

- Operator errors
- Mechanical issues
- Training failures
- Sabotage

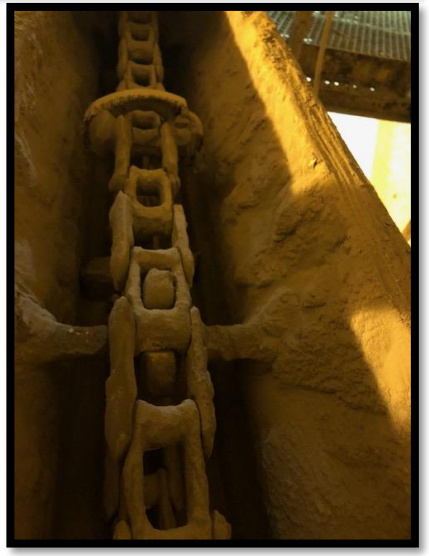


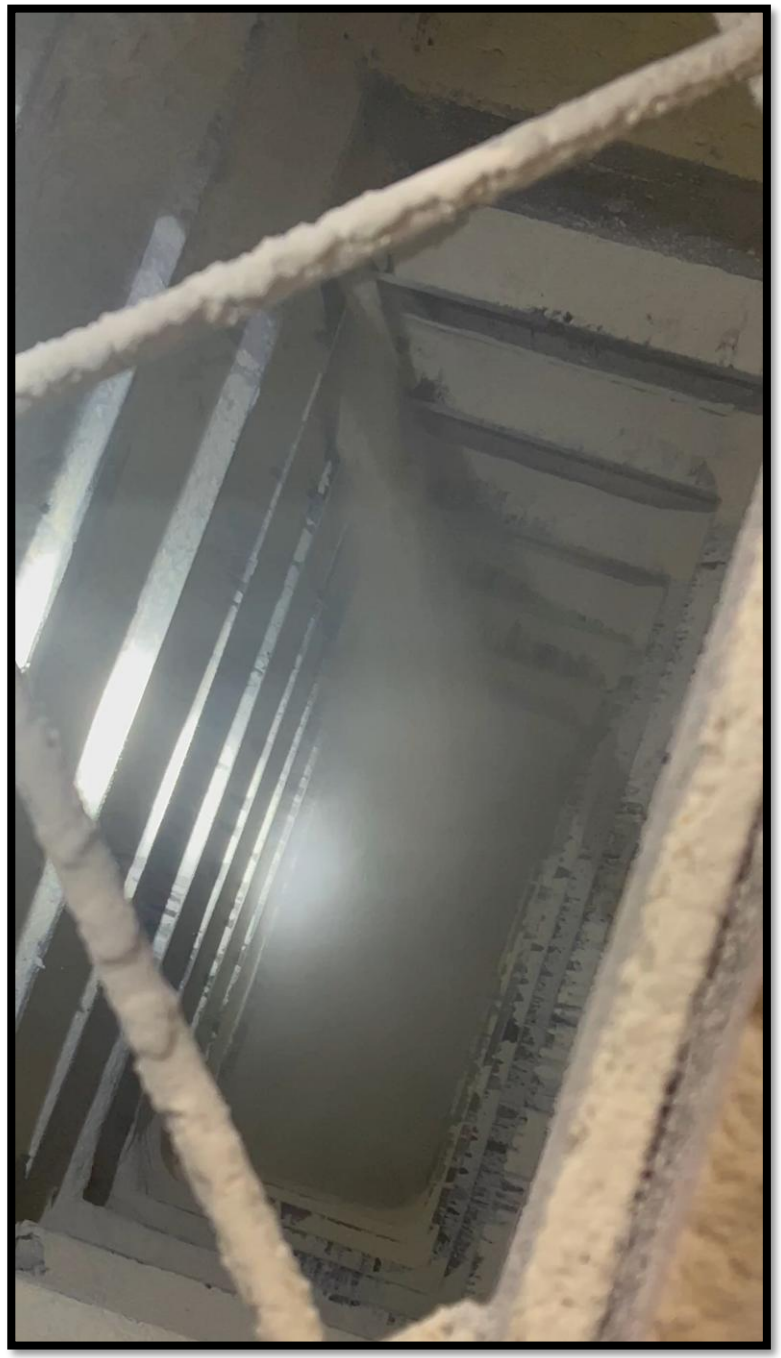
Recipe	22A.010 22A GROWER		Run	8466
Operator	bets		Batches	172669...172683 (15)
Manual	False		Start	3/10/2026 7:34:07 AM
Manual/Update	False		End	3/10/2026 1:38:38 PM
Area	B1		Order	
Flush	False		Bin	501 502

Product		Target	Actual	%Deviation
5C	Ground Corn	169,395.750	169,382.000	-0.008
100	Soybean Meal	56,940.000	56,614.000	-0.573
140	Meat and Bone Meal	9,075.000	9,058.000	-0.187
200	Limestone	2,590.500	2,585.500	-0.193
250	BioLys (80)	619.500	619.680	0.026
230	Salt	361.500	362.000	0.138
240	S-Carb	360.000	360.100	0.028
405	Trace Minerals (Bioavail)	180.000	180.000	0.000
291	ThreoPro (85)	165.750	165.750	0.000
585	Zoamix	120.000	119.850	-0.125
300	Broiler Vitamins	60.000	60.050	0.083
435	TBCC (CII)	48.000	48.200	0.417
768	Novela ELC #1757	30.000	31.100	3.667
635	Flavomycin-4	30.000	30.150	0.500
850	Optiphos/Hostazym (0.2)	24.000	25.300	5.417
285	MHA (88)	0.000	0.024	-
180	Poultry Fat	0.000	209.091	-
385	Choline (75)	0.000	0.002	-
		240,000.000	**239,850.777**	**-0.062**

Contamination

Sources of Contamination





Contamination Opportunities

Does your facility conduct routine inspection of equipment known to contribute to cross-contamination?

- Conveyors, distributors, two-way valves and bin gates
- Surge hoppers, surge bins and mash bins

Does your facility complete flush validations to determine effectiveness of equipment cleanout protocols?

Does your facility have protocols to mitigate contamination when coccidiostats are used to manufacture feeds?

- Flush sizes may vary based on the coccidiostat
- Plan for Nicarbazin and ionophores when used in facilities manufacturing both broiler and breeder diets

How does your facility mitigate salt contamination during receiving?

Phibro ANIMAL HEALTH CORPORATION

3048 Research Drive, State College, PA 16801 Tel: 888-403-0074

Report of Analysis

Laboratory ID	Feed ID Lot	Label Claim	Result	Units	% Label Claim
L0041436-0003	Flush Val 28957	0	1.44	g/ton	NA

Specification: 80 - 120 % Label Claim

Method performance is verified daily for each assay series using a control feed and fortified control feeds.

ND = Non-Detect - Compound was not detected in the sample that was analyzed.

<LOQ = Less than the Limit of Quantitation - Compound was detected but at a level that was lower than the method's calibration limit. LOQ = 0.25 ppm (0.23 g/ton).

Laboratory Sample ID: L0041436-0003
Analysis Type: Nicarbazin
Method: Nicarbazin in Feeds - V10125
Material: Type B/C Feed
Sampling Date: 10/29/2019
Concentration: 0 g/ton
Premix ID: Nicarb
Premix Lot Number: F82050099KA

FAILED

Customer: Pilgrims Pride
Address: 800 PILGRIM'S DR.
City: NATCHITOCHES
State: LA
Zip Code: 71457

Phibro ID: 2642
Phone: 3183562428
Fax:
Email(s): otis.johnson@pilgrims.com

Electronically signed by Kelly Booker

Approved by Feed Lab Management

Dec 2 2019 2:01PM

Report Date

Flush Validation Failure

Feed ID Lot	Label Claim	Result	Units	% Label Claim
6193-1	0	15.35	g/ton	NA

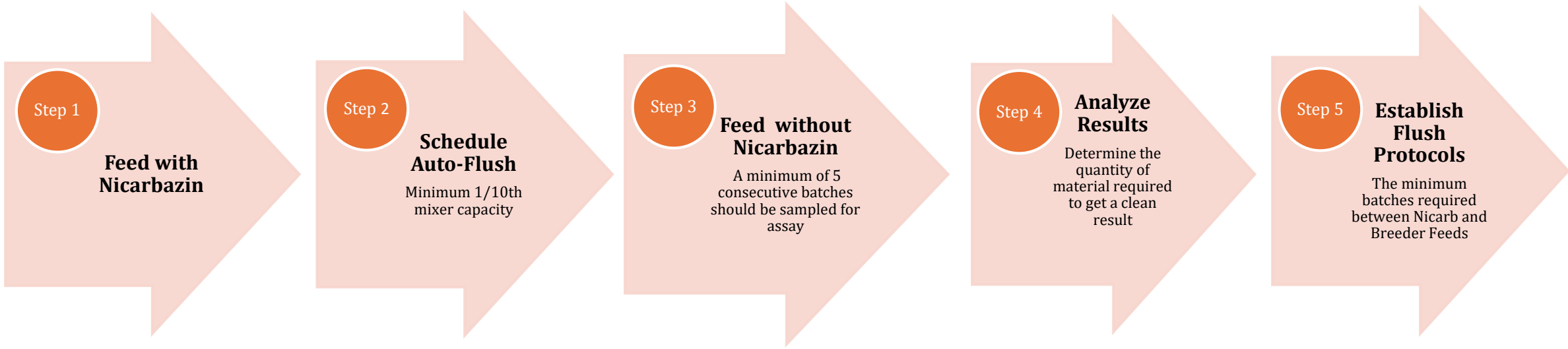
Feed ID Lot	Label Claim	Result	Units	% Label Claim
6193-2	0	3.32	g/ton	NA

Feed ID Lot	Label Claim	Result	Units	% Label Claim
6193-3	0	1.65	g/ton	NA

Feed ID Lot	Label Claim	Result	Units	% Label Claim
6193-4	0	1.56	g/ton	NA

Feed ID Lot	Label Claim	Result	Units	% Label Claim
6193-5	0	0.98	g/ton	NA

Flush Validation Protocol



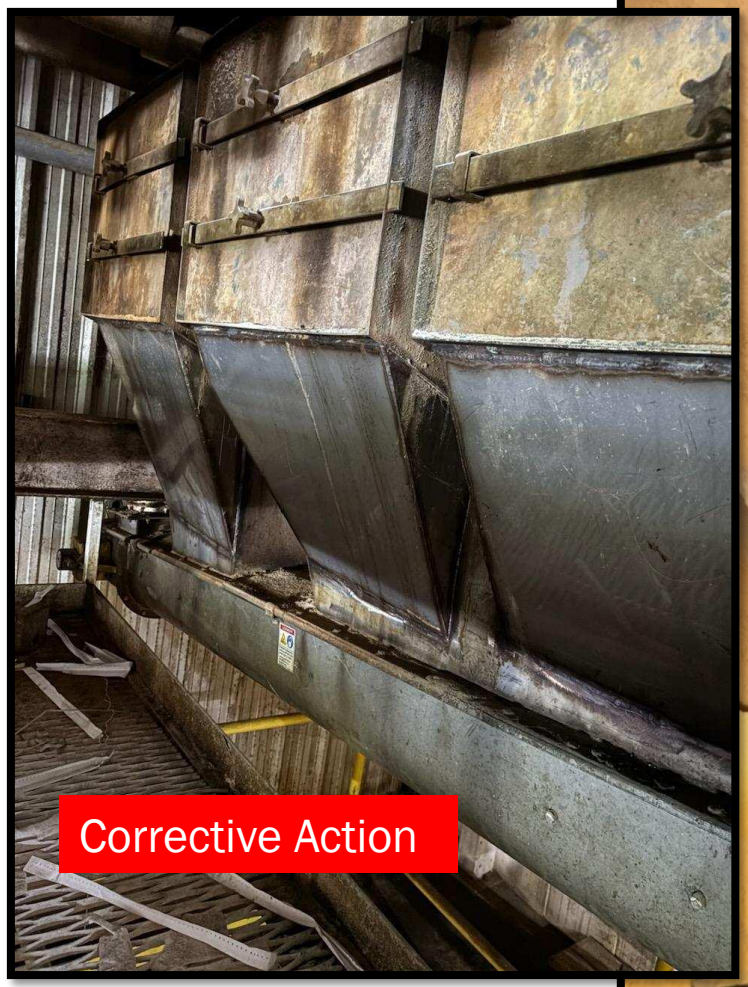
An effective flush validation determines the volume of material required to get to zero residue

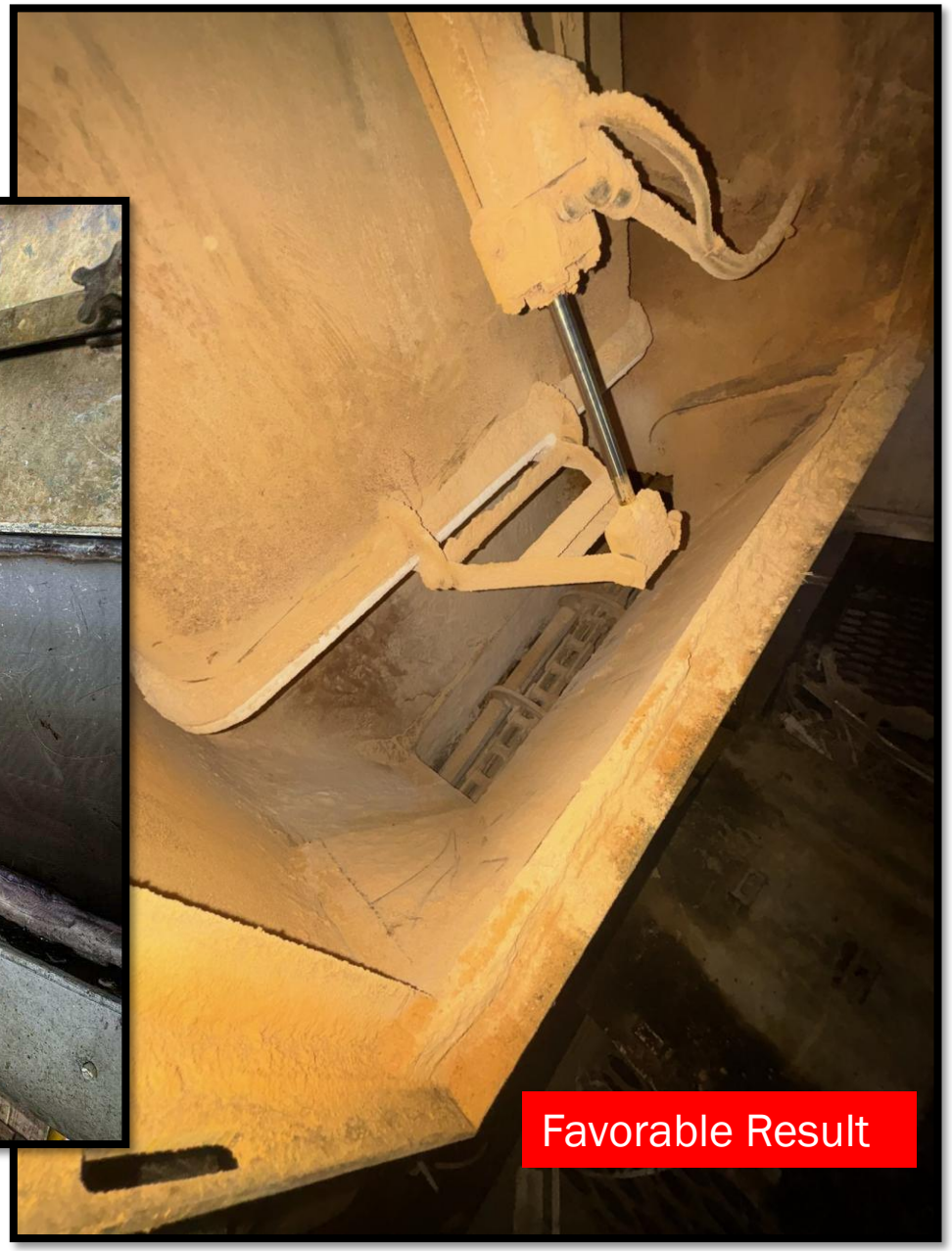
- Volume required can vary between coccidiostats
- Volume required can increase as equipment ages or is damaged

Sequencing of buffer feeds can sometimes be utilized in place of flush material

- Example Cat 2 drug with a withdrawal period in a 5 feed program. Clean 4th feed used as flush prior to Final WD feed

RCA to Corrective Action





Flush Validation Success

Feed ID Lot	Label Claim	Result	Units	% Label Claim
710838-1	0	3.03	g/ton	NA

Feed ID Lot	Label Claim	Result	Units	% Label Claim
710839-2	0	0.52	g/ton	NA

Feed ID Lot	Label Claim	Result	Units	% Label Claim
710840-3	0	0.75	g/ton	NA

Feed ID Lot	Label Claim	Result	Units	% Label Claim
710841-4	0	ND	g/ton	NA

Contamination Mitigation

Does your facility prescribe routine equipment inspection protocols?

- Inspect and repair of conveyances to ensure adequate cleanout
- Evaluate equipment timers for adequate cleanout
- Inspect distributors, turnheads and two-way valves for proper functionality

How many eyes are on the theoretical usage vs actual disappearance?

- Missing product is usually found somewhere else

Are you fully utilizing the automation?

- Utilize hard-coded formula sequencing programs for formulas
- Allow automation to control routing to mitigate mistakes
- Limit operators access to manual routing and bin assignments

What is your facility doing to determine the root cause of contamination events or flush validation failures?

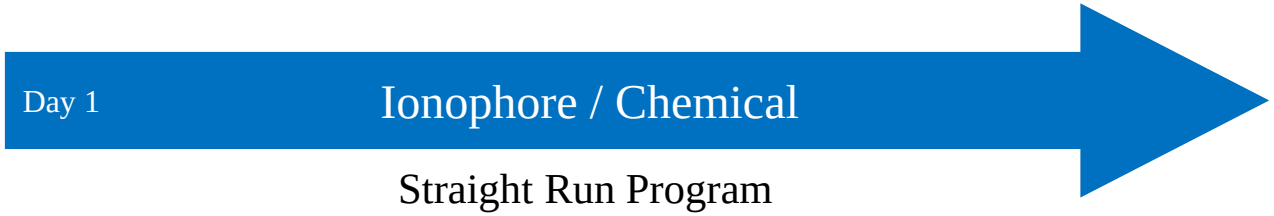
- If your flush validation fails, what's next?

Feed Schedule Adherence

Feed Scheduling Opportunities

Does the facility have protocols in place to ensure the feed schedule is accurate and adhered to?

- Who verifies those changes?
- Are they adequately communicated to all responsible parties?



Straight Run Program

Does your facility have established protocols for coccidiostat changes?

- Can the facility effectively transition without compromising the cocci control program?
- First in, first out is important during these transitions.

Shuttle Program

Do the feed schedulers and dispatchers have authority to substitute feeds?

- Has it been communicated when substitutions would not be appropriate?

Bio-Shuttle Program

Mitigating Scheduling Failures

Is management educated on the impacts to the grow out and the grower?

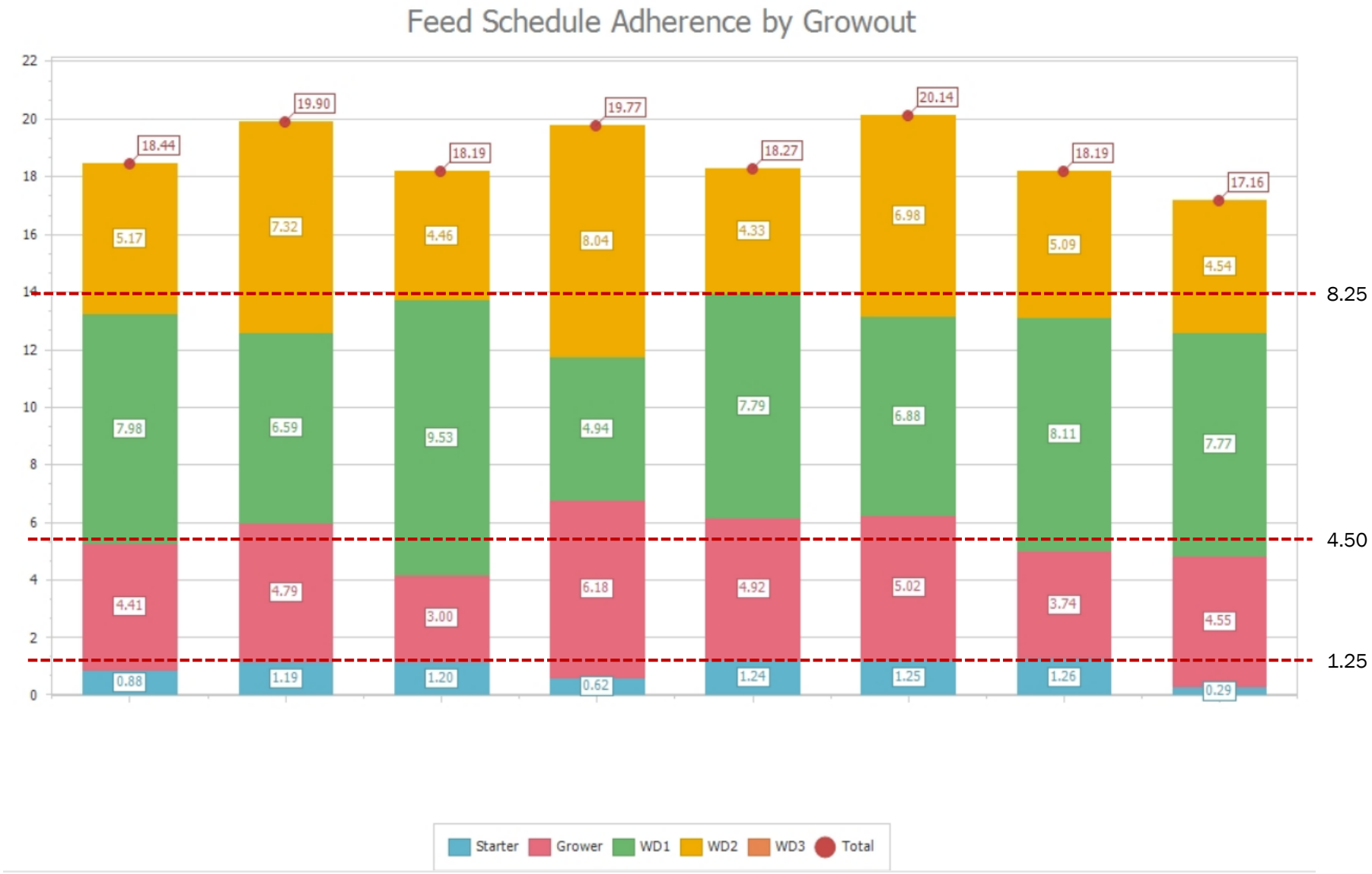
- Vaccine failures
- Early/late cocci cycling
- Suppressed growth rate
- Financial impacts

Evaluate the number of diets

- Can the facility effectively manufacture and store the target number of diets?

Are there clear lines of communication between scheduling and manufacturing?

- Reduces substitutions



Feed Quality

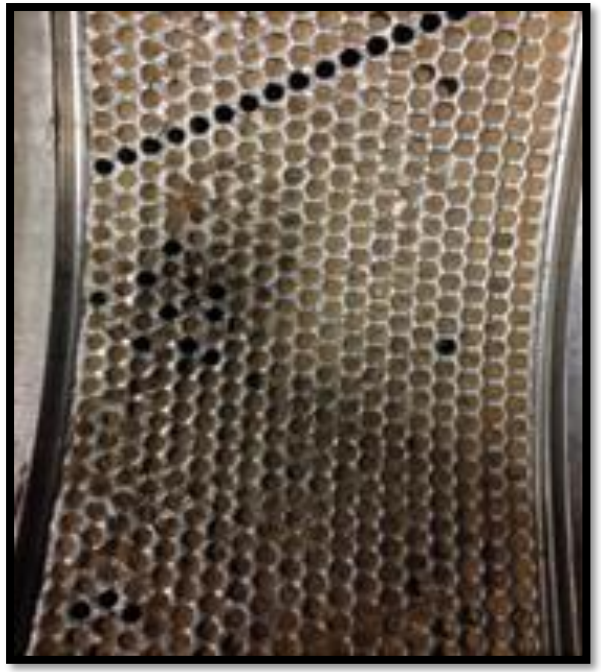
Feed Quality Opportunities

Does your facility effectively measure feed quality?

- Changes in seasonal performance
- Die/roll wear and its impacts on pellet quality
- Field data vs mill data

Does your facility have a routine QA schedule that measures the following?

- Mixer uniformity
- Pellet quality
- Cooler performance
- Scale accuracy



Are they using that data effectively to improve feed quality?

Are your die specs adequate to balance manufacturing needs with quality goals?

- Die/roll replacement guidelines
- Established PDI goals

Measuring Mixer Uniformity

Does you facility routinely measure mixer uniformity against established goals?

- CV goals should be defined for dry and liquid ingredients

Are you measuring liquid uniformity?

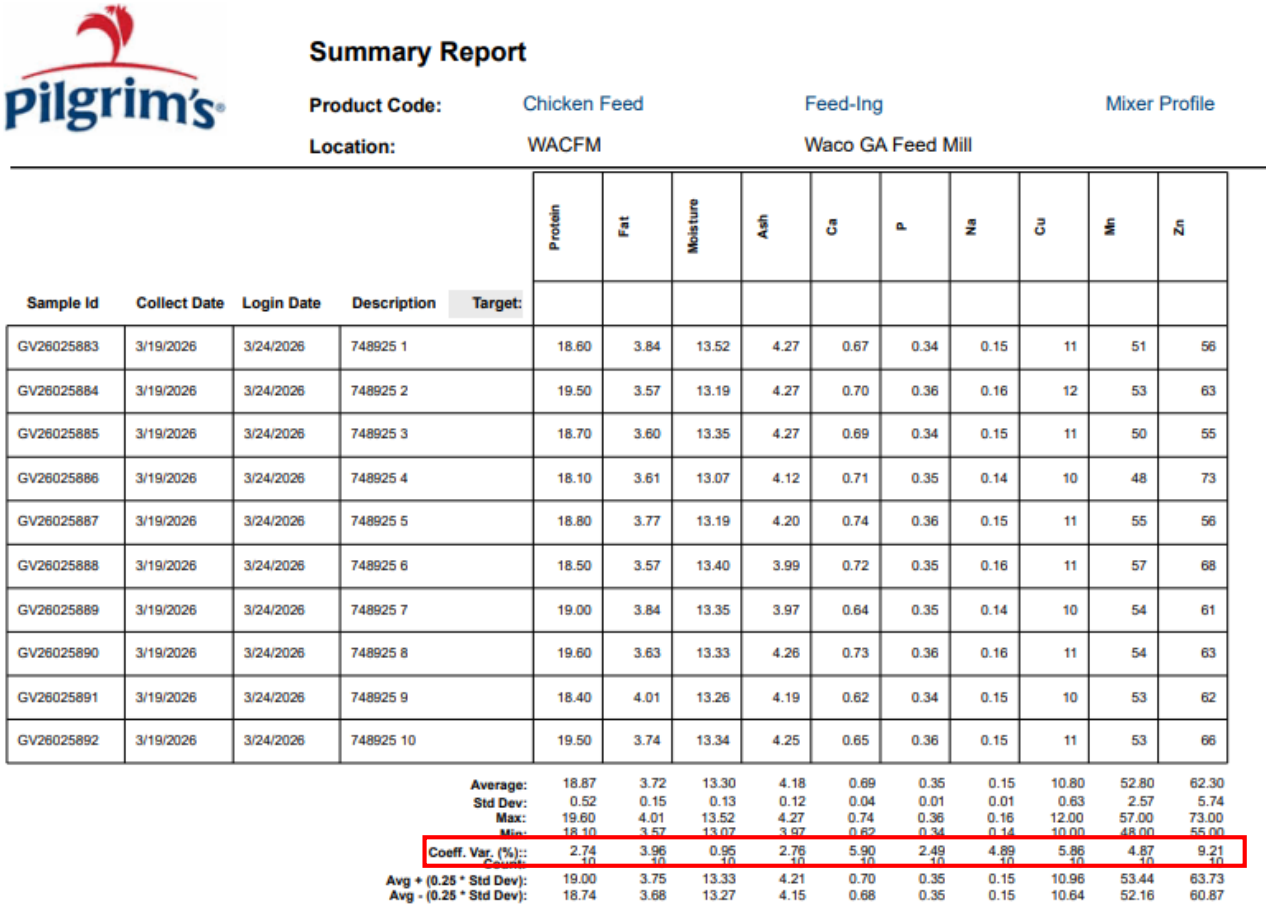
- Liquid amino acids can be hard to dial in

Are you watching for uniformity issues when density changes?

- Pullet feeds can overfill mixer when low density fillers are used in the diet
- Dry mix times can vary by density

Scale discharge sequence can affect uniformity

- In a three scale sequence, minerals and micros discharge should be delayed until major scale is empty



Pilgrim's

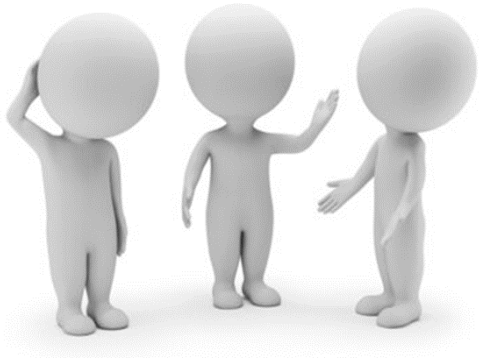
Summary Report

Product Code: Chicken Feed — Feed-Ing — Mixer Profile

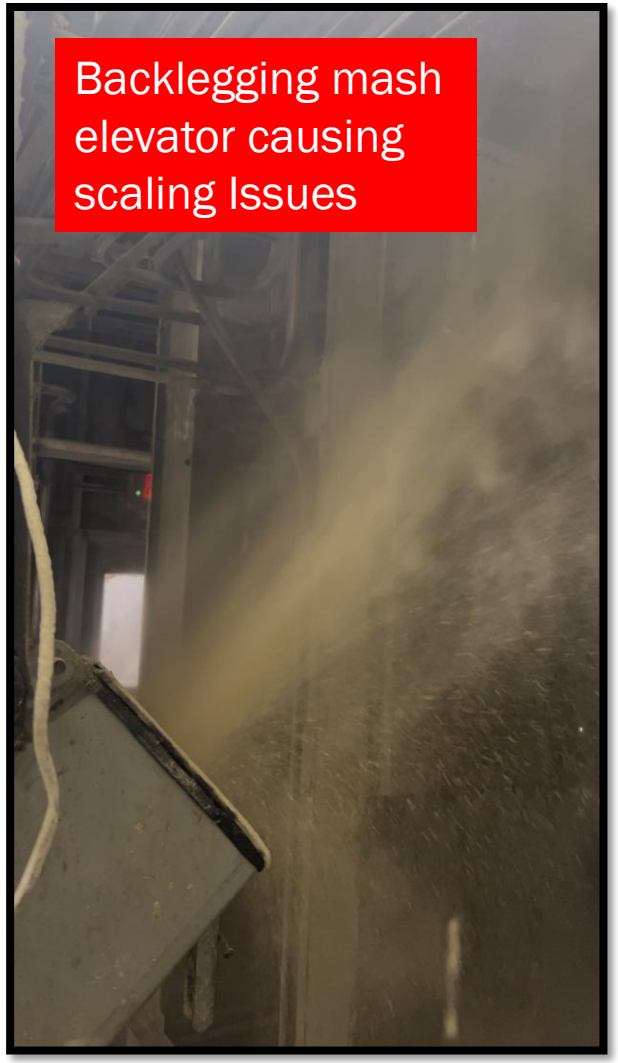
Location: WACFM — Waco GA Feed Mill

Sample Id	Collect Date	Login Date	Description	Target:	Protein	Fat	Moisture	Ash	Ca	P	Na	Cu	Mn	Zn
GV26025883	3/19/2026	3/24/2026	748925 1		18.60	3.84	13.52	4.27	0.67	0.34	0.15	11	51	56
GV26025884	3/19/2026	3/24/2026	748925 2		19.50	3.57	13.19	4.27	0.70	0.36	0.16	12	53	63
GV26025885	3/19/2026	3/24/2026	748925 3		18.70	3.60	13.35	4.27	0.69	0.34	0.15	11	50	55
GV26025886	3/19/2026	3/24/2026	748925 4		18.10	3.61	13.07	4.12	0.71	0.35	0.14	10	48	73
GV26025887	3/19/2026	3/24/2026	748925 5		18.80	3.77	13.19	4.20	0.74	0.36	0.15	11	55	56
GV26025888	3/19/2026	3/24/2026	748925 6		18.50	3.57	13.40	3.99	0.72	0.35	0.16	11	57	68
GV26025889	3/19/2026	3/24/2026	748925 7		19.00	3.84	13.35	3.97	0.64	0.35	0.14	10	54	61
GV26025890	3/19/2026	3/24/2026	748925 8		19.60	3.63	13.33	4.26	0.73	0.36	0.16	11	54	63
GV26025891	3/19/2026	3/24/2026	748925 9		18.40	4.01	13.26	4.19	0.62	0.34	0.15	10	53	62
GV26025892	3/19/2026	3/24/2026	748925 10		19.50	3.74	13.34	4.25	0.65	0.36	0.15	11	53	66
				Average:	18.87	3.72	13.30	4.18	0.69	0.35	0.15	10.80	52.80	62.30
				Std Dev:	0.52	0.15	0.13	0.12	0.04	0.01	0.01	0.63	2.57	5.74
				Max:	19.60	4.01	13.52	4.27	0.74	0.36	0.16	12.00	57.00	73.00
				Min:	18.10	3.57	13.07	3.97	0.62	0.34	0.14	10.00	48.00	55.00
				Coeff. Var. (%):	2.74	3.96	0.95	2.76	5.90	2.49	4.89	5.86	4.87	9.21
				Count:	10	10	10	10	10	10	10	10	10	10
				Avg + (0.25 * Std Dev):	19.00	3.75	13.33	4.21	0.70	0.35	0.15	10.96	53.44	63.73
				Avg - (0.25 * Std Dev):	18.74	3.68	13.27	4.15	0.68	0.35	0.15	10.64	52.16	60.87

Batch Mixing Opportunities

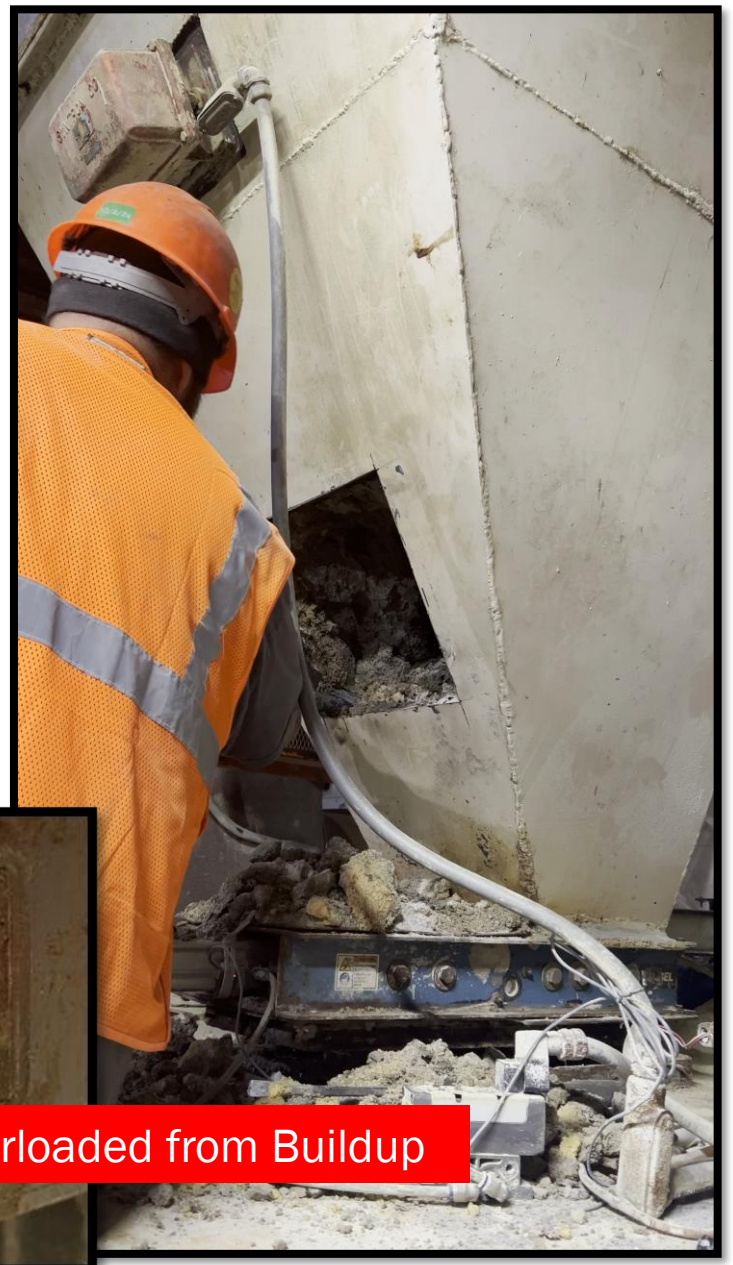


Failed Check Valve


Backlegging mash elevator causing scaling Issues


Obstructed Scale

Scale Overloaded from Buildup



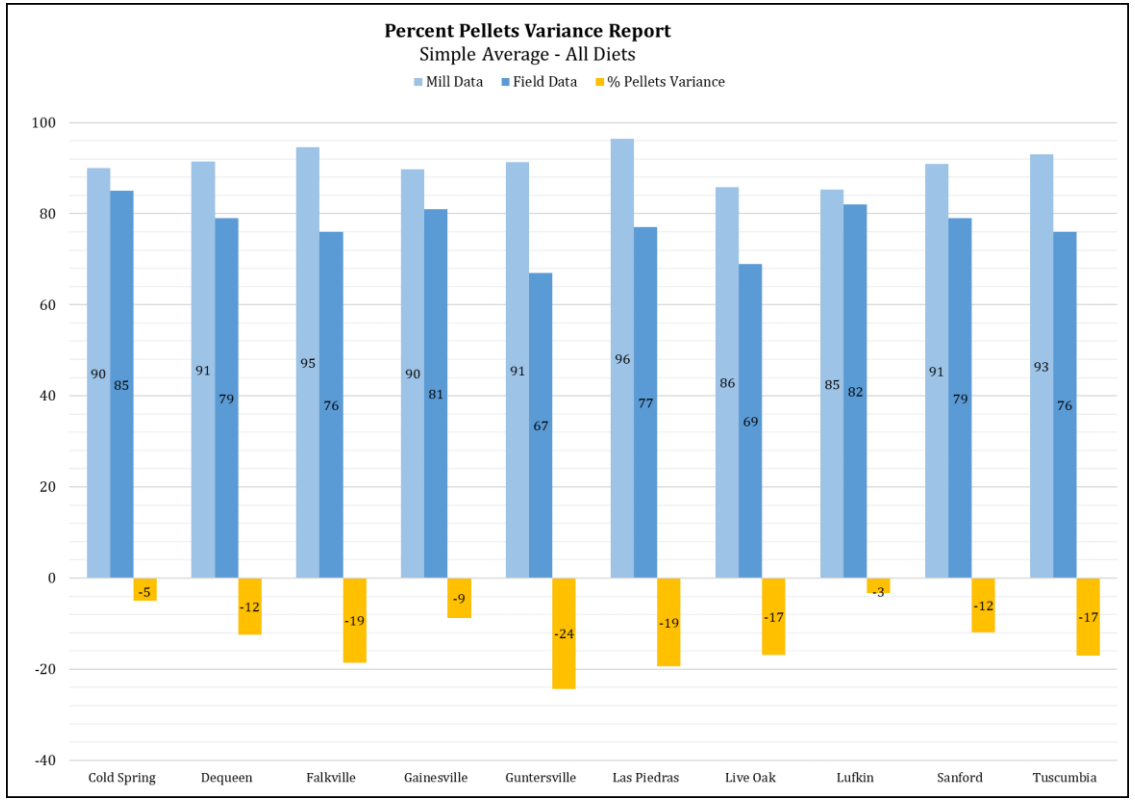
Measuring Pellet Quality

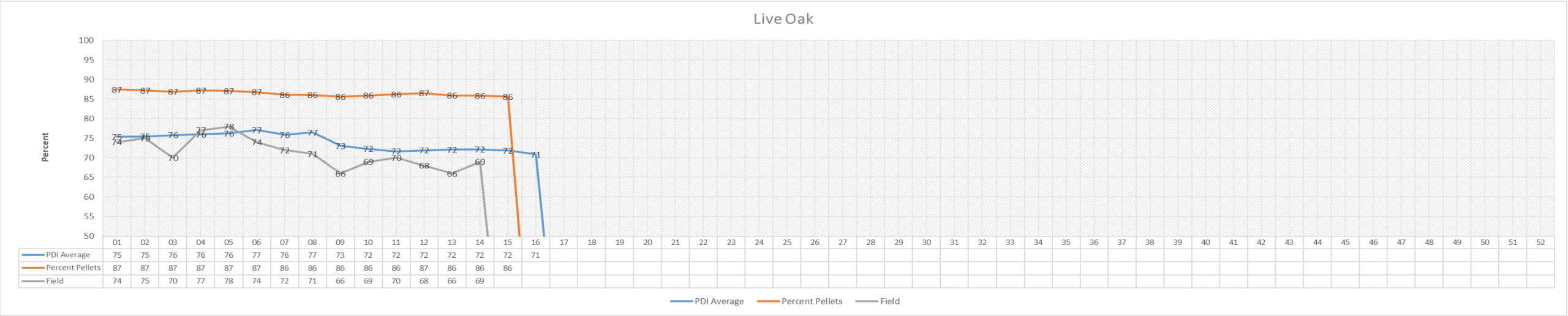
Does your facility measure feed quality results against established goals?

- PDI and % Fines goals should be defined
- Trend reports are helpful in identifying opportunities

Does someone watch for downturns in pellet quality?

- Cold weather = additional water during conditioning
- Harvest season = higher corn moisture
- Cold air temperatures = reduction is cooler efficiency
- Formula changes, by-product usage, fat inclusion
- Die/roll wear = decrease in PDI and throughput





Steam Conditioning Opportunities

Measuring Cooler Performance

Sample Id	Collect Date	Login Date	Description	Target:	Moisture
GV20009205	1/17/2020	1/27/2020	STR MILL3 MASH 1		12.48
GV20009206	1/17/2020	1/27/2020	STR MILL3 MASH 2		12.58
GV20009207	1/17/2020	1/27/2020	STR MILL3 MASH 3		12.72
GV20009208	1/17/2020	1/27/2020	STR MILL3 MASH 4		13.00
GV20009209	1/17/2020	1/27/2020	STR MILL3 MASH 5		12.45

Average:	12.62
Std Dev:	0.21
Max:	13.00
Min:	12.45
Coeff. Var. (%)::	1.69
Count:	6
Avg + (0.25 * Std Dev):	12.67
Avg - (0.25 * Std Dev):	12.56

Pre-conditioned Mash

Sample Id	Collect Date	Login Date	Description	Target:	Moisture
GV20009215	1/17/2020	1/27/2020	STR MILL3 COND 1		15.92
GV20009216	1/17/2020	1/27/2020	STR MILL3 COND 2		15.90
GV20009217	1/17/2020	1/27/2020	STR MILL3 COND 3		15.60
GV20009218	1/17/2020	1/27/2020	STR MILL3 COND 4		15.82
GV20009219	1/17/2020	1/27/2020	STR MILL3 COND 5		15.72

Average:	15.79
Std Dev:	0.13
Max:	15.92
Min:	15.60
Coeff. Var. (%)::	0.84
Count:	5
Avg + (0.25 * Std Dev):	15.83
Avg - (0.25 * Std Dev):	15.76

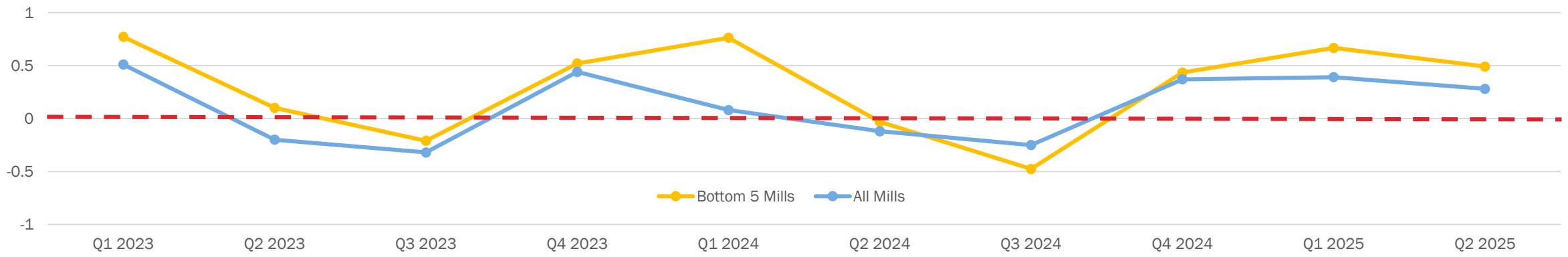
Conditioned Mash

Sample Id	Collect Date	Login Date	Description	Target:	Moisture
GV20009210	1/17/2020	1/27/2020			13.62
GV20009211					13.74
GV20009212					13.46
GV20009213					13.62
GV20009214			STR MILL3 COOL 5		13.56

FILED

Average:	13.60
Std Dev:	0.10
Max:	13.74
Min:	13.46
Coeff. Var. (%)::	0.75
Count:	5
Avg + (0.25 * Std Dev):	13.63
Avg - (0.25 * Std Dev):	13.57

Finished Feed



Pellet Cooling Opportunities

Air Bypassing the Feed

Reduced CFM

Obstruction

Feed Quality Checklist

Maintain process controls to ensure formula integrity.

- Two person verification of formula inputs into automation
- First run verification
- Prevent unauthorized access to formulas and sensitive parameters

Ensure controls are in place to mitigate contamination events.

- Utilize sequencing programs available in most automation systems
- Validate flush effectiveness when coccidiostats are used
- Adhere to an effective equipment inspection schedule

Pursue the root cause of contamination events and communicate corrective actions.

Educate on the importance of feed schedule adherence.

- Be sure management is educated on cocci control programs
- Evaluate the number of diets against feed demands

Feed Quality Checklist

The facility should be monitoring and have established parameters for:

- Mixer uniformity
- Conditioning temperature and moisture pickup
- Cooler performance
- Pellet durability and percent fines

Management should have a plan and goal around die specifications and changes

- There should be a balance between pellet quality and throughput requirements

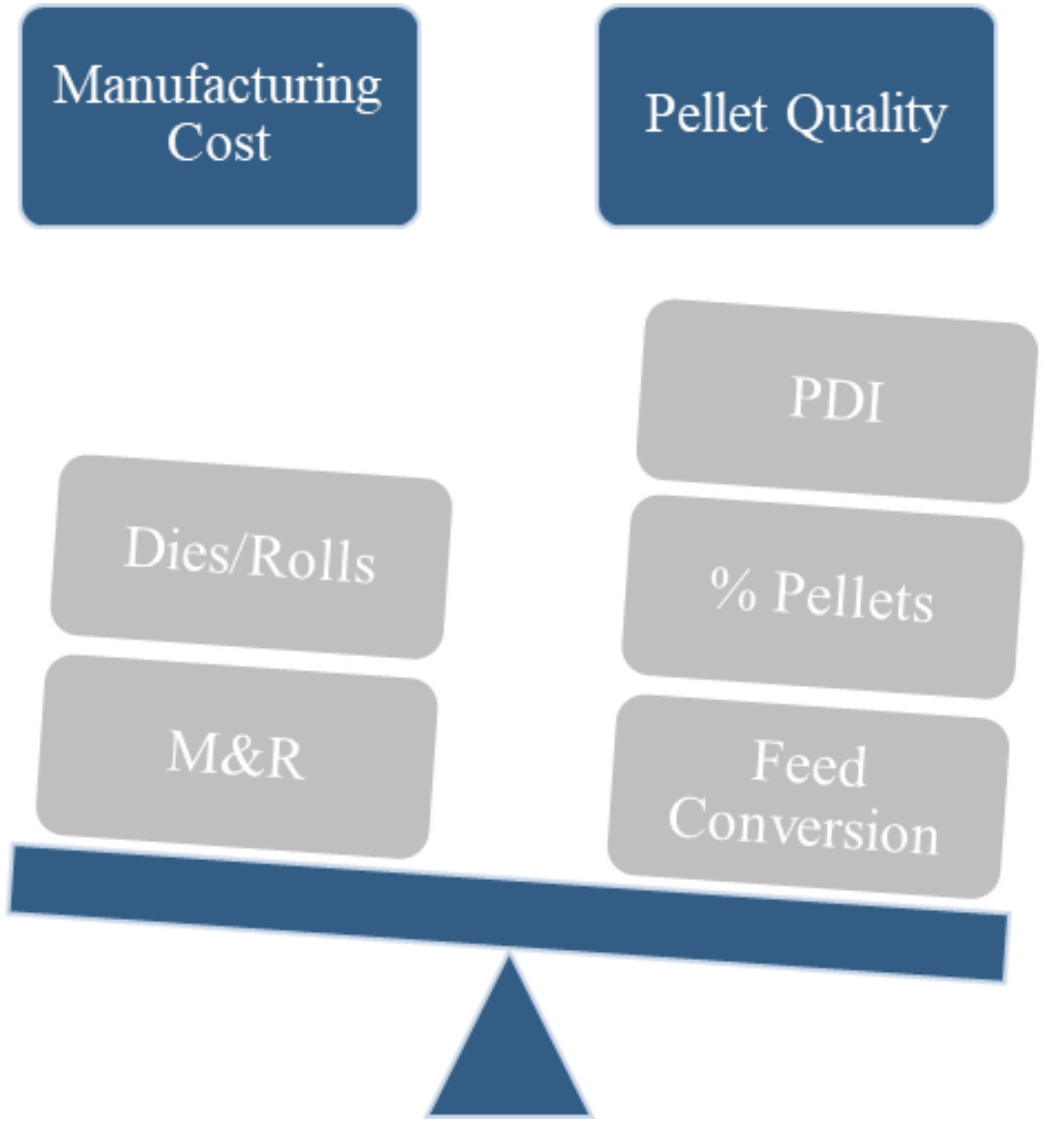
Steam conditioning systems must be inspected routinely and well-maintained

- Failed condensate return systems, control valves and pressure reducers can wreck pellet quality
- Conditioner retention times must be evaluated to ensure adequate moisture pickup

Pelleting systems must be inspected, maintained and ready for cold weather

- Coolers must be adequately filled to ensure proper cooling
- Fans, ductwork and cyclones must be free of obstructions and air leaks

Questions?


Manufacturing Cost
Pellet Quality
PDI
Dies/Rolls
% Pellets
M&R
Feed Conversion