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Feed Mill Management

Charles Stark
North Carolina State University

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ACADEMICS ▲ RESEARCH ▲ EXTENSION

Major Areas of Responsibilities

- Production
- Quality
- Costs
- Safety
- Housekeeping
- Human Resources
- Strategic Planning/Cost Analysis

Manager's Responsibility

- Production
  - Review daily production records
  - Schedule feed production
  - Schedule ingredient deliveries
  - Schedule employee shifts, vacation, etc
  - Evaluate employee and equipment production

Manager's Responsibility

- Quality
  - Review ingredient and feed sampling program
  - Review quality assurance results
  - Answer phone calls on feed quality complaints
  - Submit FDA medicated feed samples
  - Evaluate standard operating procedures
    - Flushing
    - Sequencing
  - Set the standard for Quality Assurance

Manager's Responsibility

- Cost
  - Prepare annual budget
  - Evaluate time cards, labor and overtime.
  - Review & report monthly costs
    - Personnel, Property, Operating
  - Evaluate new technology to lower manufacturing cost
  - Prepare Capital request

Manager's Responsibility

- Safety
  - New Employee Safety Training
  - Safety Meetings
    - Monthly, Weekly
  - Annual Safety Training
    - Fire Ext, Hot Works, Etc
  - Inspections
    - Housekeeping, Safety
  - Permits
    - Hot Works, Confined Space

Housekeeping

- Interior
  - Process areas (grinding, pelleting, etc)
  - Non-process areas (bin decks)
- Exterior
  - Landscaping
  - Grass
- Control Rooms/Offices
  - Mangers office is a reflection of expectations!!!

Human Resources

- Hiring
- Training
- Employee Development
  - Continuing Education
  - Mentoring
- Discipline
- Conflict Resolution
- Investigation
  - Safety
  - Grievance

Feed Mill Key Performance Indicators

- Productivity
- Cost
  - Property
  - Personnel
  - Operating
- Safety
- Quality
  - Ingredients
  - Process
  - Finished Feed

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New Employee Training

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New Employee Training and Development

- First Day Overview
- Position Review
- Computer Review
- Safety Training Topics
- Quality Assurance
- Regulations – Air & Water
- Employee Development
- Preventive Maintenance & Housekeeping
- Standard Operating Procedures

New Employee Roles

- Keep your eyes open for hazards
- Fix or report problems to the manager or maintenance
- Make suggestions for improving safety
- Read labels and ask questions
- Pay attention to warning signs
- Be aware of you surroundings
- Practice good housekeeping

Facility Tour - Checklist

- Restrooms
- Fax Machines
- Copy Machines
- QA Lab
- Scale House
- Receiving
- Silos
- Liquid Storage
- First Aid Kits
- Fire Alarms
- PPE
- Fall Protection
- Eyewashes
- Safety Showers
- Fire Extinguisher
- Fire Hoses
- Spill Kits
- Emergency Lights

New Employee Information/Resources

- Company Handbook
- Safety Manual
- Safety Training Material
- MSDS, Labels
- Bulletin Boards
- Safety Meetings
- Managers and Supervisors
- Safety Director & Safety Committee

New Employee Training – Checklist

- Safety Training
  - ❑ Smoking Policy
  - ❑ Emergency Procedures
    - Meeting Location
    - Safety Equipment, First Aid & Accidents Reporting
    - Spills
    - Fire, Weather, etc
  - ❑ Hazard Communication (MSDS/Labels)
  - ❑ PPE requirements
  - ❑ Lock-out/Tag-out

Key Policies - Checklist

- Company Mission Statement
- Vacation and Sick Leave
- Leaves of Absence(FMLA)
- Holidays
- Time and Leave Reporting
- Overtime
- Performance Review
- Uniform
- Environmental Policy
- Right to Know
- Personal Conduct Standards
- Progressive Disciplinary Actions
- Security
- Confidentiality
- Safety
- Emergency Procedures
- Visitors
- E-mail and Internet Use
- Anti-Harassment

New Employee Training – Checklist

- Safety Training
  - ❑ Designated Confined Spaces
  - ❑ Accident Reporting Procedures
  - ❑ Man lifts
  - ❑ Grain Handling Facilities
  - ❑ Access to Employee Exposure and Medical Records
  - ❑ Accident Prevention, Signs, and Tags

New Employee Training Follow-up

- Document All Trainings
- Utilize Tests
- Evaluate Performance After 30 Days
- Create Individual Development Plans
- Performance Reviews
  - 6 months
  - 12 months
- Annual Training Topics
- Monthly Training

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EMPLOYEE TRAINING

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Quality Assurance Topics

- Mission Statement
- Receiving
  - Standard Operating Procedures
- BSE Training for Ingredient Truck Drivers
  - Training and Documents
- Ingredient Sampling Procedures
- In-Bound QC Tests
  - Grades, Moisture, Mycotoxins
- Grinding
  - Particle Size Targets

Quality Assurance Topics

- Batching and Sequencing Guidelines
- Premix Room and Micro-System
- Reconciliation Process
- Pelleting
- Packaging
- Bulk Load-Out and Delivery
- Finished Feed Sampling and Schedule
- Finished Feed QC Tests

Quality Assurance Topics

- Current Good Manufacturing Practices
  - General Provision
  - Construction and Maintenance of Facilities and Equipment
  - Product Quality Control
  - Packaging and Labeling
  - Records and Reports
  - Facilities and Equipment
  - Product Quality Assurance
  - Labeling
- Bioterrorism Act

Quality Assurance Topics

- Employee Training – SOP's
  - Receiving
  - Grinding
  - Manufacturing Medicated Feeds
  - Packaging
  - Bulk Load-out

Safety Manual

- **Emergency Action Plan - OSHA 1910.38**
  - ❑ Emergency Contacts
  - ❑ Engulfment Insert
  - ❑ EAP Quick Sheet
  - ❑ Employee Log
  - ❑ Employee Addresses
  - ❑ First Aid Trained Employees
  - ❑ Visitors Log Cover Page
  - ❑ Visitors Log Sign In Page

Safety Manual

- **Facility Map**
  - ❑ Exits, fire fighting equipment, eyewash & shower
  - ❑ Floor & room maps posted at exits
- **Hazard Communication Program** **OSHA 1910.1200**
  - ❑ Employee Training & Information
  - ❑ List of Chemicals
  - ❑ Container Labeling
  - ❑ Material Safety Data Sheets (MSDS)
  - ❑ Outside Contractors
  - ❑ Non-Routine Hazardous

Safety Manual

- **Hazard Assessment & PPE** **OSHA 1910.132-138**
  - ❑ Eye and face protection
  - ❑ Head protection
  - ❑ Foot protection
  - ❑ Hand protection
  - ❑ Respiratory protection
  - ❑ Hearing protection
  - ❑ Fall protection
- **Smoking Policy**
  - ❑ Approved areas (break room, offices, vehicles)
  - ❑ Distance from feed mill

Safety Manual

- **Housekeeping Program OSHA 1910.272**
  - Priority Areas
    - If dust accumulation in excess of 1/8 of an inch occurs within 35 feet of the following priority areas:
    - Processing Areas - Grinding, Receiving, Bucket elevators, etc
  - Non Priority
    - Warehouse
    - Grounds
    - Offices
    - Silos

Safety Manual

Lockout/Tagout Program OSHA 1910.147

- LOTO Program
- Equipment (upstream, equipment, downstream)
- Stored energy (electrical, hydraulic, pneumatic, mechanical, and chemical).
- Lock Devices
- Lock Tags
- Forms & checklists
- Shift Changes
- Outside Contractor Policy

Safety Manual

- **Confined Space Program** **OSHA 1910.146; 272**
  - ❑ Permit required
  - ❑ Non-permit confined space
  - ❑ Locations (safety signs)
  - ❑ Participants responsibility
    - Attendant
    - Entrant
    - Manager Supervisor
    - Rescue
  - ❑ Contractor policy/procedures

Safety Manual

- **Hot Works Program OSHA 1910.252**
  - Cutting, welding, grinding (sparks or open flame)
  - Fire Prevention
    - Cleaning
    - Fire blankets
    - Wetting area
    - Fire Extinguishers
  - Personal Protective Equipment (PPE)
  - Trained/Certified Welders
  - Contractor Communication

Safety Manual

- **Forklift Safety OSHA 1910.178**
  - Equipment selection
  - Trained
    - **Classroom**
    - **Driving test**
  - Forklift checklist – daily
  - Driving rules

Safety Manual

- **Ladder Safety OSHA 1910.25**
  - Step Ladders
    - Type 1 Industrial 3 to 20 ft
    - Type 2 commercial 3 to 12 ft
    - Type 3 household 3 to 6 ft
  - Rung Ladders
    - Single section 30 ft max
    - Two section 60 ft max
  - Care & maintenance
  - Inspections

Safety Manual

- **Hearing Conservation OSHA 1910.95**
  - Noise monitoring (
    - Exceeds 85 db limit/8 hrs
    - Exceeds 115 db limit/15 min
  - Hearing protection
    - Earmuffs
    - Earplugs
  - Employee training - annually
  - Employee hearing test - annually
  - Signs (hear protection areas)

Safety Manual

- **Respiratory Protection OSHA 1910.134**
  - Dust Mask
  - Respiratory
    - Training
    - Physical
    - Selection
    - Inspection, maintenance & care
- **Blood Borne Pathogens OSHA 1910.1030**
  - Blood or body fluid exposure (HIV, Hepatitis)
  - PPE – Gloves, eye protection
  - Report exposures

SPCC

- Spill Prevention Control Countermeasures
  - Emergency Contacts
    - Management
    - EPA
      - Report Hazardous Substance Releases or Oil Spills to the National Response Center at 1-800-424-8802
  - Liquid Containment Area (55 drum, fat dikes)
  - Spill kits
  - Training
  - Inspections

Air & Water Regulations

- Air Permit Emission Sources
  - Boilers
  - Bag Filters
  - Cyclones
- **NESHAP** NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS
  - Premixes that contain: Cr 0.1% and/or Mn 1%
  - Greater that 50 tons/day pelleted feed
- National Pollutant Discharge Elimination System Permit –NPDES
- Storm Water Plan (Best Management Practices and Water Testing)

SOP – Standard Operating Procedures

- Sampling trucks
- Entering formulas
- Grading cereal grains
- Feed additive reconciliation
- Feed delivery
- Medicated feed sequencing
- Laboratory analysis
  - Moisture, mycotoxin, NIR

SOP – Example

NCSU Feed Mill
Standard Operating Procedure

SOP # Name: Mixer Analysis Sampling

Original Date: 5/1/07 Last Revision: 5/1/07

Purpose: Determine the mixing time required to achieve a uniform mix of feed.

Reference: ASAE 1990. Standard S303.2 and S380.
AFIA 2005. Feed Technology V, Appendix D.

Safety Equipment:

Equipment:

Sample Probe
Sample Bags
Stopwatch
150 ml glass beaker
Stirring rods
Quantab Strips
Filter paper
Distilled water

Procedures:

Sampling

1. Select a nutrient that has a single source in the formula (i.e. salt, amino acid, etc)
2. Batch and mix feed according to standard operating procedures.
3. Obtain ten samples from a single batch of feed:
    a. Discharge method – pull samples at evenly spaced intervals during the unloading process.
    b. Probing method – Stop the mixer and sample the mixer or mixer surge directly with a sample probe.
        i. **Safety Note: Follow Lock-out/Tag-out procedures.**
4. Label the samples according to the time they were pulled or the sample location in the mixer or surge.

Quantab Chloride Titrator

1. Weigh 10 g sample into a cup a labeled 150 ml beaker.
2. Add 90 ml of distilled hot water.
3. Stir the sample for 30 sec, wait and stir for another 30 sec.
4. Fold the filter paper twice to make a cone and place the cone in the beaker.
5. Place the Quantab strip in the cone.
6. Wait until the indicator strip at the top of the Quantab strip turns black.
7. Remove the strip, label, and read the highest point on the strip to the nearest 1 unit.
8. Convert the reading to a percentage using the calibration chart provided on the bottle.
   Note: Different Quantab lot numbers may have different calibration charts.
9. Multiply the results by 10 (10:1 dilution of sample with water)
10. Record results for the ten samples.
11. Calculate the standard deviation, mean, and CV for the ten samples.

$$\text{Equation} - CV\% = \frac{\text{Standard Deviation}}{\text{Mean}} \times 100$$

Preventive Maintenance & Housekeeping

- Lock-out/Tag-out Procedures
  - Equipment Numbers
  - Motor Control Center (MCC) Box Labels
- Fall Protection
- Electrical Safety
  - PPE
  - Arc Flash
  - Clothing
- Cleaning Magnets

Preventive Maintenance & Housekeeping

- Greasing Pellet Mill Rolls
- Greasing Bearings
- Work Orders
  - Time
  - Money
  - Parts and Vendors
  - History Tracking

Preventive Maintenance & Housekeeping

- Housekeeping Areas
  - Priority Areas
  - Assigned Areas
  - Compressed Air Policy
- Pest Control Program (Internal or External)

Employee Development

- Time Management
- Conflict Resolution
- Discipline
- Performance Reviews
- Team Building
- Personality Profiles
- Interviewing Skill
- Preventing Harassment in the Workplace

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Feed Mill Reports & Key Performance Indicators

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Feed Mill Key Performance Indicators

- Productivity
  - Tons/man hr
  - Changeovers
  - Tons per run
  - Energy per ton
    - Electrical
    - Fuel
  - Actual vs. scheduled hrs
  - Bagged tons per day
  - Downtime
    - Unplanned vs. planned
  - Transportation efficiency
  - Load-out waiting time

Feed Mill Key Performance Indicators

- Cost
  - Personnel
    - Salary (exempt)
    - Hourly (non-exempt)
      - Overtime
  - Property cost
    - Repair and maintenance
      - Routine
      - Extra-ordinary
  - Operating
    - Supplies
    - Utilities

Feed Mill Key Performance Indicators

- Quality
  - Samples submitted vs. required
  - Particle size
  - Finished feed nutrient content
    - % Theoretical
      - Moisture
      - Protein
      - Fat
  - Shrink/Gain

Feed Mill Key Performance Indicators

- Safety
  - Days since LTA
  - Days since accident
  - Near misses
  - Safety test results

REPORTS

Reporting Frequency

- Shift Logs & Reports
- Daily Reports
- Weekly Reports
- Monthly Reports
- YTD Reports

Feed Mill Daily Reports

- Supervisor Log
  - Manufacturing Problems
  - Receiving Issues
  - Lack of ingredients
- Maintenance
  - PM items completed
  - Open PM work orders
- Production Board/Report
  - Daily production by shift

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Batch Production Report

1:02 PM 4/30/2009

N.C. State

Batch Reports

Run ID 3481

Mixer: Mixer 1 — Batching

1

Finished Feed Code	Finished Feed Description	Dest Bi	Run Serial	Total Tons	Batch Number	Batch Size (lbs)
FM32000001	SEU Gestation	17	1339	3	1 of 2	3000

2

Ingredient Code	Ingredient Descrip	Bins	Target Weight	Actual Weight	Dev Weight	Comment
Mixer 1 Handa						
11105	Grd Corn HA	N/A	30.00	30.00	0.00	
52225HA	Mono-Dical 21%P HA	N/A	45.00	45.00	0.00	
			75.00	75.00	0.00	
Liquids						
31001	Fat - Poultry	100	30.00	31.06	1.06	Over Warnin
			30.00	31.06	1.06	
Major Scale						
11100	Corn #2- Southern States (Mid West)	7	5.00	5.00	0.00	New_Bin Accepted
11100	Corn #2- Southern States (Mid West)	1	2404.00	2408.00	4.00	
21100	SBM 48%	5	415.50	417.00	1.50	
			2824.50	2830.00	5.50	
Abel Micro Sc						
52225	Mono-Dical 21% P	M3	16.50	16.48	-0.02	No_Flow
52120	Limestone	M2	33.38	33.27	-0.10	Jogs=1
52310	Salt	M20	15.00	15.10	0.10	
71100	Swine Sow/Pig Vit Prmx (DSM)	M19	1.13	1.23	0.11	
71000	Swine TM Prmx/KSU	M18	4.50	4.71	0.21	Jogs=1 Accepted
			70.50	70.79	0.29	
	Batch Total (Lbs)		3000.00	3006.85	6.85	

3 **4** **5**

Dry Mix Time	Wet Mix Time
180	90

Start Time	End Time	Elapsed Time
4/30/2009 7:39:17	4/30/2009 7:50:19	00:11:02

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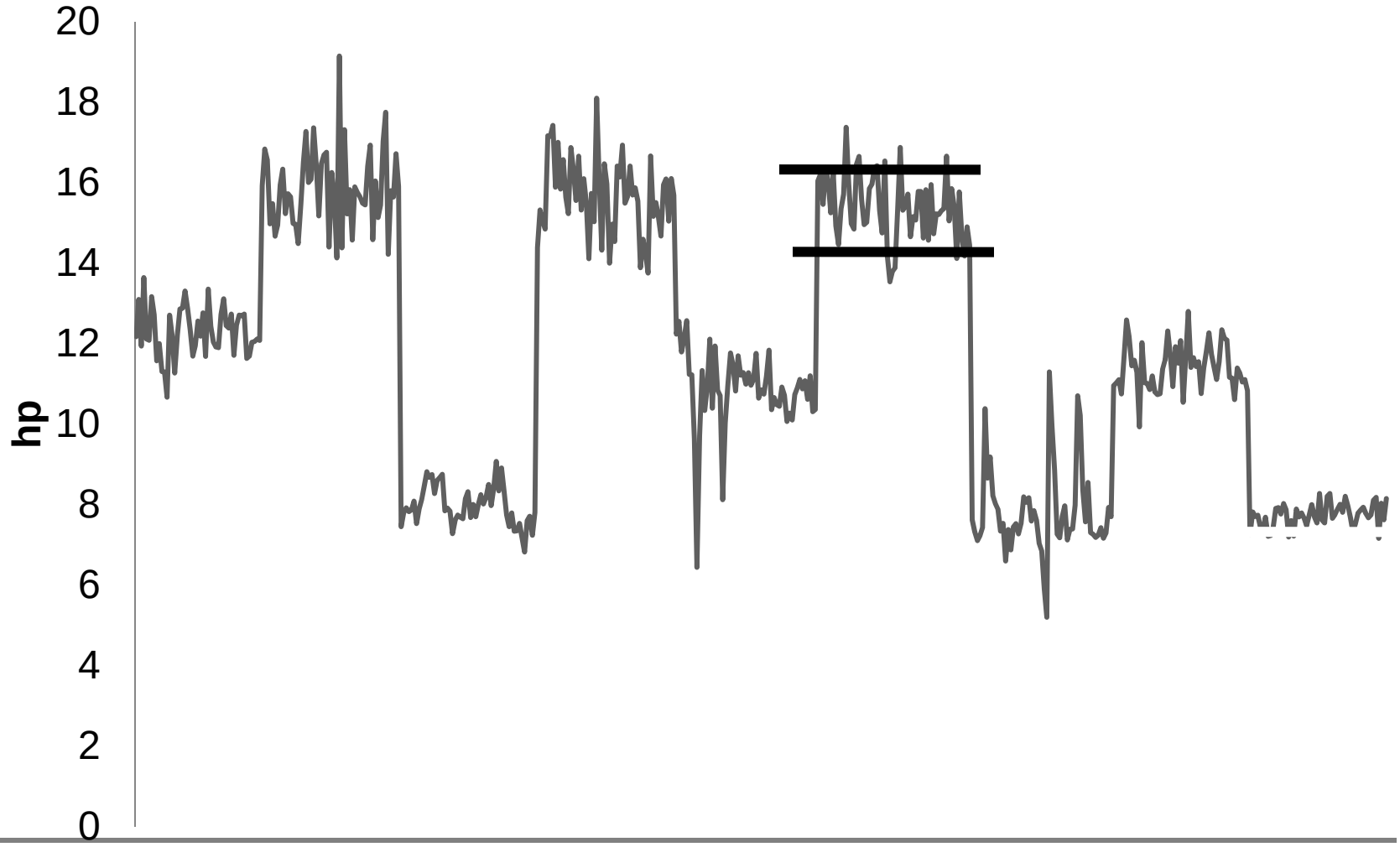
Pellet Mill Motor Load



Daily Checklist

	Bulk Ingredient Inventory		Magnets
	Bag Ingredient Inventory		Lock-out Fat Tank
	Micro-bin Inventory		Scale checks
	Drug Reconciliation		
	Feed production Report		
	Pellet Mill Reports		
	Maintenance		
	Boiler		

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Manager's Weekly Report

Hours	
Salary	120
Base	320
OT	80
Employees	
Salary	2
Hourly	8

KPI

Total Hrs	520
Hourly	400
Tons/Hr	72
Tons/Changeover	209
Tons/Man Hr	17
Efficiency	90
Days Since LTA	372
Days Since Accident	45

Manufacturing	
Tons	9000
Schedule hrs	120
Actual hrs	125
Change overs	43
Capacity	10000
R&M	
Downtime hrs	4

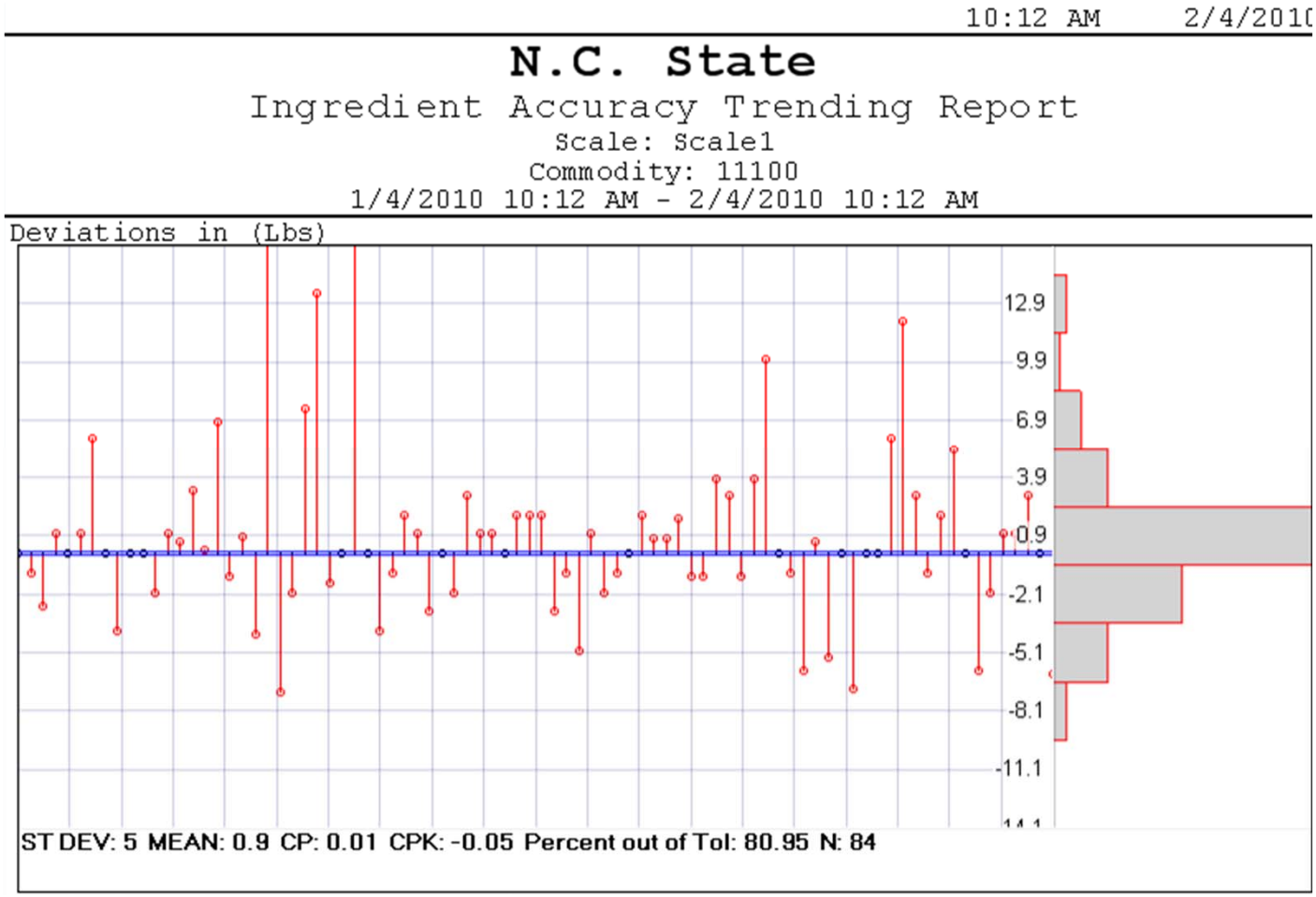
Transportation	
Tons Shipped	8500
Emergency Outs	7
Feed Returned	28

Inventory	
Beginning	1800
Ending	2300

Sampling report

Item	Target	Actual
Finished feed	10	8
Particle size	2	2
Mash/Cooler moisture	1	0
Unit Train Sample	3	2
Rail – liquid fat	5	3

Inventory Trend Report – Major Scale



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Feed Mill Monthly Report

Week	Total Hrs	Base	OT	Tons	Tons/Run	Tons/Man Hr
1	560	320	80	8,500	209	16
2	565	320	85	8,600	210	15
3	570	320	90	9,000	185	16
4	570	320	90	9,000	190	16
Average	**566**	**320**	**86**	**8,775**	**199**	**16**
Total	**2,265**	**1,280**	**345**	**35,100**		

Days LTA	Days Doctor	Safety Quiz	Shrink
390	66	89	0.89

Manufacturing costs

	$/month	Actual	Budget	Difference
Personnel				
Salary	11,500	0.33	0.40	-0.07
Hourly	23,400	0.67	0.65	0.02
Benefits	10,121	0.29	0.25	0.04
Property				
Repair & Maintenance	31,550	0.90	0.75	0.15
Die & Roll	3,510	0.10	0.10	0.00
Depreciation	32,000	0.91	1.30	-0.39
Rentals	2,500	0.07	0.11	-0.04
Vehicle	350	0.01	0.01	0.00
Operating				
Electricity	38,025	1.08	1.18	-0.10
Fuel	63,000	1.79	2.00	-0.21
Water	2,000	0.06	0.08	-0.02
Manufacturing Supplies	2,555	0.07	0.10	-0.03
Office Supplies	1,000	0.03	0.05	-0.02
Waste	600	0.02	0.02	0.00
Other	80,000	2.28	2.00	0.28
Total	**$ 302,111**	**8.61**	**9.00**	**-0.39**
Tons		**35,100**	**34,000**	

Words of Wisdom

Treat people as you want to be treated

Respect ALL employees

Do the Right Thing!!