Statistical Process Control (SPC)

- Shift in mindset
- Have implemented SPC for Weight Control and Seal Integrity
- Beginning to implement SPC with environmental testing, chemical testing, and looking to implement in other aspects of the process.
# Root Cause Analysis & Roadmap

## Failure Mode
- Fin seal Wrinkles - Maintenance
- Fin seal Wrinkles - Vertical Bar Alignment
- Airbags - Cold Lines
- Bad Seal - Jaws Dirty
- Bad Seal - Electronic Settings
- Overfilled/ Low # - procedure
- Overfilled/ Low # - Deflate Plates
- High Weights - Calibration, Cold SU
- Missed Issues - low FTE
- Missed Issues - Onboarding

## Inspect Out
- Startup/ Shutdown Maintenance CP (could be weekly)
- SU/SD/ Shift Fin Seal Checks
- Weight Checks, Wind jet Checks, Mixing Checks
- Hourly Jaw Checks
- SU/ SD settings verification
- Warehouse Checks
- Shift “finger pinch test” (micrometers to standard)
- Eliminate Single Point Adj, Shift C, QA CP
- Shift Coverage/ Staggered
- Onboarding CL/ Plan for each position

## Mitigate
- PM Protocol from Ica
- Maintenance Control
- Wind Jet (Fan), Catch Bins replace Diverter, Insulate Hopper
- Shutdown Clean, Mid Shift Clean (Study frequency)
- Leadership Messaging on Expectations
- Clear escalation Protocol
- Maintenance Control Deflate Plates
- SU procedure, post Ramp Up, 10 pt calibration, SP/CYRG reaction plan
- FTE/ Line Ratio, Alarming for key failures
- Drive accountability/ sign off

## Design Out
- Tooling to lock settings - one product
- Heat Tracing Lines, Photo eye setting (DCE)
- Password Change - Maintenance Controlled
- Deflate plate tooling to minimize variation/ lock settings
- New Equipment, Servo vs Piston, automate
- Auto Line Stoppage Alarms for critical issues
Weight Control - Fall 2018

• Weight Test Performed
• For Line Adjustments Only
• No Analysis and Control
• Kicked off SPC Project with Data Sampling
• Standard Deviation - 1.5 Grams
Improve/Control: Progress to Date

• Established Weight Standards and Policies
• Implemented Data Collection System for Weights, Visual and Vacuum
• Collect Real-Time at Operator and QC Stations
• Immediate Feedback, Analysis and Control
• Standard Deviation <1 Gram
• Improvement from 3 to 5 sigma vs run rules and 8 sigma vs MAV
Comparison Overall

We’ve seen the tubes calibrate much better to reduce overall variability from 1.5 stdev to less than 1 stdev. This translates to a reduction in defects per million of 60,000 to less than 1000 (or from 6% to .1%)
Weight Control - Line Comparison continued

By tube then

By tube now
Weight Control - Then and Now all Plant Comparison

*Individual standard deviations are used to calculate the intervals.*
Daily Dashboard - Weight and Seals
Daily Dashboard - Process Capability

Customer Capability

<table>
<thead>
<tr>
<th>Measured on All Packets</th>
<th>Tube A</th>
<th>Tube B</th>
<th>Tube C</th>
<th>Tube D</th>
<th>Tube E</th>
<th>Tube F</th>
<th>Tube G</th>
<th>Tube H</th>
<th>Tube I</th>
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<td>7.2</td>
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- Lower Limit
- Lower 3 Sigma
- Lower 4 Sigma
- Lower 6 Sigma
Timeline Dashboard - Weights

Graph showing weight tests over time with a table indicating the number of weight tests outside limits for different categories.
Timeline Dashboard - Process Capability

Customer Capability Over Time

- Mean
- Lower Limit
- Lower 3 Sigma
- Lower 4 Sigma
- Lower 6 Sigma
Timeline Dashboard - Inspection Failures
Seal Integrity - as of April

Seal Check - 4.5 Sigma Level (current)

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<th>DPU</th>
<th>DPMU</th>
<th>Sigma</th>
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Vacuum Check - 4.4 Sigma Level (current)

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Mana Nutrition