Case Weight Variation Reduction and Subsequent Ballistic Dispersion Improvements in M118LR

Ms. Dionne Dillon
Manager, Manufacturing Engineering ,7.62mm and Cal .50
ATK Small Caliber Systems
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Current Condition

- Demand For M118LR Increased 900% Between 2001 And 2009

- Considerable Field Experience Yielded Helpful User Feedback
  - Overall Quality And Performance Very Good
  - Accuracy And Consistency Typically Exceeds Specifications

- Some Users Requested Improvements
  - Improve Consistency Between Sublots
  - Reduce Need For Re-zero Between Sublots

Users – “Reduce Variation Between Sublots”

ARDEC / ATK Continuous Improvement Project

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Project Objective:

Identify Process-Related Measures that Can Be Implemented at the Lake City Army Ammunition Plant To Improve Average Extreme Horizontal and Vertical Spreads and Reduce the Need to Re-zero Between Sublots

Continuous Improvement Philosophy

M118LR Case Requirements

- M118LR Case Is Essentially Identical To An M80 7.62 Case Except For:
  - Primer Pocket Diameter
  - Head-stamp Requirements
  - Note 10 On M118LR Drawing

"Unit wt: 190-20 Grains. Case Weight Variation For Each Cartridge Sublot Shall Not Exceed 2 Grains After Taper."

M118LR Cases Nearly Identical to M80 Cases

Why Is Note 10 There?

- Studies Show Relationship Between Case Volume, Pressure & Accuracy
- Minimize Case Volume Variation To Achieve The Best Accuracy
- Case Volume Can Be Correlated To Case Weight
- Case Weight Is Inherently Easier To Measure At High Production Levels
- Result Was Case Weight Variation Requirement

Control Case Weight For Best Performance

M118LR Case Manufacturing Process

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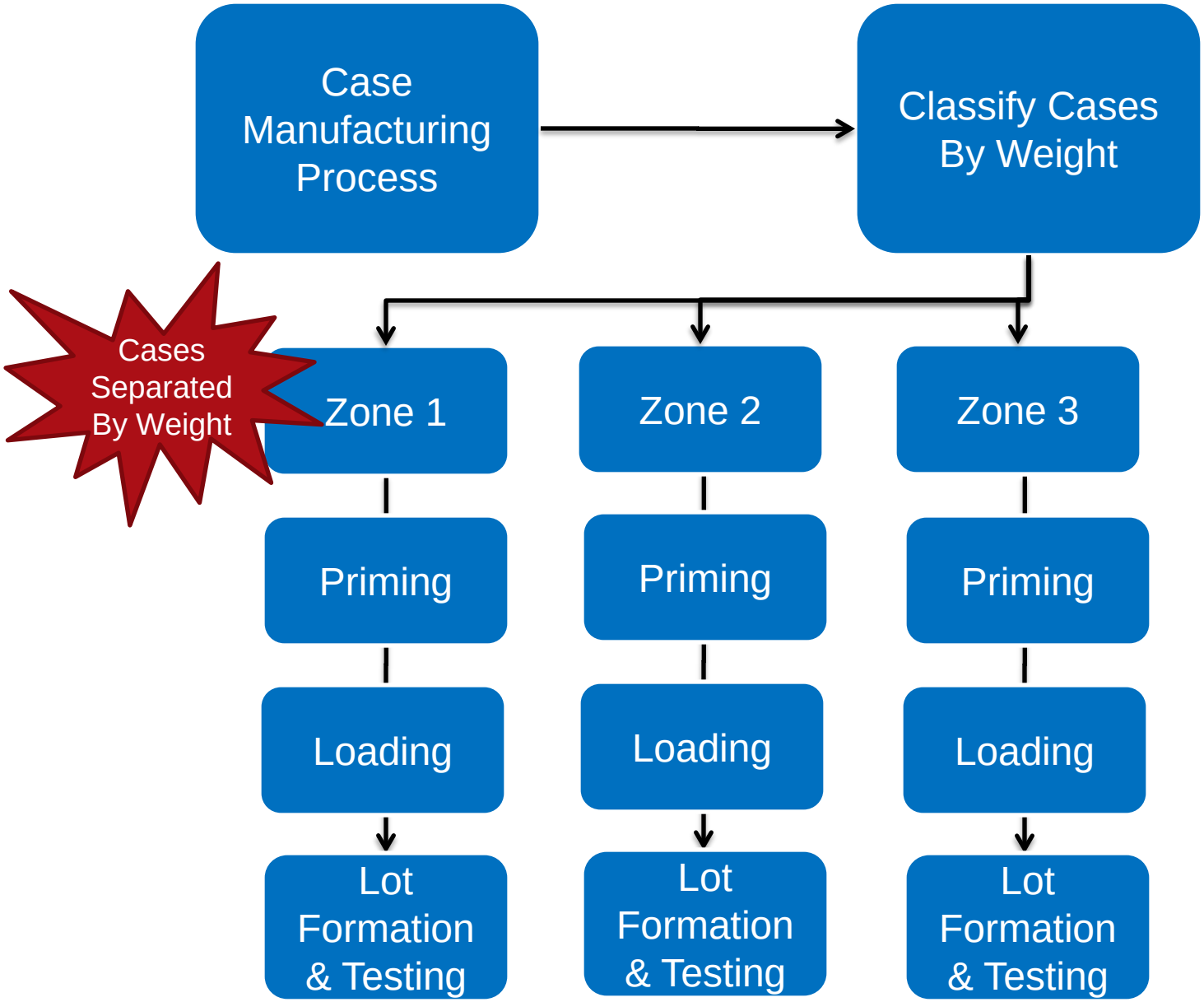
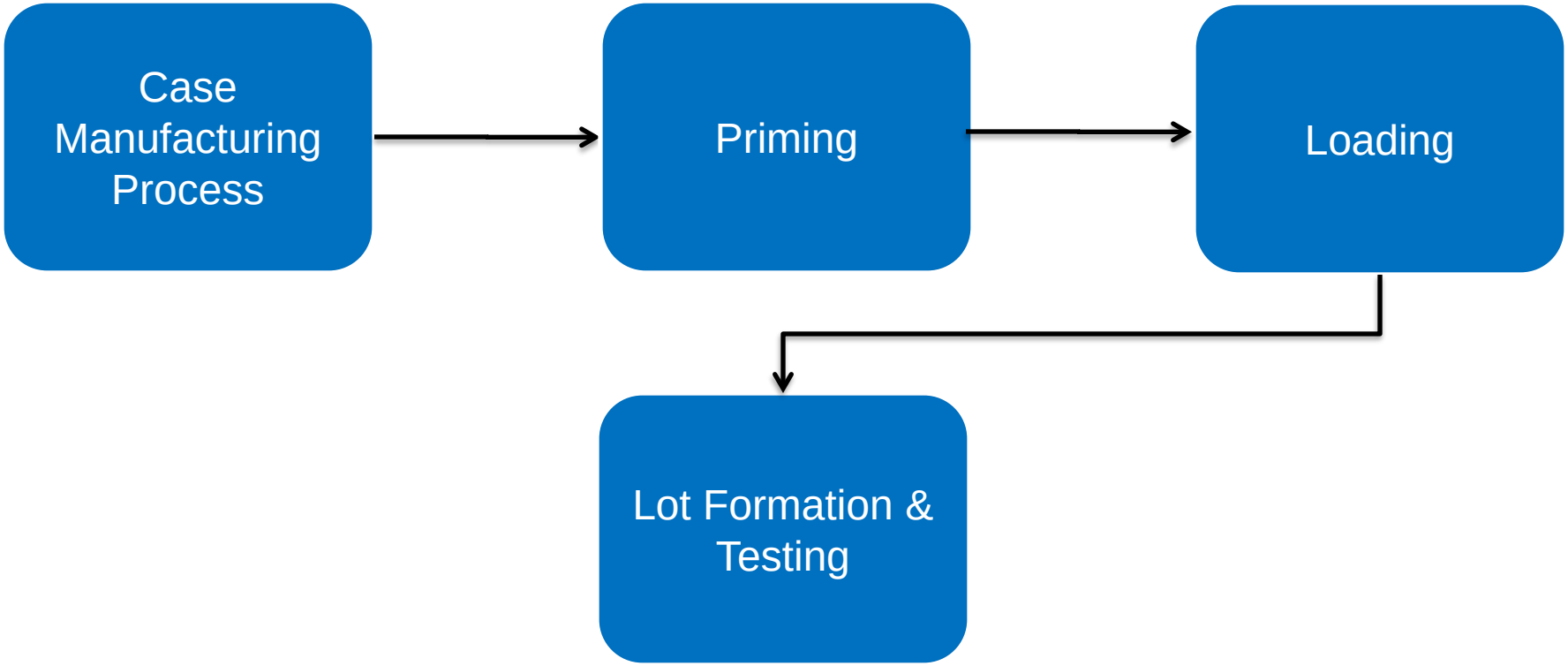


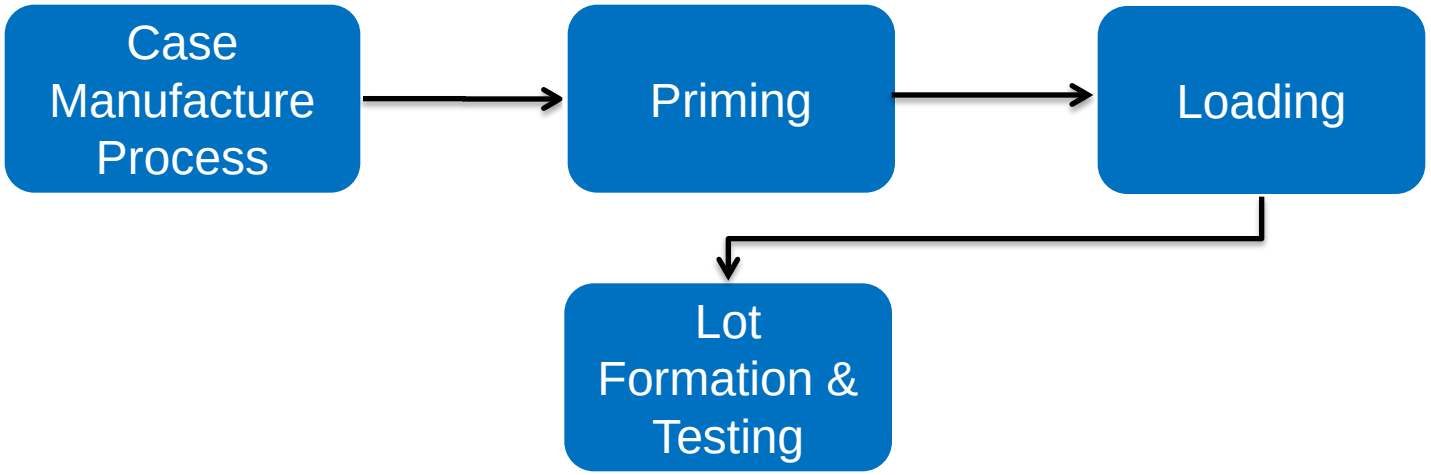
M80 Case Manufacturing Process



Could M118LR Cases Be A Subset of M80 Cases?

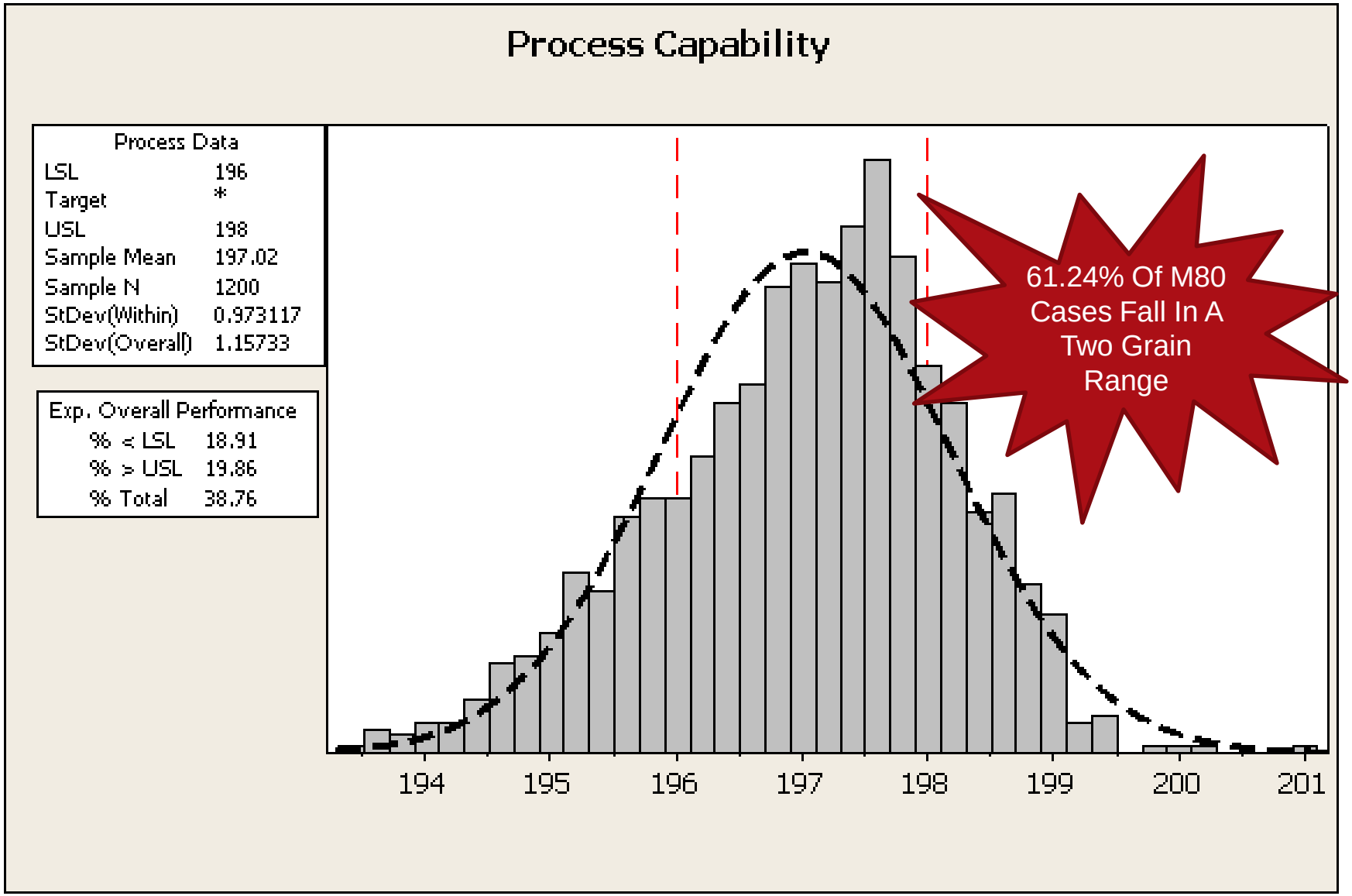
M80 Case Weight Study

- Weigh Random Samples Of M80 Cases
- Over A Long Period Of Time, Capture Differences In Brass Strip Gauge Variation
- Calculate The Proportion Of M80 Cases That Fall Into The Desired Weight Range

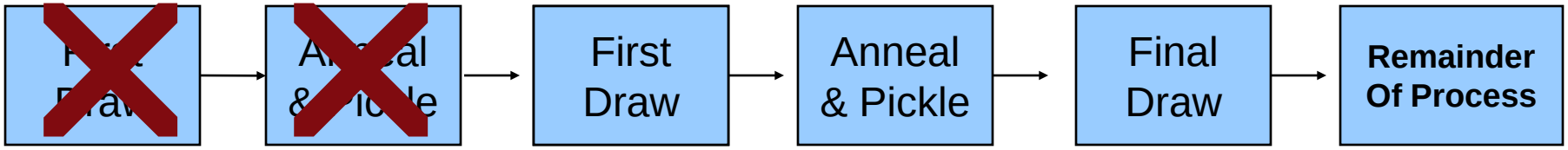


SPC Utilized To Measure Current M80 Process

M80 Case Weight Study Results



Conclusions and Actions For Improvement



- Data Collection And SPC Analysis Supported Changes
  - Different Raw Material Dimensions
  - Elimination Of 1 Draw, 1 Anneal, & 1 Trim Operation
  - M118LR And M80 Cases Are Now Manufactured Using The Same Process

M118LR Process Mimics Proven M80 Process

M118LR and M80 – Unified Process Flow

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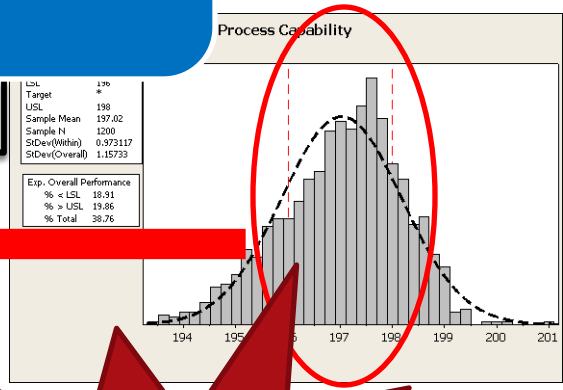
Drawing Operations

Case Weigh



NATO

Priming

Loading

Lot Formation & Testing

M118LR

Priming

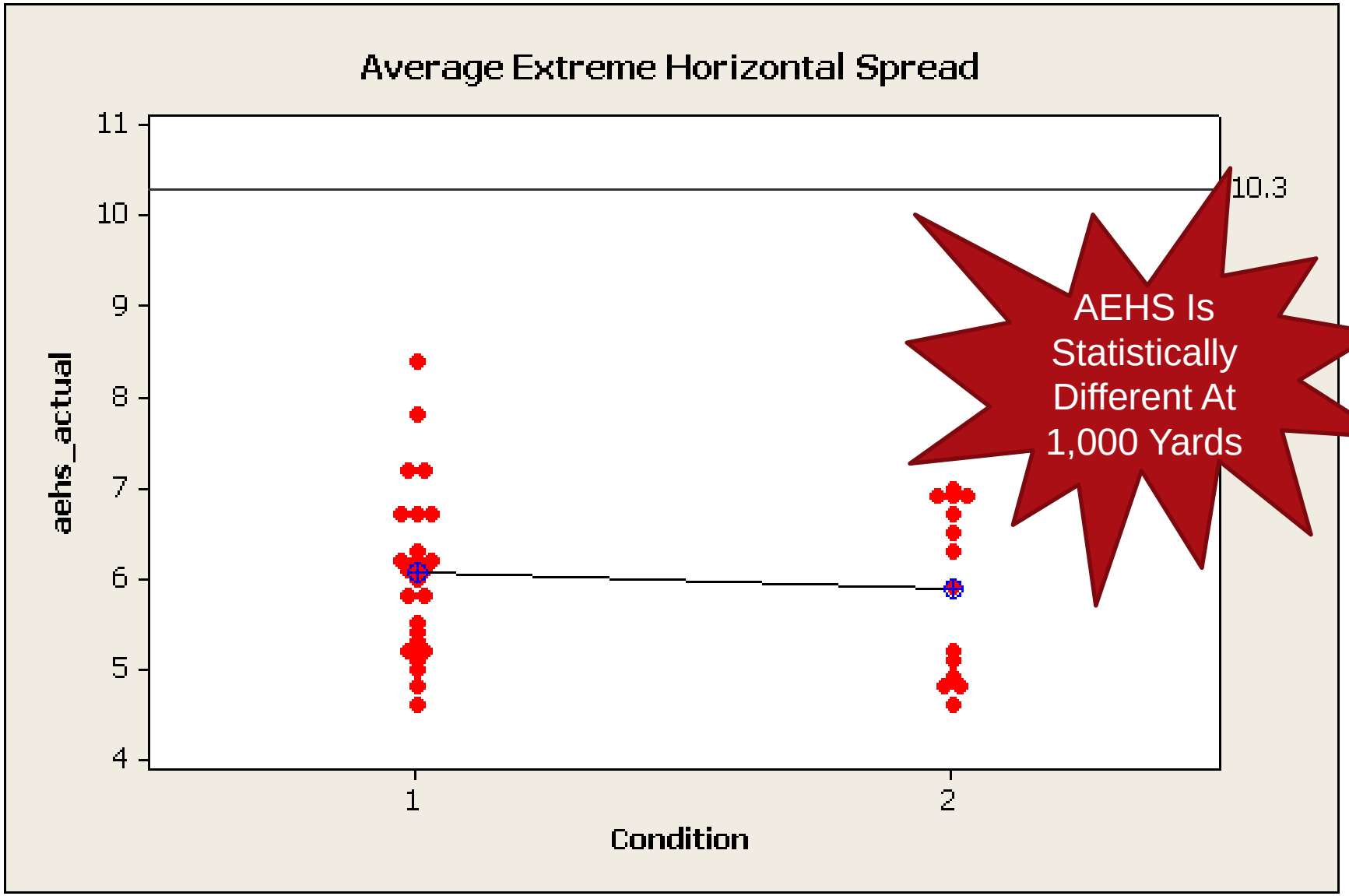
Loading

Lot Formation & Testing

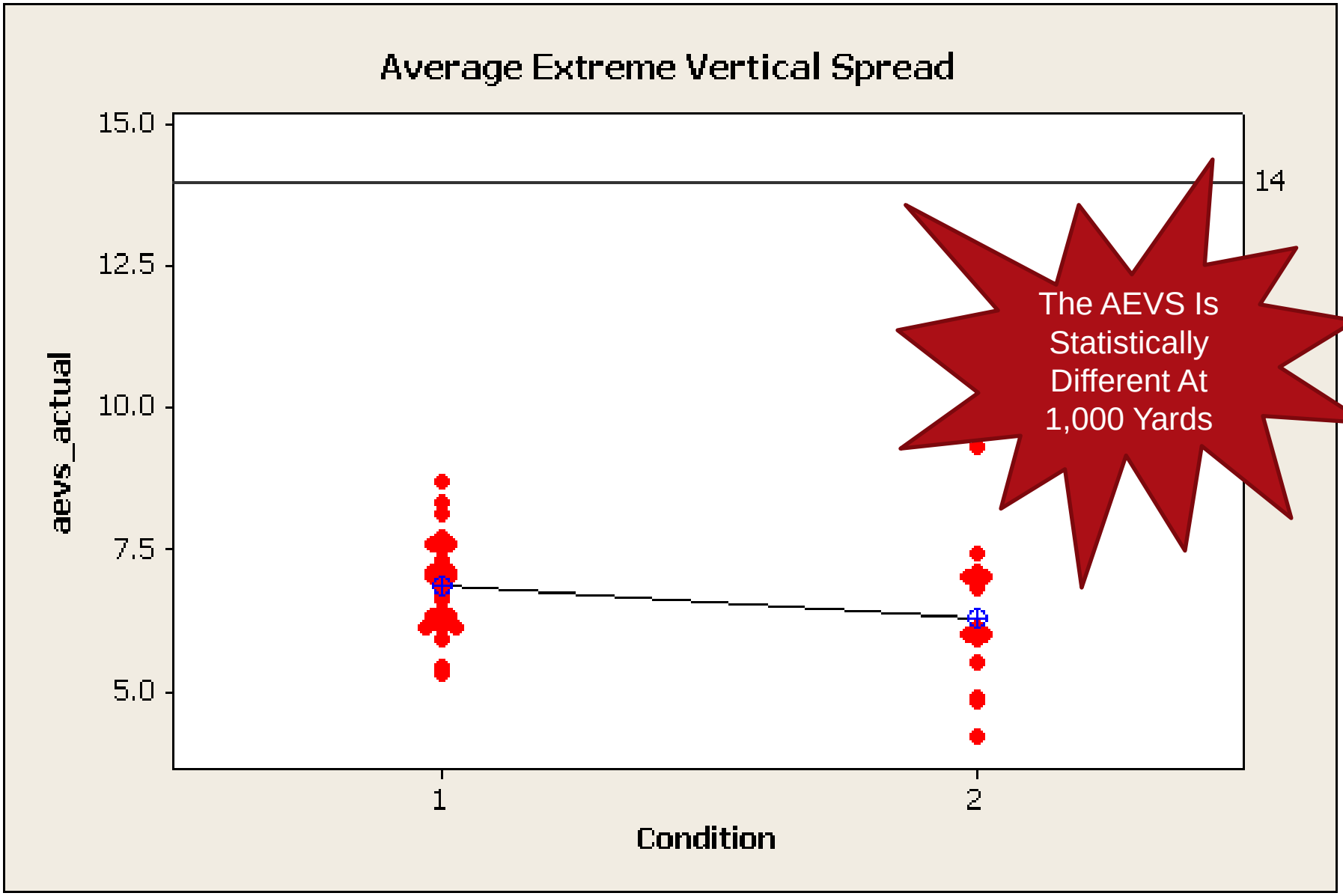
M118LR Cases Are The Same Weight In Every Sublot

LR Cases Come From The Center Of The Case Process

Horizontal Spread



Vertical Spread – A Better Measurement



Summary

- M118LR Accuracy Was Improved
  - Reduced AEHS From 6.06 To 5.89
  - Reduced AEVS From 6.85 To 6.29

- Contributing To Less Variation In Point Of Impact Between Sublots

A More Consistent Product For The User

Contact Information

Dionne Dillon

ATK

816.796.5017

dionne.dillon@atk.com