

T E S L A

Summer 2021 Internship Presentation

Sabrina Manji

Former Manufacturing Engineering Intern

Battery Module/Pack

Fremont, CA

LAST EDITED

8/5/2021



Sabrina Manji

Personal Introduction

Rising senior at Clemson University pursuing an ABET-accredited B.S. in Mechanical Engineering (graduating 2023)

Background – Clemson Formula SAE, University Innovation Fellow, previous internships in mechanical engineering

Hobbies/Interests – Flying, Photography, Drawing, Hiking



Presentation Overview

What did I do?

Sheet Metal Feature Folding

Line Retrofit for Tooling

Mold Release Inline Trial

Camera Rig Inline Station

Side Projects – Pallet Coating Studies, Inductive Sensor Calibration, Process Writing, VBA Programming, Coating Tolerance Study, Ergo Improvements, ESD Improvements

Autofolder

Bringing a new machine online

Initial State:

- Bypassed originally using a manual bridge solution
- Sparse information about machine capability
- Question of manual sheet metal fold process capacity

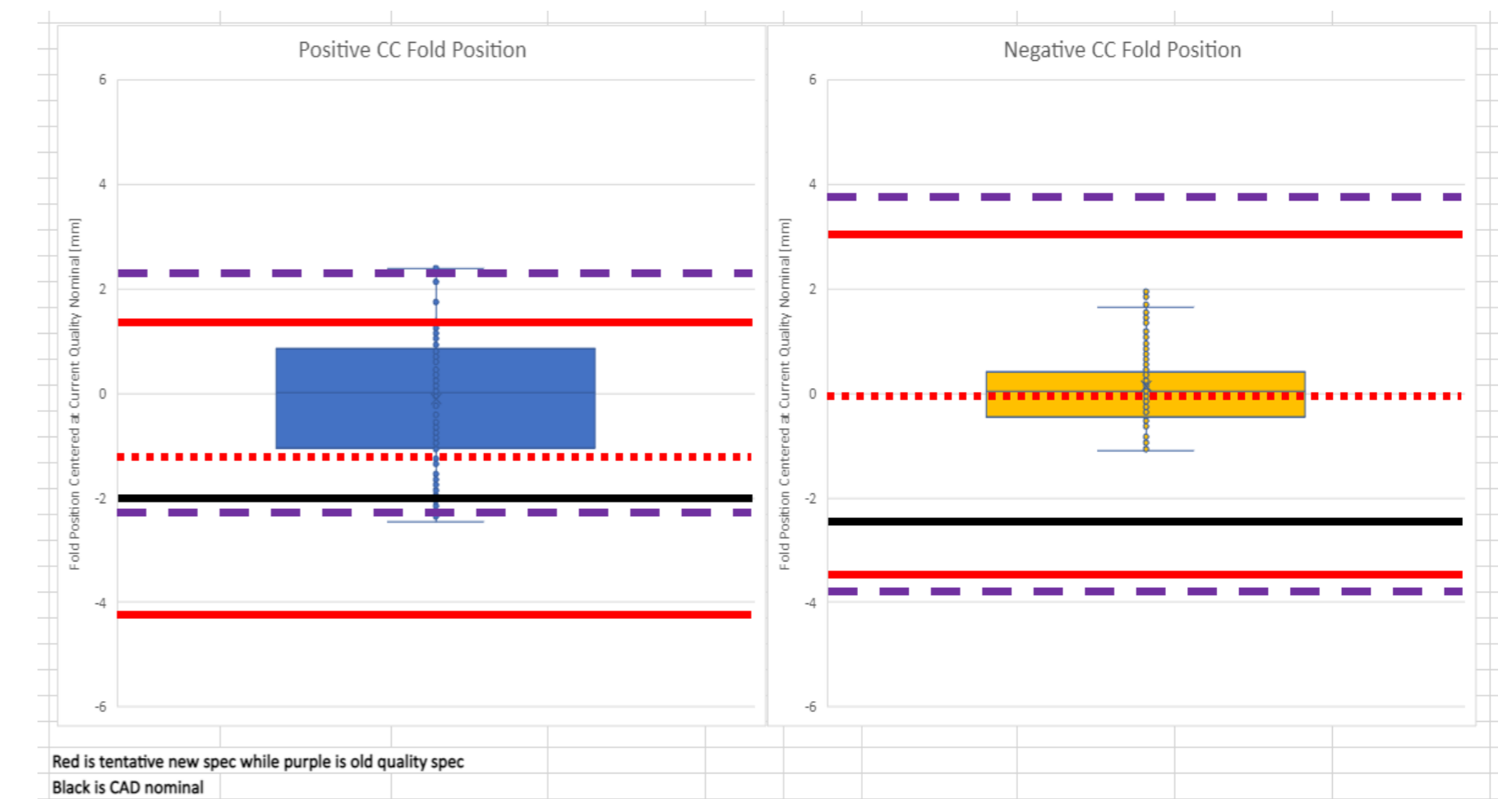
My Work:

- Ran various trials to determine capability, define cycle time, tune adjustments (spanning over 100 modules)
- Collected, analyzed, and presented data for each of these trials
- Redefining fold tolerance according to weld constraints

Current State:

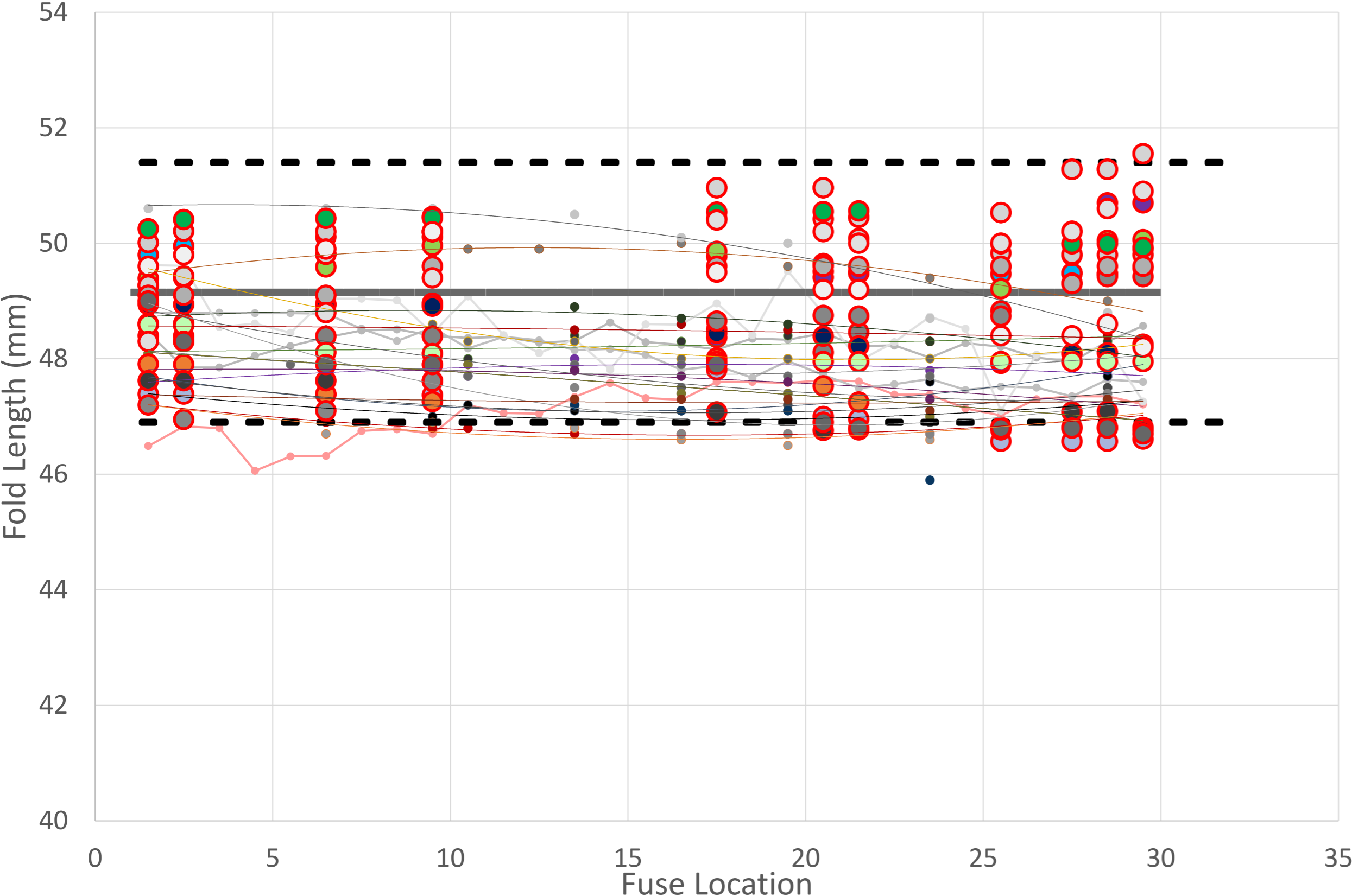
- Determined that machine is capable pending results of fold spec redefinition
- Continuing work to bring machine online

No Seepage Auto-fold		
	POS	NEG
Tol +/-	2.25	3.75
N (points)	187.0	153.0
AVG	0.0	0.0
σ	1.2	0.7
RANGE	4.8	3.0
CPK	0.63	1.79
CPK IF MEAN CENTERED	0.63	1.79

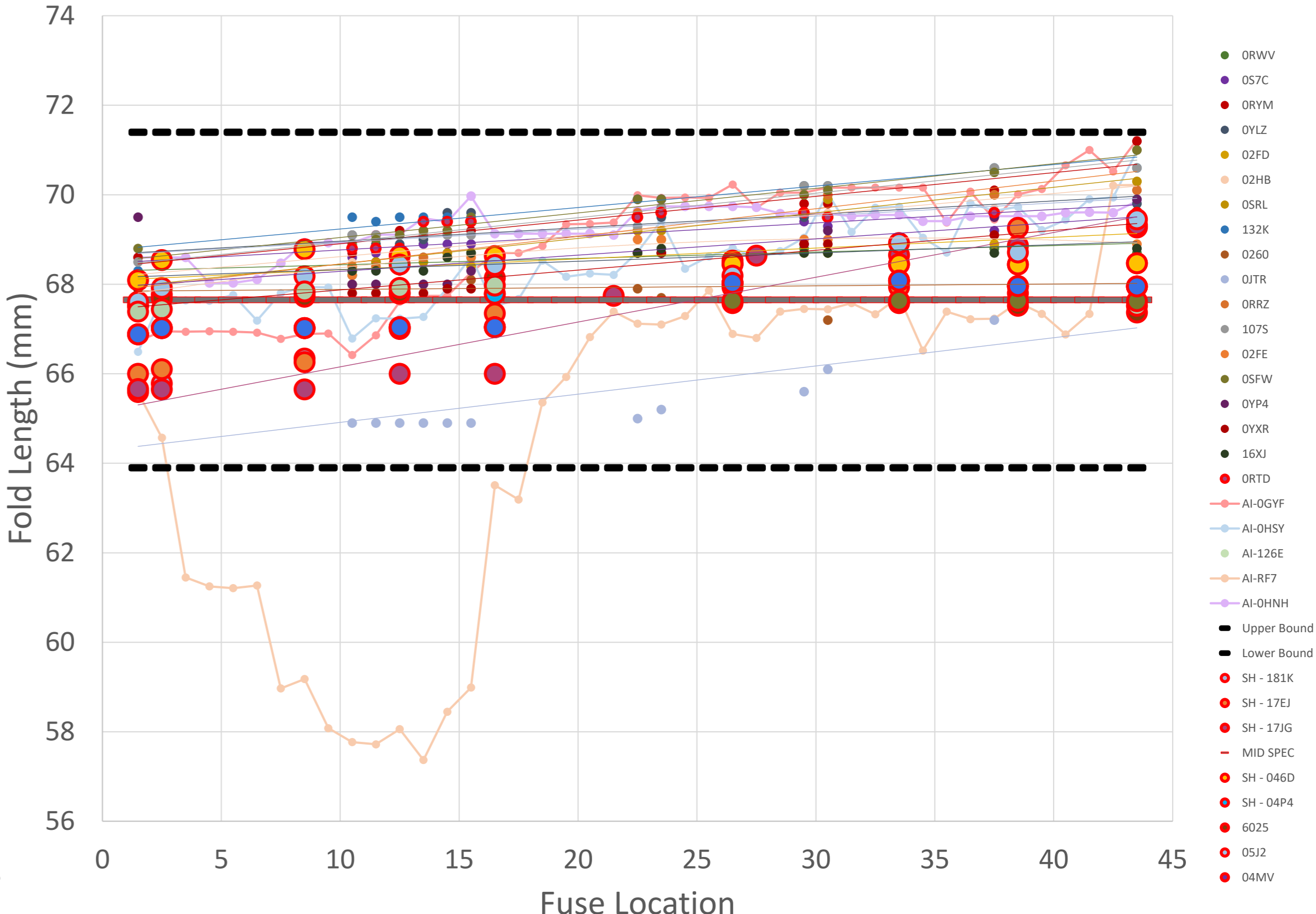


Autofolder – Data Plots

Positive Fold Trends



Negative Fold Trends



- 0RWV
- 0S7C
- 0RYM
- 0YLZ
- 02FD
- 02HB
- 0SRL
- 132K
- 0260
- 0JTR
- 0RRZ
- 107S
- 02FE
- 0SFW
- 0YP4
- 0YXR
- 16XJ
- 0RTD
- AI-0GYF
- AI-0HSY
- AI-126E
- AI-RF7
- AI-0HNH
- Upper Bound
- Lower Bound
- SH - 181K
- SH - 17EJ
- SH - 17JG
- MID SPEC
- SH - 046D
- SH - 04P4
- 6025
- 05J2
- 04MV

Line Pallet Retrofit

Improving line yield

Initial State:

- Fallout when looking at yield
- Caused by parts not being pulled to datum correctly by the pallet
- Retrofit materials had been selected but operation needed to be organized

My Work:

- Ran inline trial of test pallet to determine if modifications caused unforeseen issues
- Drove putting together operational process and guidelines for retrofit

Current State:

- Fleet-wide retrofit for 190 pallets is in progress

Mold Release Inline Trial

Improving cycle time and availability

Initial State:

- Plastic liners used on pallets in line to prevent potting buildup
- Liners decrease the number of modules that get stuck during removal
- Increased cycle time and cost, not sustainable

My Work:

- Coordinated and ran a 30+ pallet inline trial to determine recommendation
- Learned SQL to run queries to aggregate data for general pallet population and mold release-coated population
- Analyzed data and presented findings to make recommendation to remove liners

Current State:

- Removing liners has been recommended, currently working to add UV additive to release agent and then determine cutover timeline



Camera Rig Line Station

Process change

Initial State:

- Needed to move in order to maintain tracking flow
- Conveyor limitations would increase the potential of miscommunication and quality escapes while also requiring 2 associates instead of 1
- Increased cycle time and labor costs

My Work:

- Designed and built a camera rig and set up a monitor to make it possible to staff one associate
- Reduced risk of quality escape and reduced labor cost

Current State:

- Optimizing station and getting final approval for documentation

Overview

[EDIT](#)

CHANGE OWNER Sabrina Manji	CHANGE TYPE Process- No Trial
TARGET LAUNCH DATE 07/15/2021	RELATED CHANGES
PART SYSTEM • Module	FACILITY • Fremont Factory
PRODUCTS • SXSHARED	PRODUCTION LINES • MS/X Battery -- Module
IMPACTED AREA • Process Changes	REASON FOR CHANGE • Program Related

CURRENT STATE

Currently the final module QIS station is located on the conveyor after manual fold and manual icing inspection.

FUTURE STATE

Once the automatic icing measurement station is released, the final QIS station will need to move to the EOL conveyor after the automatic icing measurement station to allow for final quality check and proper MOS flow.

JUSTIFICATION

This will allow for the line to maintain correct flow while allowing for thorough quality checks and increased efficiency