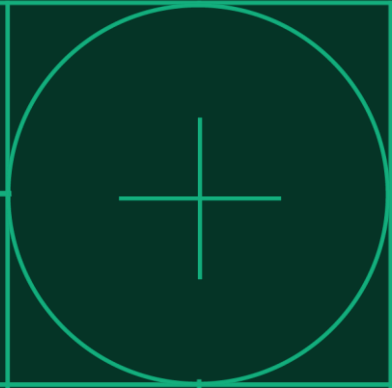




# CONNECT

2024 AUSTIN



# From Concept to Execution Analytics in Action

# Who am I?

**Matt Holt**, Principal Solutions Architect; CLA, CPI, E.I.T.

BSEE / BSCS – Texas Tech

*I enable digital transformation initiatives and data-driven decision making.*

2022: Joined NI Digital Transformation Practice

2020: Global Digitalization Leader; Celanese

2019: Systems Architect; IIoT Implementation Board Lead – Lockheed Martin

2017: Software Evangelist; MFC Test Engineering – Lockheed Martin

2014: CTO; IIoT and Microgrid Control – ELM FieldSight, LLC

2010: Lead Architect; Test and Automation / IIoT – Dell Engineering Services

2007: Passed CLA Practical Exam

2006: Passed CLAD and CLD Exams

2004: Programming Supervisor; Manufacturing Smart Factory – Toshiba International Corporation

# Who am I?

## Mike Castañeda, Principal Solutions Architect; CLA

BSCE – University of Florida

MSCS – Arizona State University

*My focus is on automation solutions and backend analytics*

2021: Principal Solutions Architect in the Digital Transformation Team at NI

2016: Staff Software Engineer at Intel - RF Validation IOTG Automation and Analytics

2013: Sr. Test R&D Engineer at Intel - RF Validation ICDG Automation and Analytics

2010: Applications Engineer at Fujitsu - RF Validation Automation

2006: Software Engineer at Intel - Electrical and Signal Integrity Validation Automation

# Why are we here?

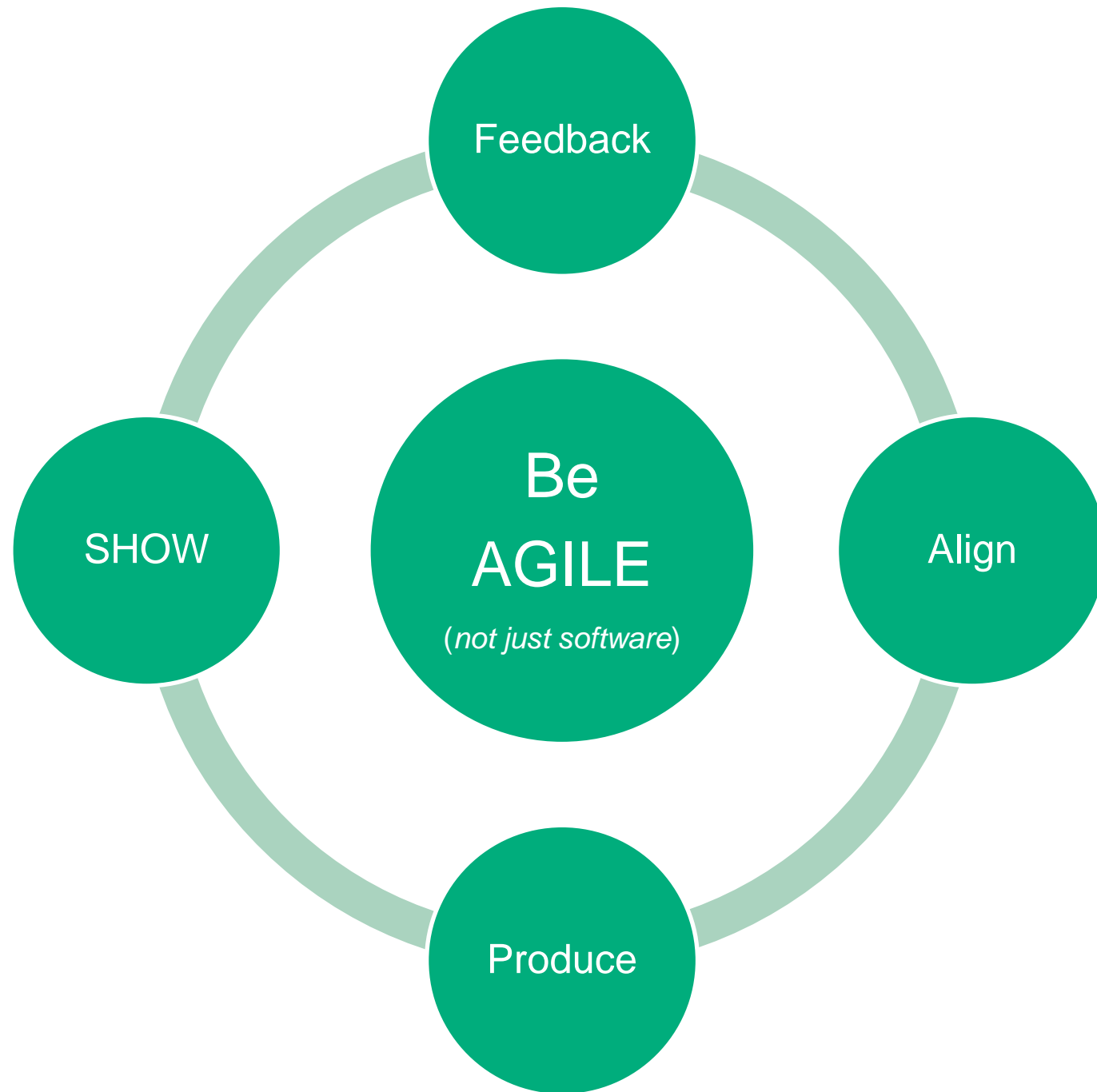
- Overview of the process
  - Trade Studies / Data collection
  - Define and monitor your Successes
- Examples
  - Example 1: Automotive – Contract Manufacturing Management
  - Example 2: ADG Customer – Test Data and Utilization
  - Example 3: Cameras Manufacturer – Manufacturing Optimization

*Where are you now?*

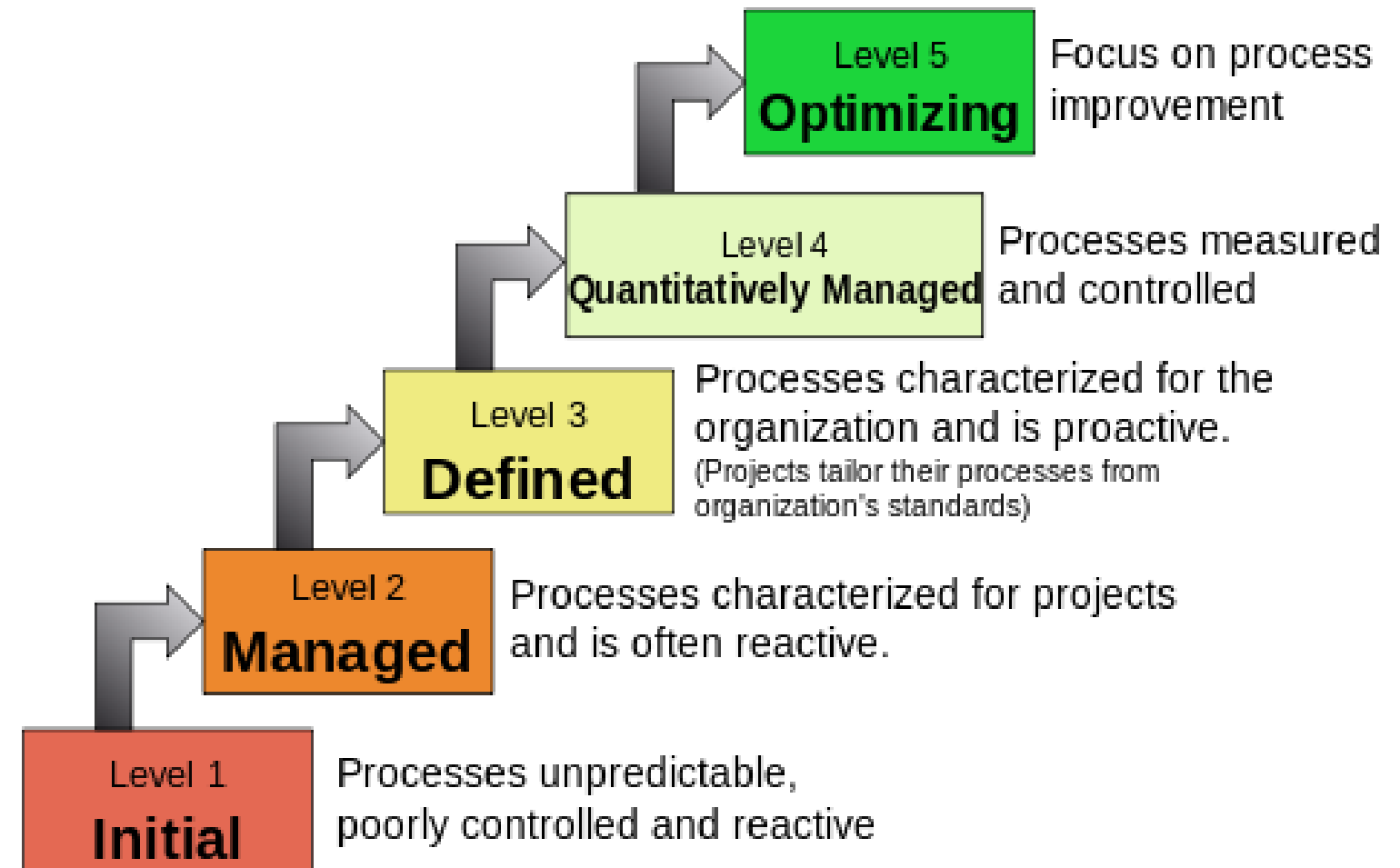
*Who and What?*

*How can you be successful?*

*When do we start?*



## Characteristics of the Maturity levels



# Study the industries!

- General
  - McKinsey & Company, IBM Institute for Business Value, Boston Consulting Group, Harvard Business Review, IEEE, Upwork
- Industry Specific
  - AviationWeek, BCG Digital Transformation Report, Deloitte Industry Clouds, Financial Times, **COPILOT / ChatGPT**
- Trade Shows
  - NIconnect, IEEE, Emerson Exchange, Digital Transformation Summit
- ASK THE EXPERTS
  - Contact your sales / account teams, reach out on LinkedIn





# Automotive: Contract Manufacturing

# Where they Started

Each facility within each Contract Manufacturer:

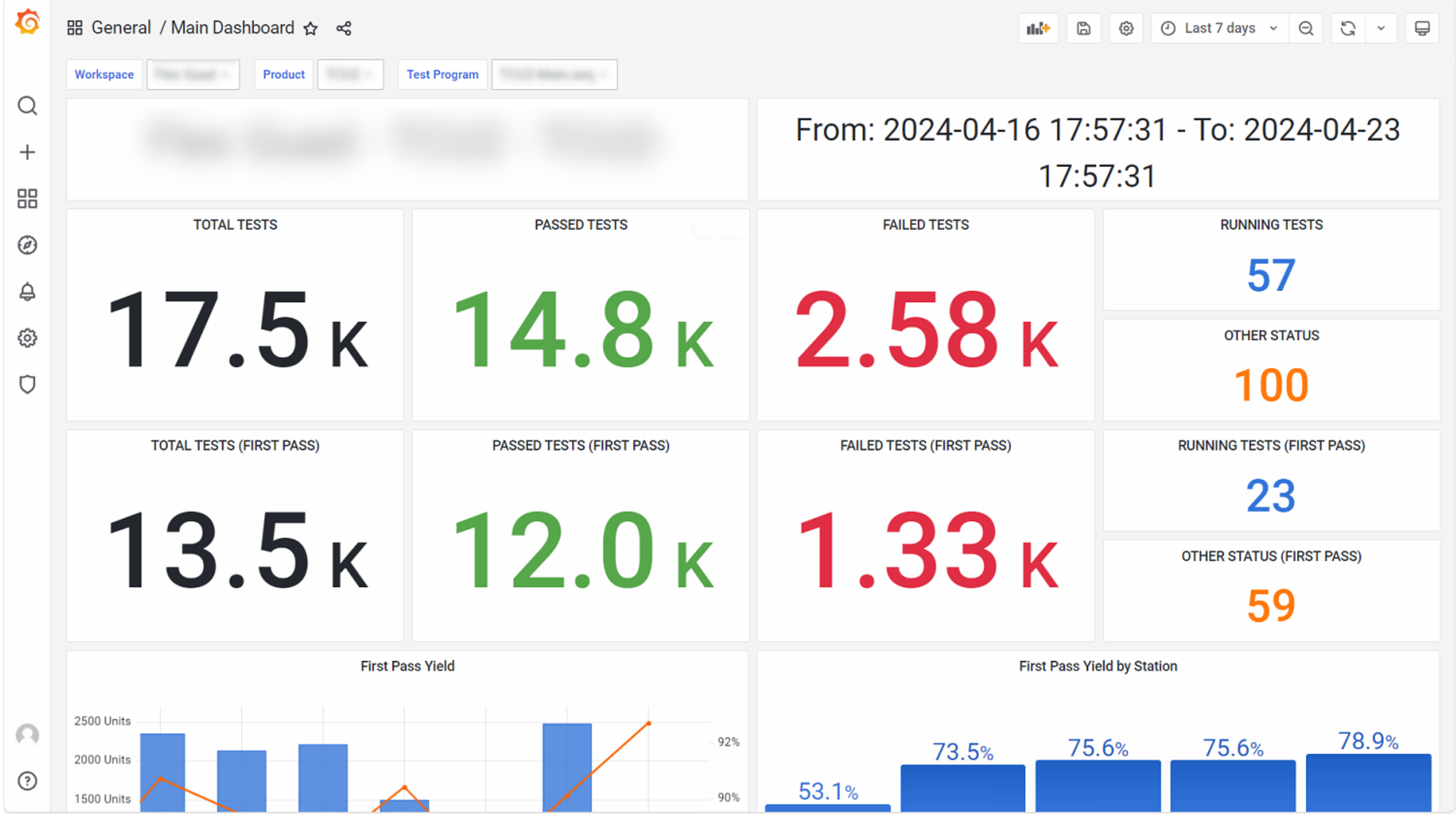
1. Uniquely tracks and reports yield, throughput, and FPY
2. Limits visibility to actual production data
3. May or may not report bonepile
4. Maintains unique test processes and standards
5. EMAIL based reporting



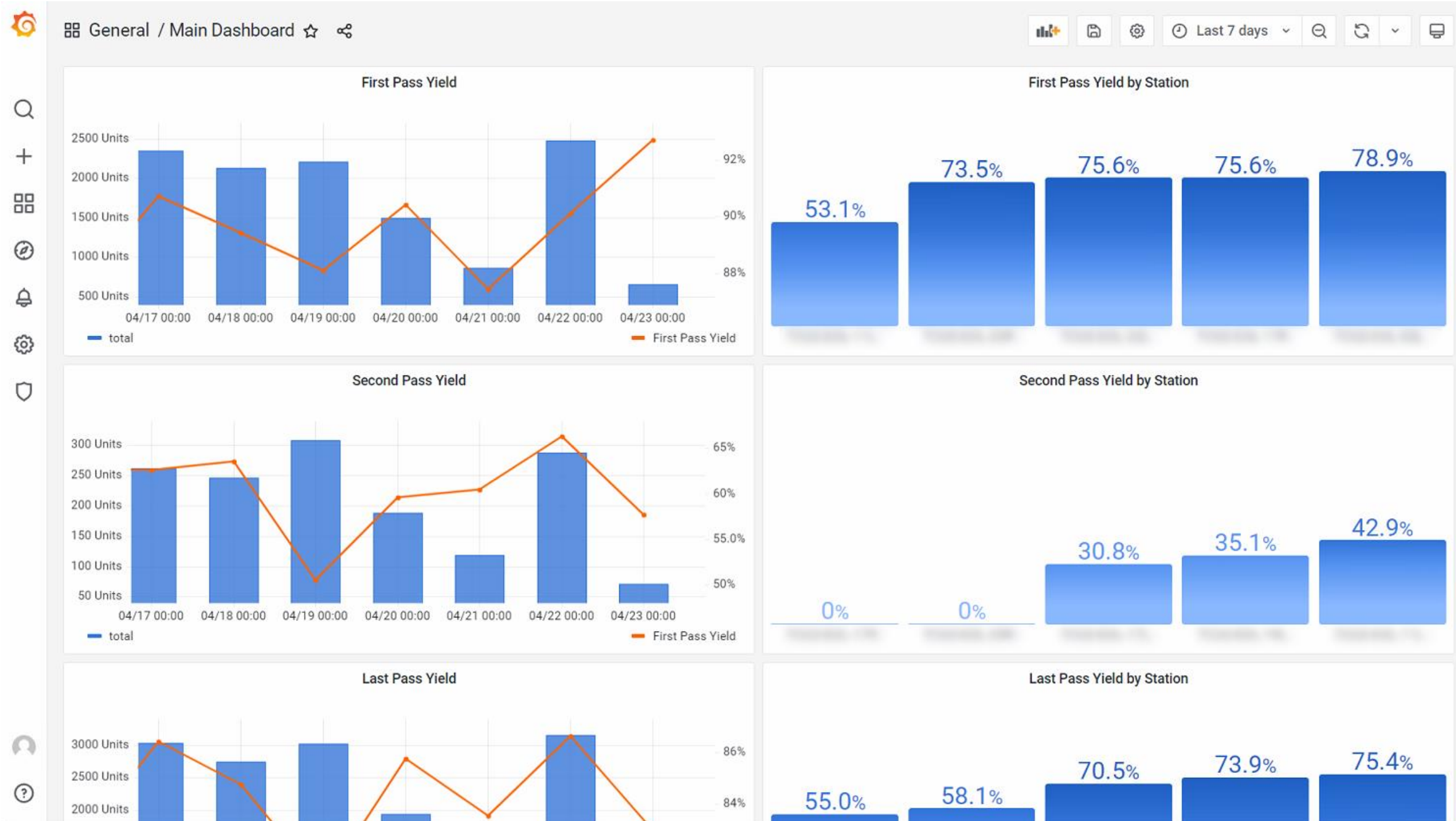
# The Process



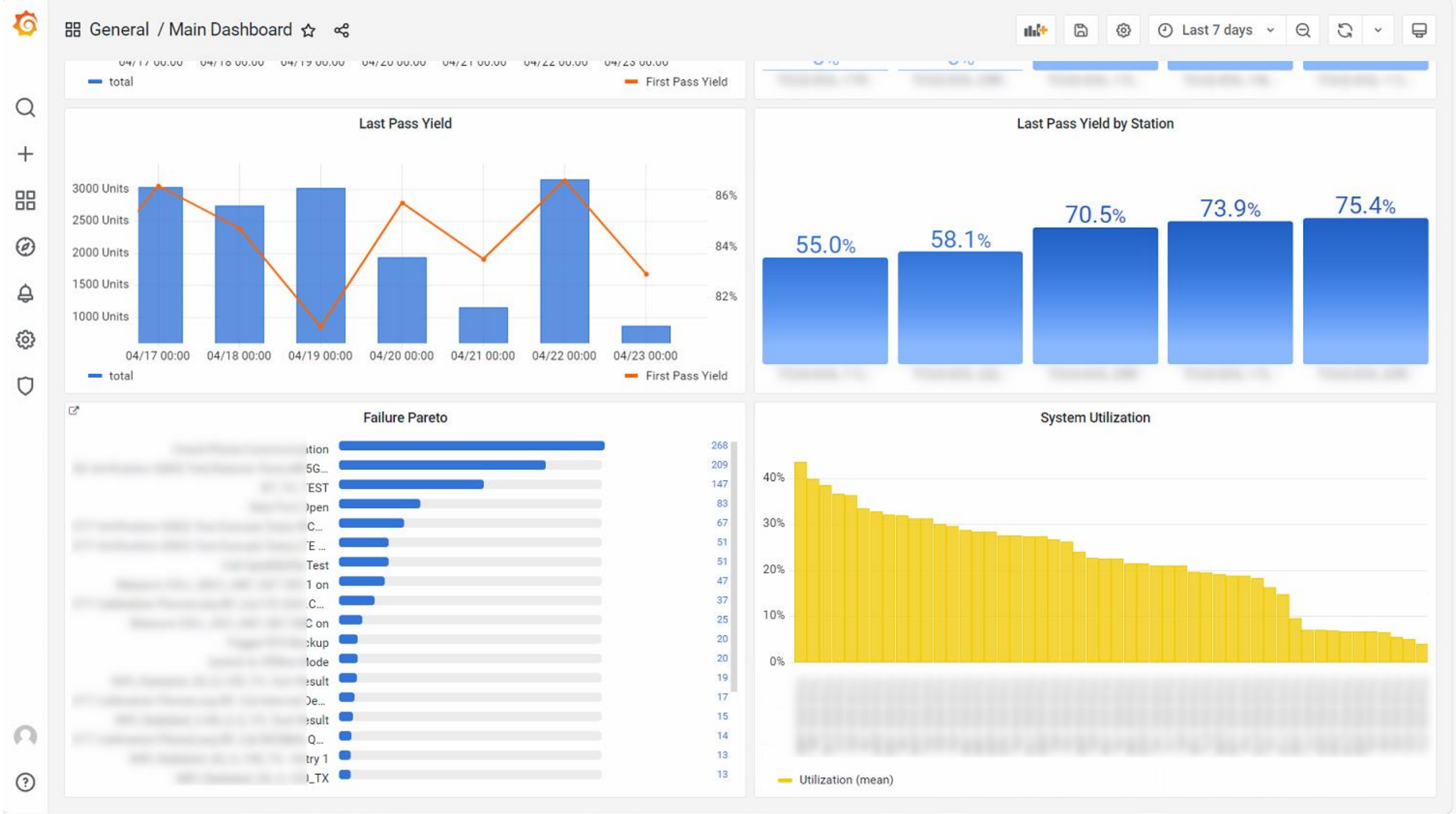
# WHERE THEY ARE NOW



# WHERE THEY ARE NOW



# WHERE THEY ARE NOW



# WHERE THEY ARE NOW

General / Bone pile ☆ 🔊

Workspace  Product  TestProgram All ▾ Failure older than [Days] 3 ▾

1. The dashboard scans the list of units defined by the top filters including the time range.

2. Returns a list of all units which failed more than X days ago and didnt run again since.

Total units

# 317

Bone pile								
Serial Number ▾	Last started At ▾	Station Name ▾	Product ▾	Test Program ▾	Iteration ▾	Status ▾	Failed step ▾	Days Since failure ▾
523	2024-04-16 22:35:41	10L			2	Fail	WIFI...	5 days 21:24:18.171
523	2024-04-16 22:35:41	10L			2	Fail	WIFI...	5 days 21:24:18.171
523	2024-04-16 22:35:41	10L			2	Fail	WIFI...	5 days 21:24:18.171
689	2024-04-16 22:45:08	20R			3	Fail	5G Ve...	5 days 21:14:51.007
298	2024-04-16 22:56:22	06R			3	Fail	Bluet...	5 days 21:03:37.122
747	2024-04-16 23:21:21	06L			1	Fail	5G Ve...	5 days 20:38:38.672
997	2024-04-16 23:42:14	17L			2	Fail	Wait...	5 days 20:17:45.778
997	2024-04-16 23:42:14	17L			2	Fail	Wait...	5 days 20:17:45.778
508	2024-04-16 23:56:03	01R			2	Fail	XTT...	5 days 20:03:56.41
964	2024-04-17 00:32:57	05R			2	Fail	Wait...	5 days 19:27:02.123
964	2024-04-17 00:32:57	05R			2	Fail	Wait...	5 days 19:27:02.123
855	2024-04-17 00:44:20	06L						5 days 19:15:39.494
971	2024-04-17 00:52:05	07R				Fail	WIFI...	5 days 19:07:54.076
971	2024-04-17 00:52:05	07R				Fail	WIFI...	5 days 19:07:54.076
971	2024-04-17 00:52:05	07R				Fail	WIFI...	5 days 19:07:54.076



## WHERE THEY ARE NOW

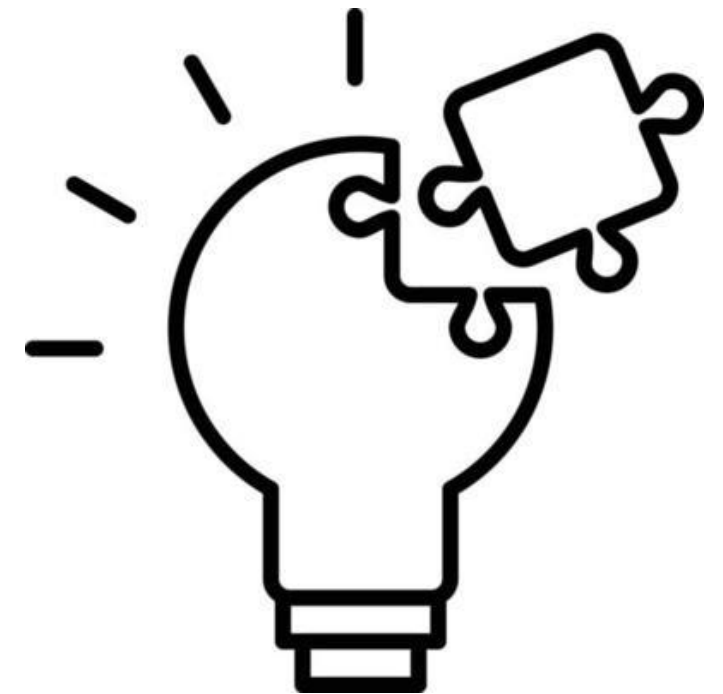
1. Consistent and real-time Yield, Throughput, and FPY
2. Access to production system health, all measured data (including calibration sequences)
3. Bonepile data is retrievable real-time
4. Confirms to CUSTOMER processes and standards
5. Access to an UNPRECEDENTED view of all contract manufacturers



# Aerospace and Defense: Test and Utilization

## Where they Started

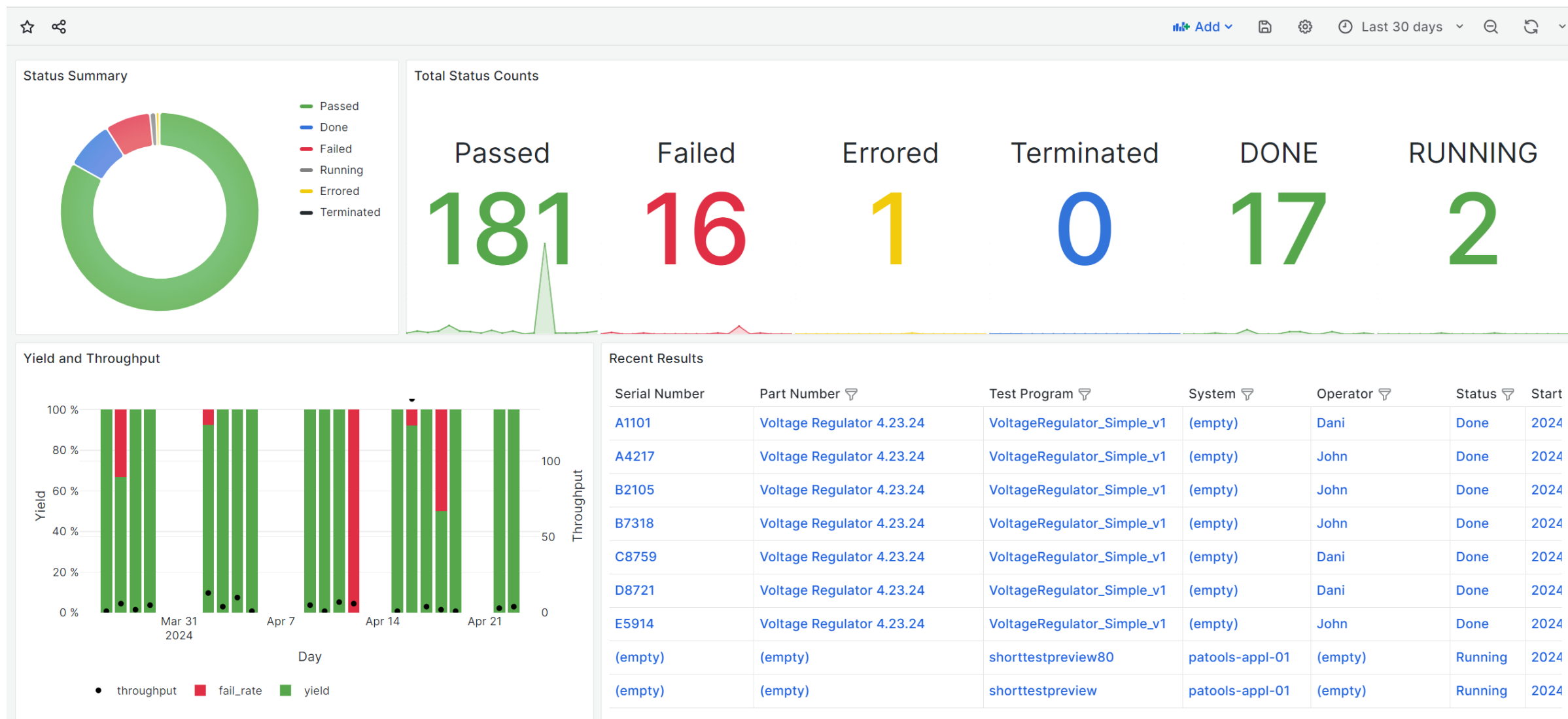
1. Isolated Lab environments
2. No data standardization
3. Unique testing environments and data management solutions
4. Limited metrics and analytics
5. No method of easily accessing or querying data
6. No method of monitoring test stations



# The Process

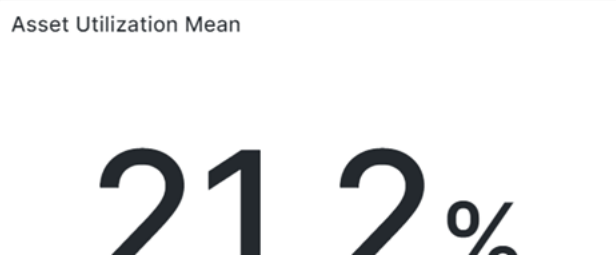
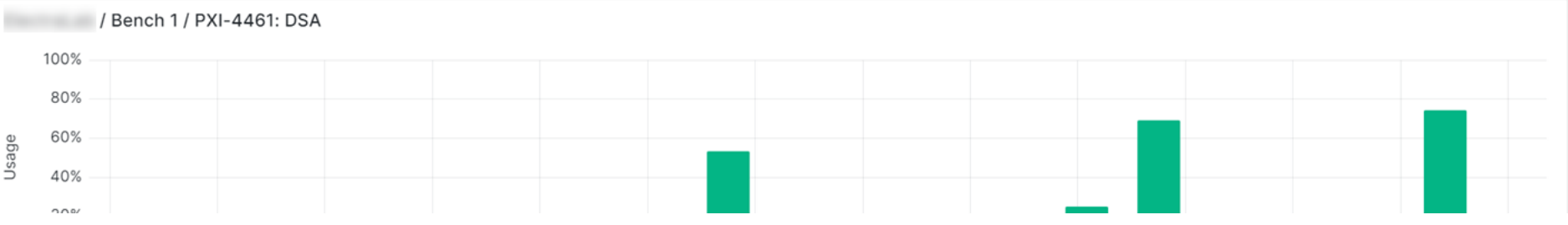
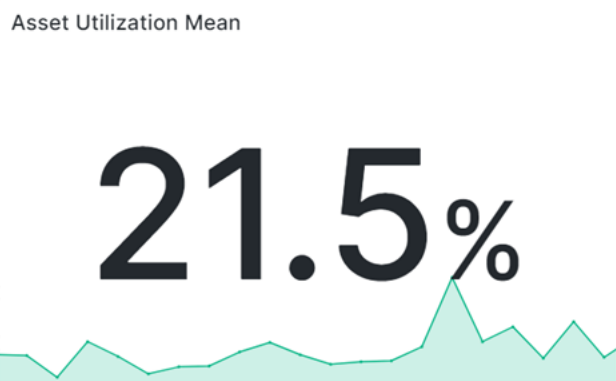
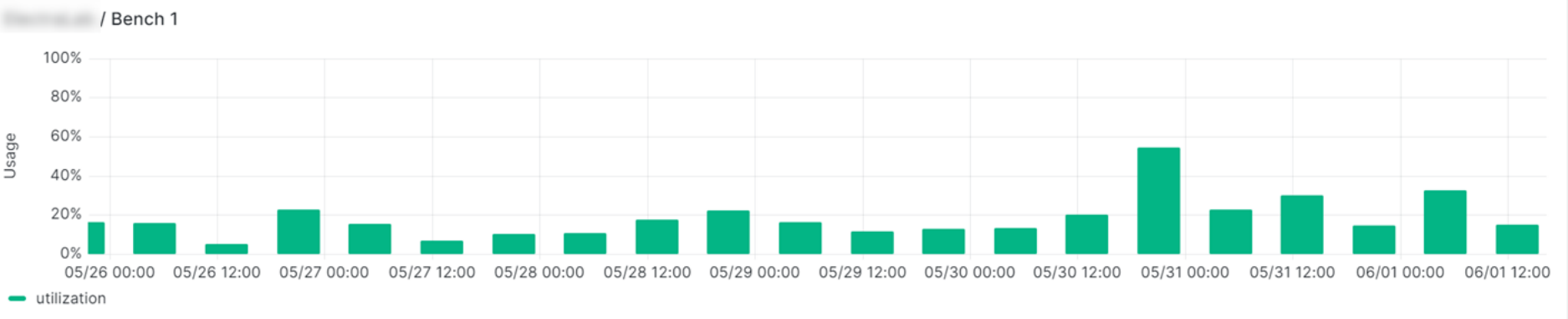
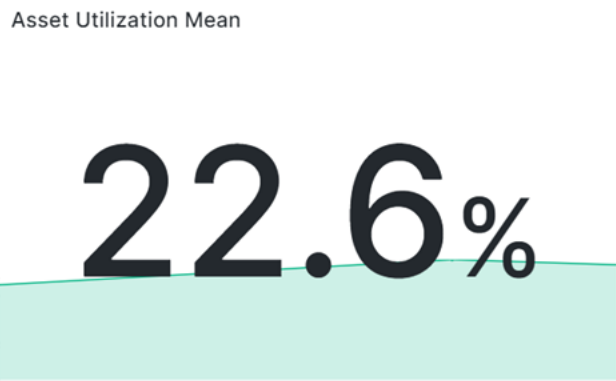
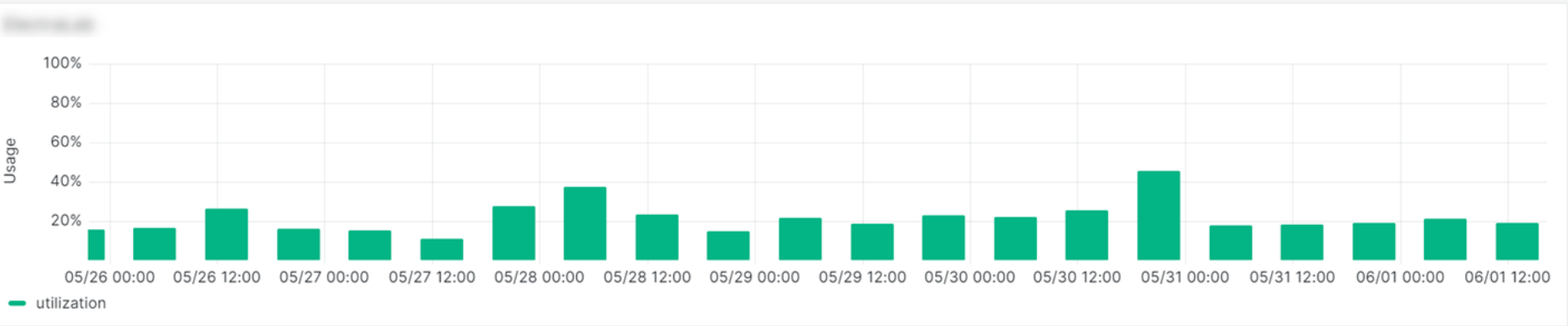


# WHERE THEY ARE NOW



# WHERE THEY ARE NOW

Asset Utilization Trends



## WHERE THEY ARE NOW

1. The customer now has a centralized location for storing all of their result data.
2. Access to data is controlled using SystemLink's Role-Based Access Control, which is tied to security groups defined by the customer's Single Sign On Provider
3. Data is standardized across multiple test programs and follows a common data model.
4. Analytics such as FPY and Utilization can now be monitored and calculated across all of their test programs
5. The customer reported a savings of around **100 hours per week** for just 1 test program after their pilot was complete.

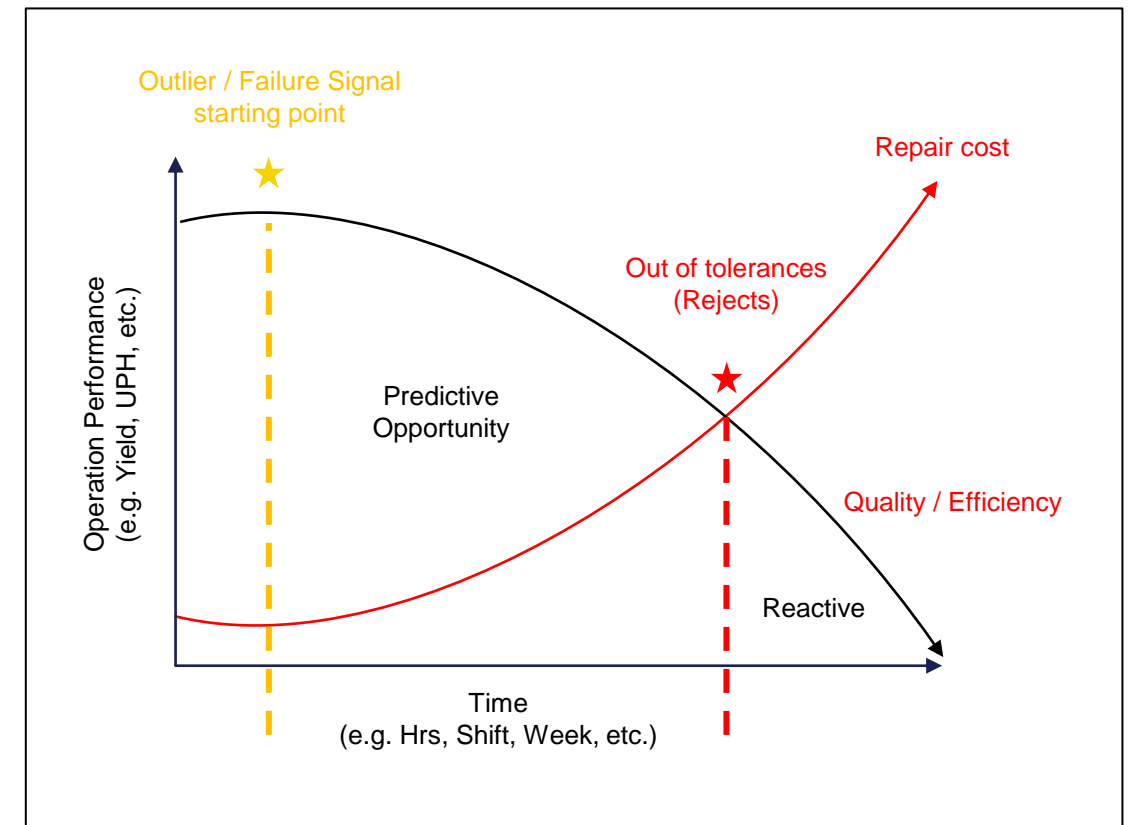


# Cameras Manufacturer: Manufacturing Optimization



# Where They Started

1. Reactive actions triggered by costly scrap generation
2. Required Human intervention to correct issue
3. Produced line stop and UPH loss
4. Fixing isolated operations without acting on root cause
5. Process analysis required realtime data correlation
6. Traditional solution (Verify MTF 2 times) was adding 4X cycle time, impacting throughput



# The Process



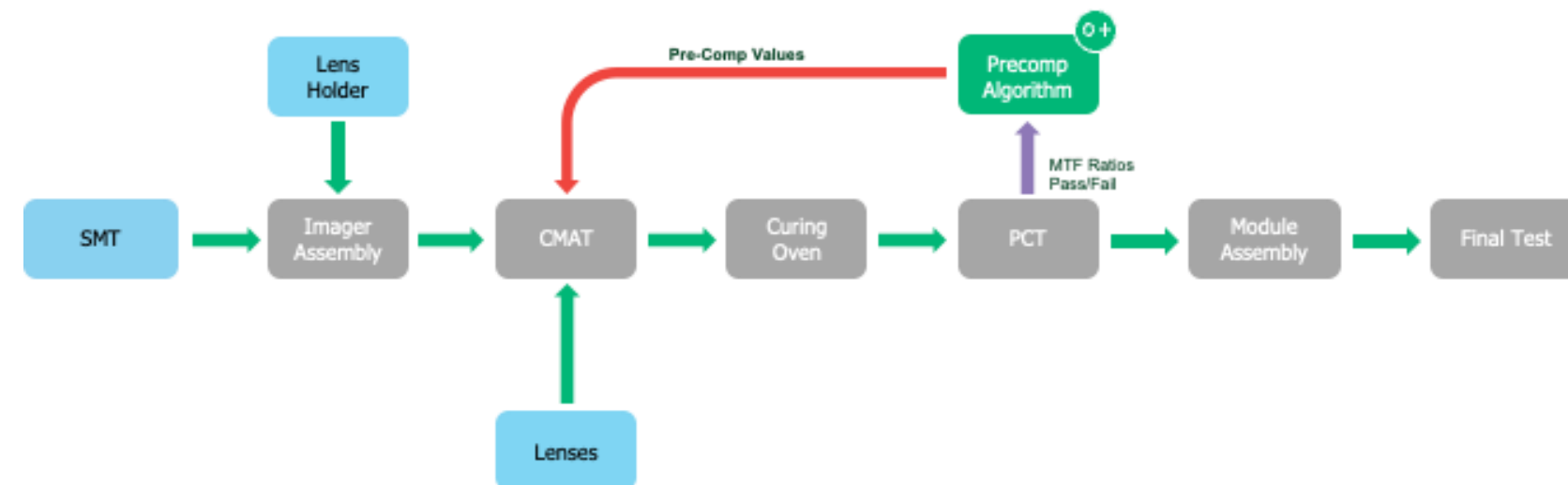
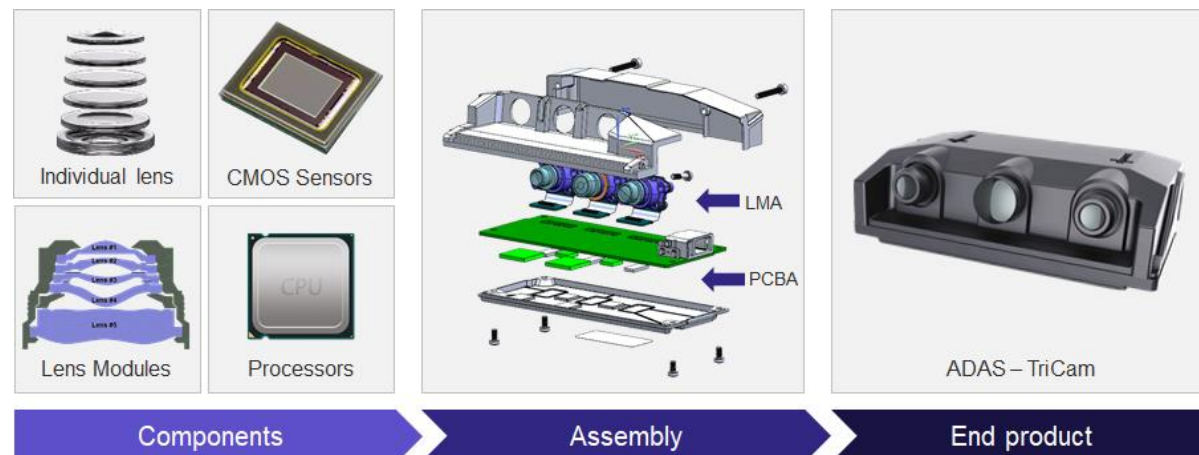
# One Page Summary

## Deployment Summary – Automotive Cameras

- Implemented adaptive manufacturing algorithms based of advanced cross-operational analytics to improve scrap and efficiency
- Predictive maintenance algorithms improved total process efficiency and OEE (Performance)

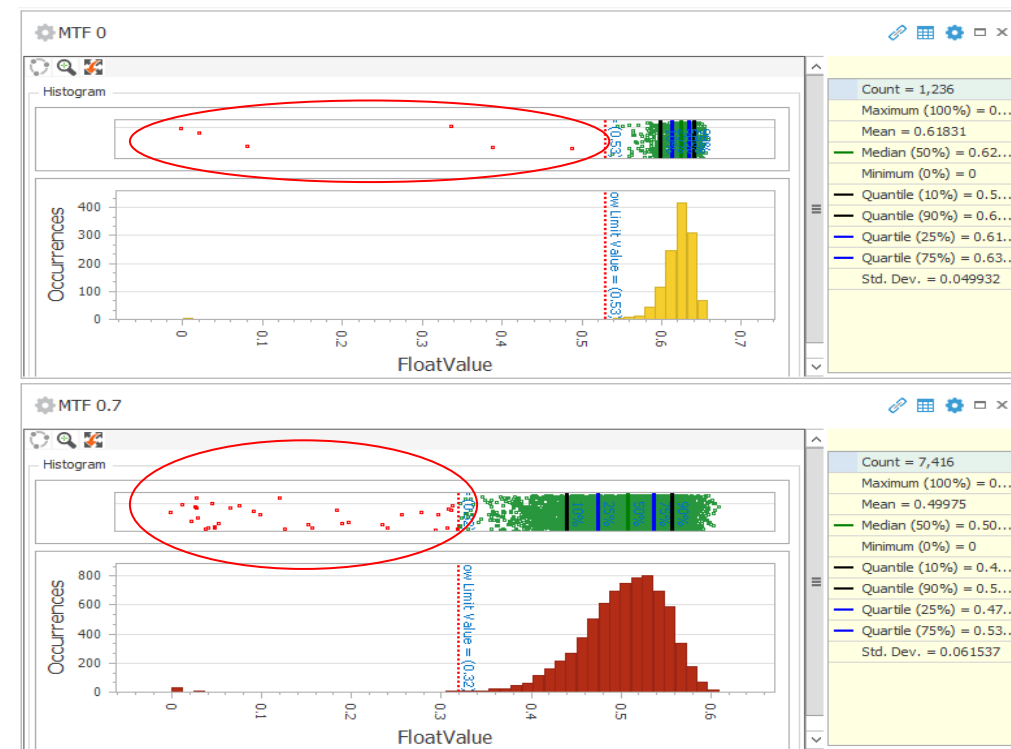
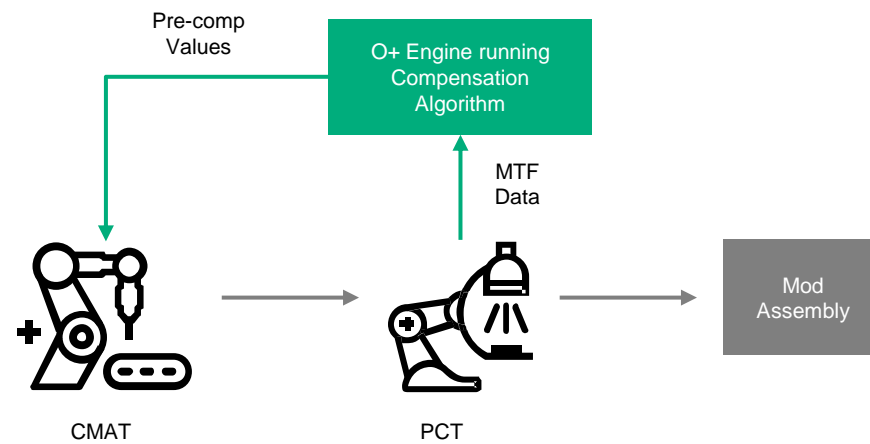
## Realized Benefits

- Reduced Scrap by >25%
- Retest/Rework reduction >30%
- Throughput increase of 15 Units per Hour (UPH)



# Analysis Dashboards

Line	Sub Product	Count	Ratio	Action	PreComp Suggested Change	PreComp Group
1	A	3126	1.145	OK		0.00425
3	A	1033	1.108	Prompt for Pre-Comp Increase	+0.0025	0.0065
3	A	2063	1.175	OK		0.007
2	BCC	3109	1.139	OK		0.00525



Outliers removed in the data analysis, so they do not influence compensation algorithm. Filter out all data that falls between  $MTF\ 0 < 0.4$  &  $MTF\ 0.7 < 0.2$

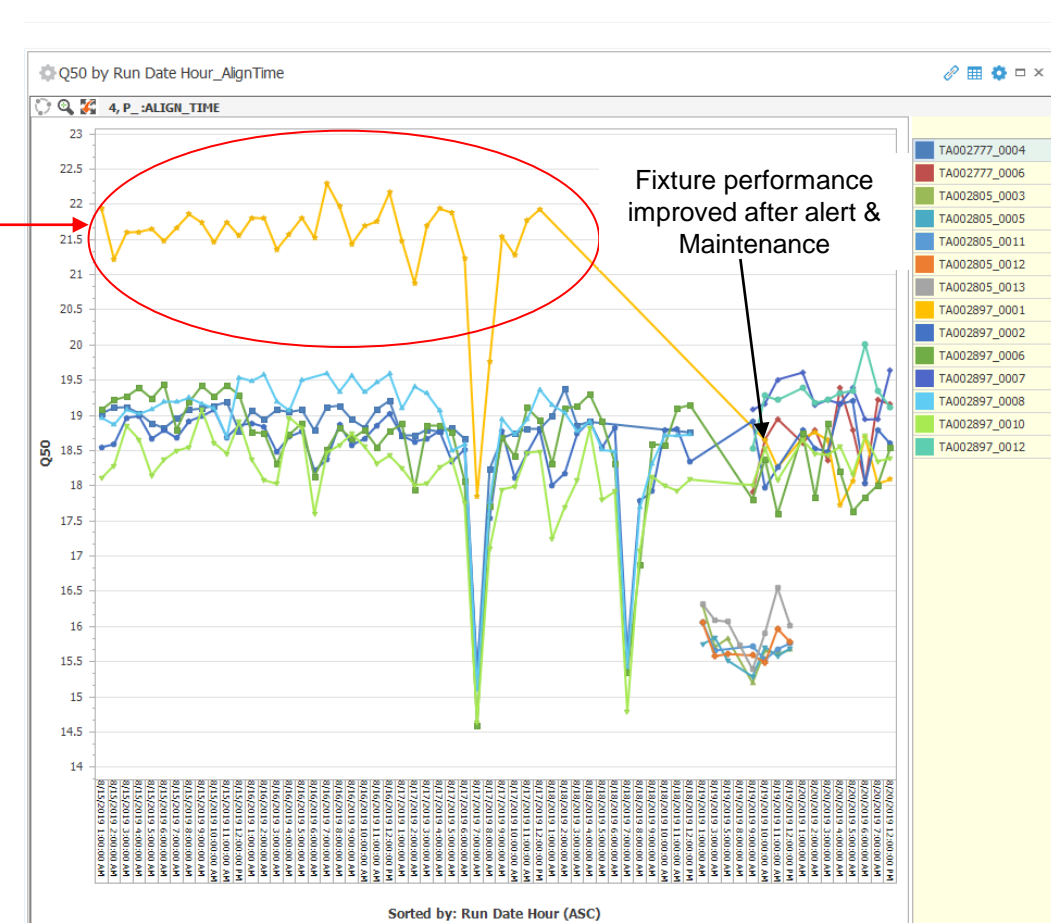
# Analysis Dashboards

agg\_data

Potential\_Signal

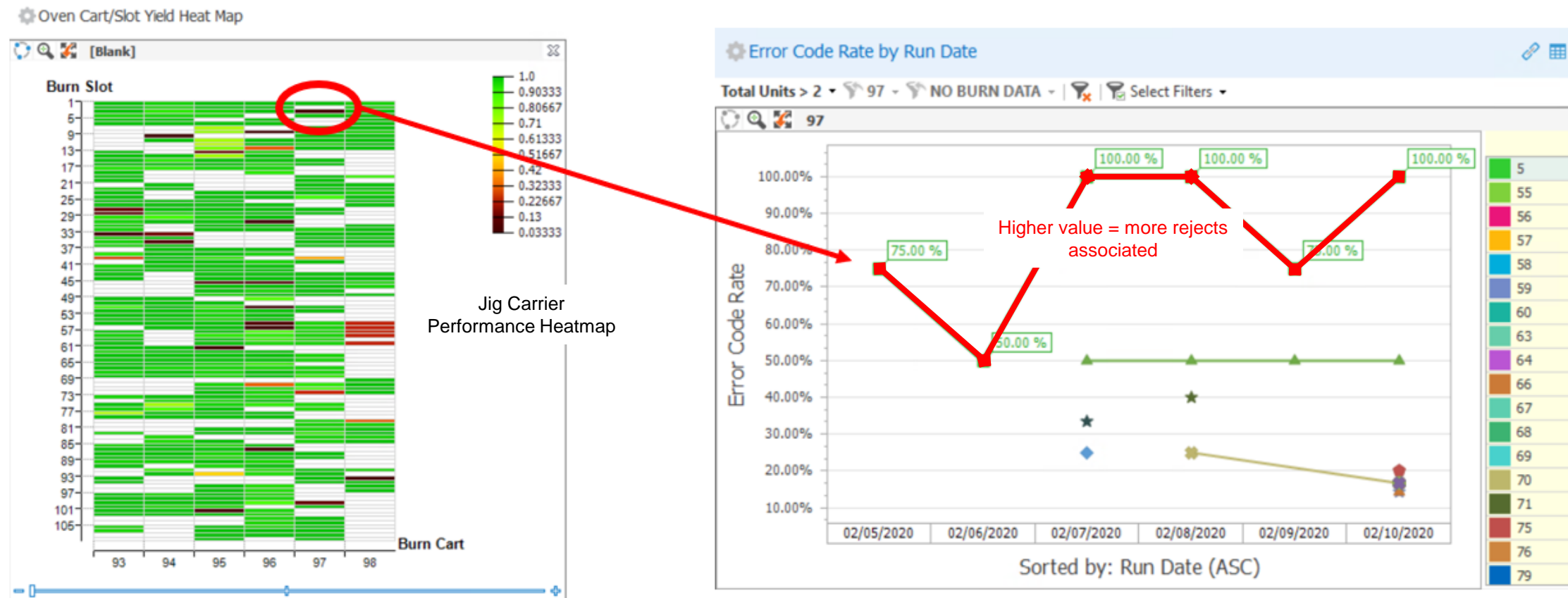
Operation	Product	Parametric Test Name	Line	Compare_Group	Count	Median	RS	ZScore	Potential_Signal
CMAT	Camera	P_:ALIGN_TIME	4	TA002897_0001	46	21.544	1.2837	10.934	Y
CMAT	Camera	P_:ALIGN_TIME	3	TA002573_0001	14	15.698	1.3387	4.8058	Y
CMAT	Camera	P_:ALIGN_TIME	2	TA002573_0006	39	17.34	0.95997	5.5907	Y
CMAT	Camera	P_:ALIGN_TIME	2	TA002739_0006	14	16.9	0.87658	4.6116	Y
CMAT	Camera	P_:ALIGN_TIME	2	TA002573_0013	36	16.715	0.93774	4.2	Y
CMAT	Camera	P_:ALIGN_TIME	4	TA002897_0012	9	19.285	0.094885	2.0471	NA
CMAT	Camera	P_:ALIGN_TIME	4	TA002897_0007	9	19.22	0.25426	1.7934	NA
CMAT	Camera	P_:ALIGN_TIME	4	TA002897_0008	43	19.09	0.37787	1.2821	NA
CMAT	Camera	P_:ALIGN_TIME	4	TA002777_0004	39	18.94	0.2096	0.6922	NA
CMAT	Camera	P_:ALIGN_TIME	4	TA002777_0006	11	18.802	0.42216	0.14945	NA
CMAT	Camera	P_:ALIGN_TIME	4	TA002897_0006	56	18.764	0.5493	0	NA
CMAT	Camera	P_:ALIGN_TIME	4	TA002897_0002	56	18.695	0.26566	-0.27137	NA
CMAT	Camera	P_:ALIGN_TIME	4	TA002897_0010	55	18.366	0.36953	-1.5653	NA
CMAT	Camera	P_:ALIGN_TIME	4	TA002805_0013	6	16.042	0.1086	-10.707	NA
CMAT	Camera	P_:ALIGN_TIME	4	TA002805_0012	6	15.696	0.24574	-12.065	NA
CMAT	Camera	P_:ALIGN_TIME	4	TA002805_0005	7	15.69	0.13473	-12.09	NA
CMAT	Camera	P_:ALIGN_TIME	4	TA002805_0003	5	15.674	0.037064	-12.153	NA
CMAT	Camera	P_:ALIGN_TIME	3	TA002739_0009	51	14.99	0.39328	3.1071	NA
CMAT	Camera	P_:ALIGN_TIME	3	TA002739_0014	21	14.649	1.3229	2.2889	NA
CMAT	Camera	P_:ALIGN_TIME	3	TA002739_0006	38	14.447	0.41681	1.8055	NA
CMAT	Camera	P_:ALIGN_TIME	3	TA002573_0005	18	14.231	0.69481	1.286	NA
CMAT	Camera	P_:ALIGN_TIME	3	TA002739_0003	37	14.053	0.52783	0.86015	NA
CMAT	Camera	P_:ALIGN_TIME	3	TA002573_0009	51	13.695	0.20202	0	NA
CMAT	Camera	P_:ALIGN_TIME	3	TA002573_0007	49	13.538	0.49299	-0.37669	NA
CMAT	Camera	P_:ALIGN_TIME	3	TA002573_0010	54	13.369	0.46389	-0.78276	NA
CMAT	Camera	P_:ALIGN_TIME	3	TA002739_0005	52	13.309	0.13993	-0.92612	NA
CMAT	Camera	P_:ALIGN_TIME	3	TA002739_0013	47	13.221	0.11324	-1.1373	NA
CMAT	Camera	P_:ALIGN_TIME	3	TA002739_0001	50	13.207	0.11278	-1.1696	NA
CMAT	Camera	P_:ALIGN_TIME	3	TA002573_0004	15	12.903	0.24427	-1.9002	NA
CMAT	Camera	P_:ALIGN_TIME	2	TA002573_0002	38	15.688	0.47721	1.9136	NA
CMAT	Camera	P_:ALIGN_TIME	2	TA002573_0004	28	15.445	0.42161	1.374	NA
CMAT	Camera	P_:ALIGN_TIME	2	TA002573_0011	34	15.175	0.77187	0.77324	NA

Total Records : 51 Selected Count : 1 Sum : 0 AVG : N/A



Capture and Alert specific fixture in CMAT that deviates along time away from population

# Analysis Dashboards



- Burn oven location data and test operation Error Code data are merged to automatically detect bad slots
- Automated rule also sends cart/slots csv file enabling automatic blocking of those slots

# Q&A

# Other “Connectivity, Data, and Insight” Activities

May 21

**Modernizing Your Lab Operations**  
10:15-11:15



**Automating the Lab with SystemLink (Automotive Track)**



**Gaining Product Insight From Your Test Data**  
11:30-12:30

**Generative AI to Accelerate Test Workflows**  
2:00-3:00



**Modern Lab Operations with SystemLink: Hands-On**  
2:00-4:15



**Maximize Your Lab with SystemLink Software**  
3:15-4:15

May 22

**Analytics From Wafer To Reel To Strip (Semiconductor Track)**  
10:15-11:15



**Modern Lab Operations with SystemLink: Hands-On**  
10:15-12:30



**Modernizing Your Lab Operations**  
11:30-12:30

**AI at the Edge**  
1:30-2:30



**From Concept Through Execution: Analytics in Action**

**Analytics From Wafer to Reel to Strip**

**SystemLink Ask Me Anything**  
2:45-3:45



**May 23, NIC**

**9:00-1:00**

**SystemLink User Group Meeting**

**0+ User Forum**

**New**

**SystemLink Learning Courseware (V/ILT)**  
*Managing Systems and Assets with SystemLink Enterprise*