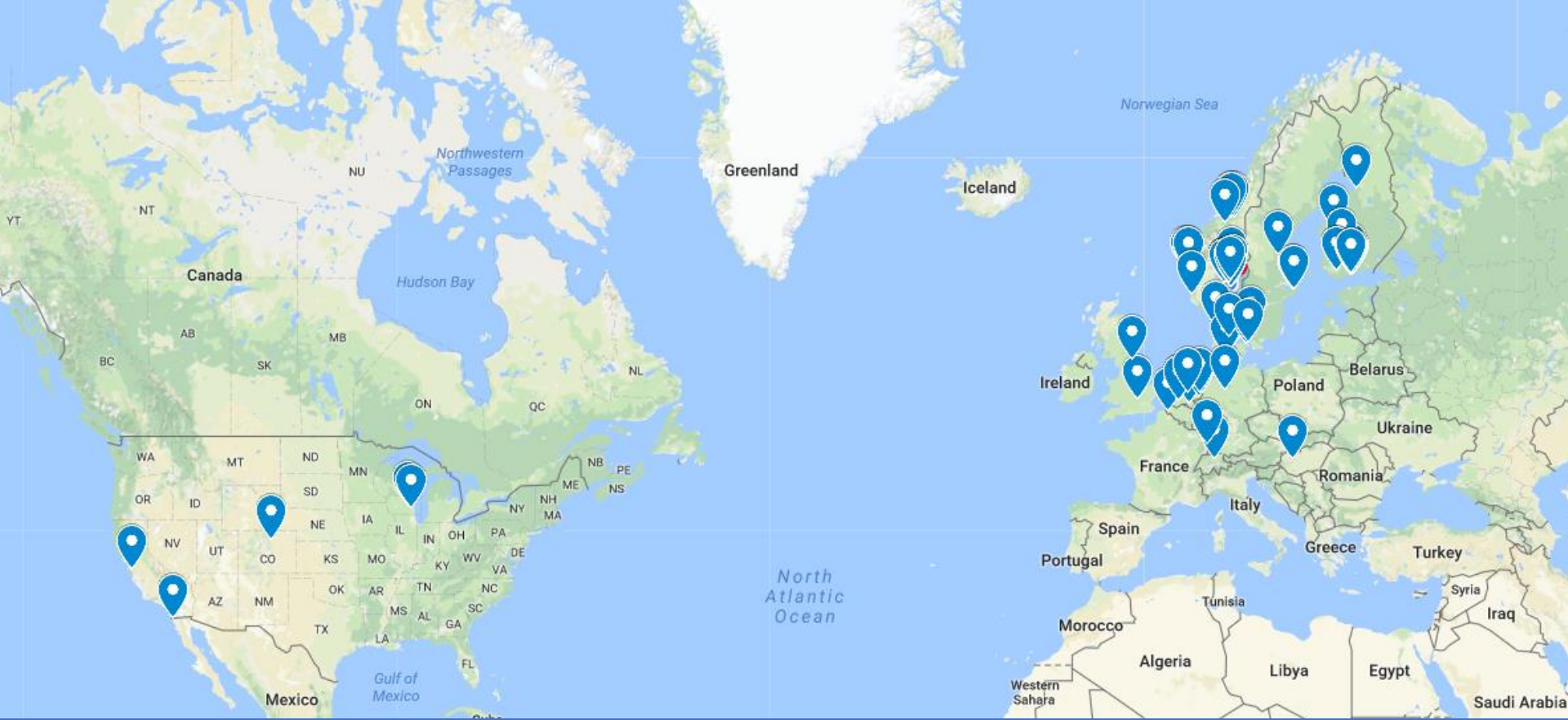


Using Data From Manufacturing Test Systems

Tom Andres Lomsdalen, Virinco

- Intro
- Test Data Challenges
- Big Data Approach
- Predictive Analysis
- Analyzing data – examples
 - Top failures
 - Retests
 - Limits
 - Comparisons



3 releases pr year

Collecting data from **thousands** of ATE's

Serving more than **80** customers WW

WATS is used in over **200 sites** in **20 countries**

Logging daily **500 000** reports

skyWATS.com has processed **6 billion** measurements

Challenges

- Data is stored in multiple formats: databases, files, paper
- Data is stored in multiple locations: many computers, globally
 - Networking topologies, router configurations, firewalls
- Information is used retroactively, for instance after a field return
- Inhouse developed
 - Reporting and queries are manual
 - Often data is being manipulated in Excel
 - New products or revisions require custom development to fit the reporting
 - Follow the current OSs, browsers
 - Let your talent focus on your own business
- Analysis addressing the wrong problem
- ++

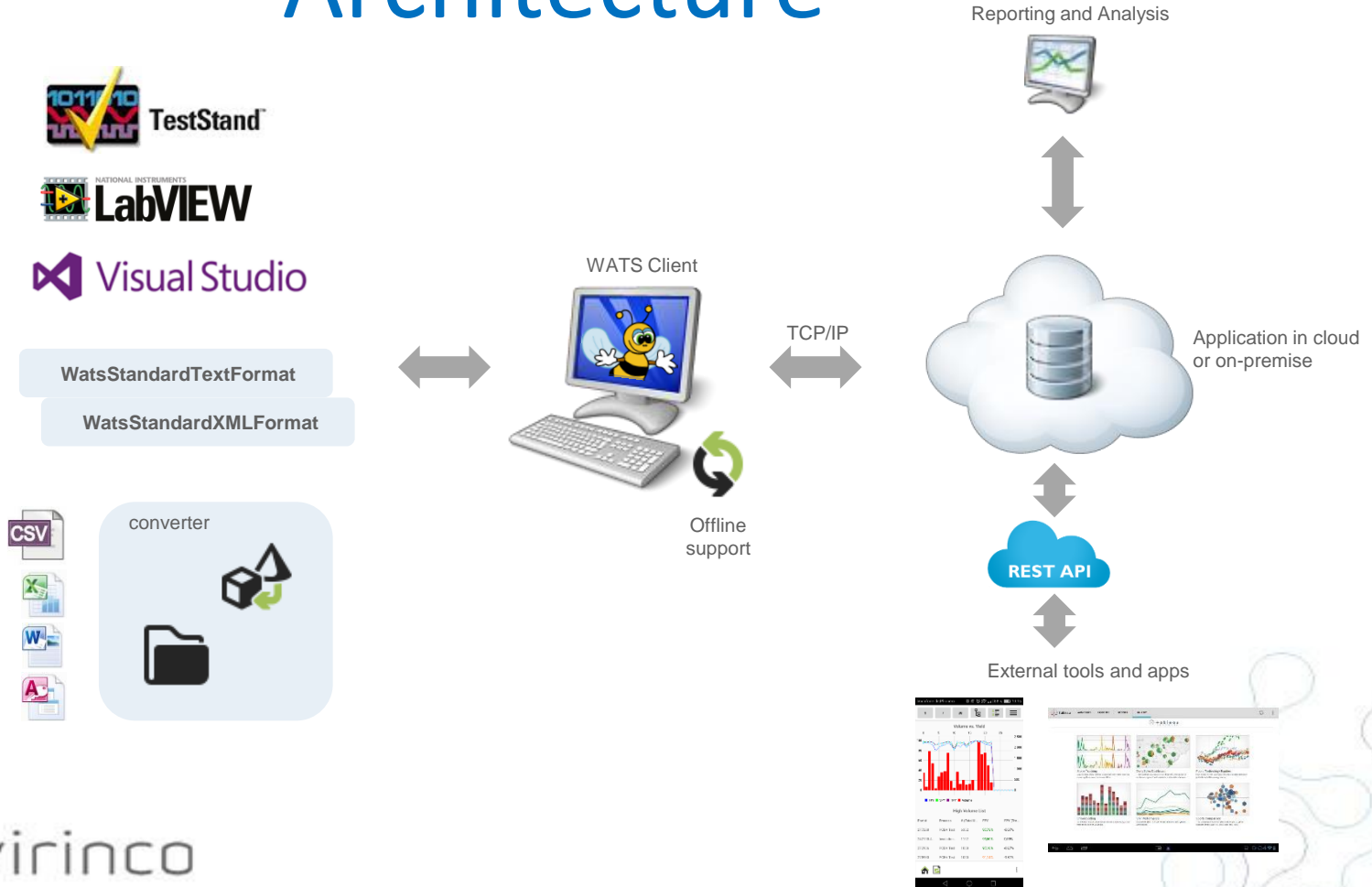


Big Data Approach

- Test Data
 - Not That Big
 - 1 GB per year per test station
 - Big Data Problem – because data is not being utilized by traditional tools and methods
- Top Down Approach
 - A pragmatic approach to help you resolve quality issues
 - Solve biggest problems first
 - Yield reports
 - Process Capability Analysis

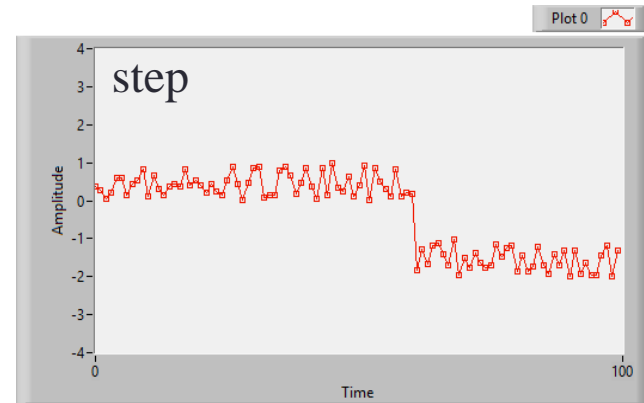
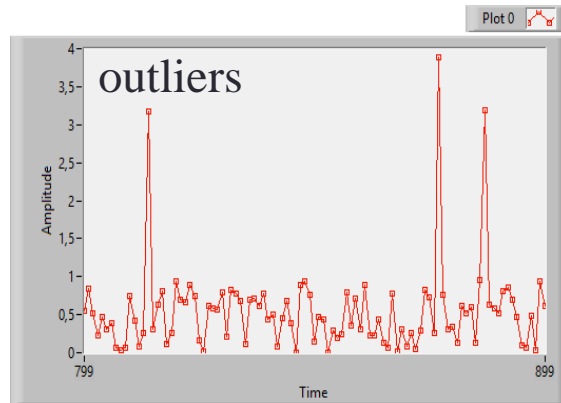
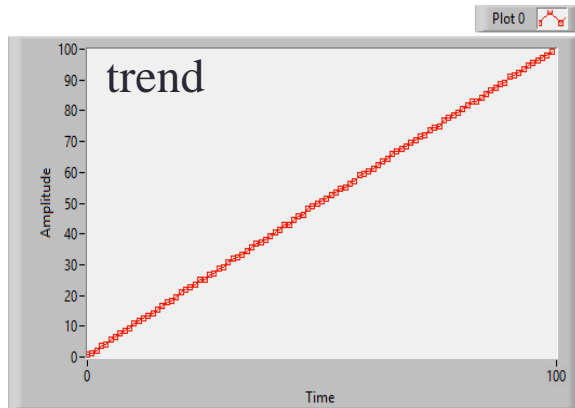


Architecture

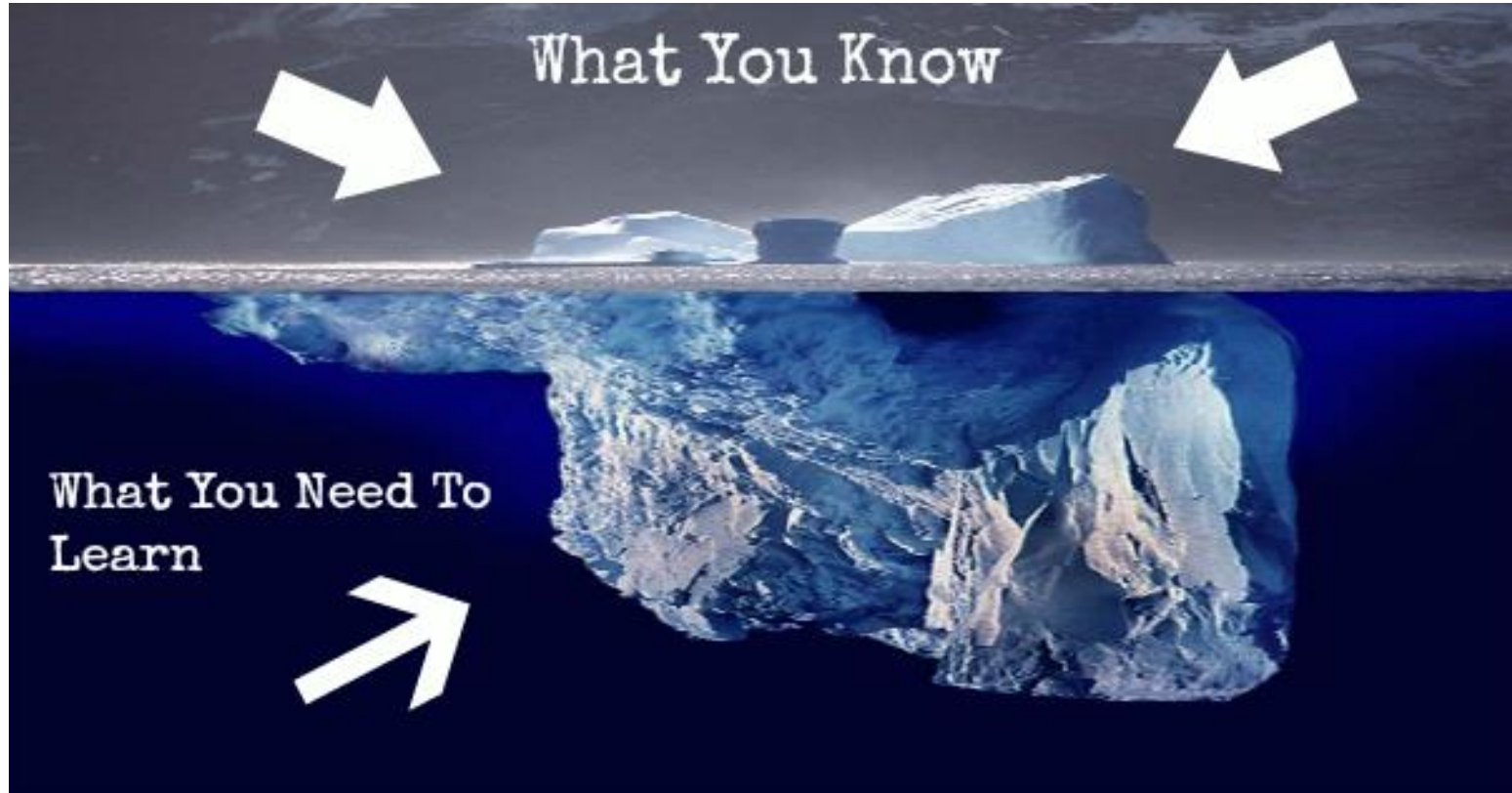


Predictive Analysis

- Advanced analytics to make predictions about unknown future events



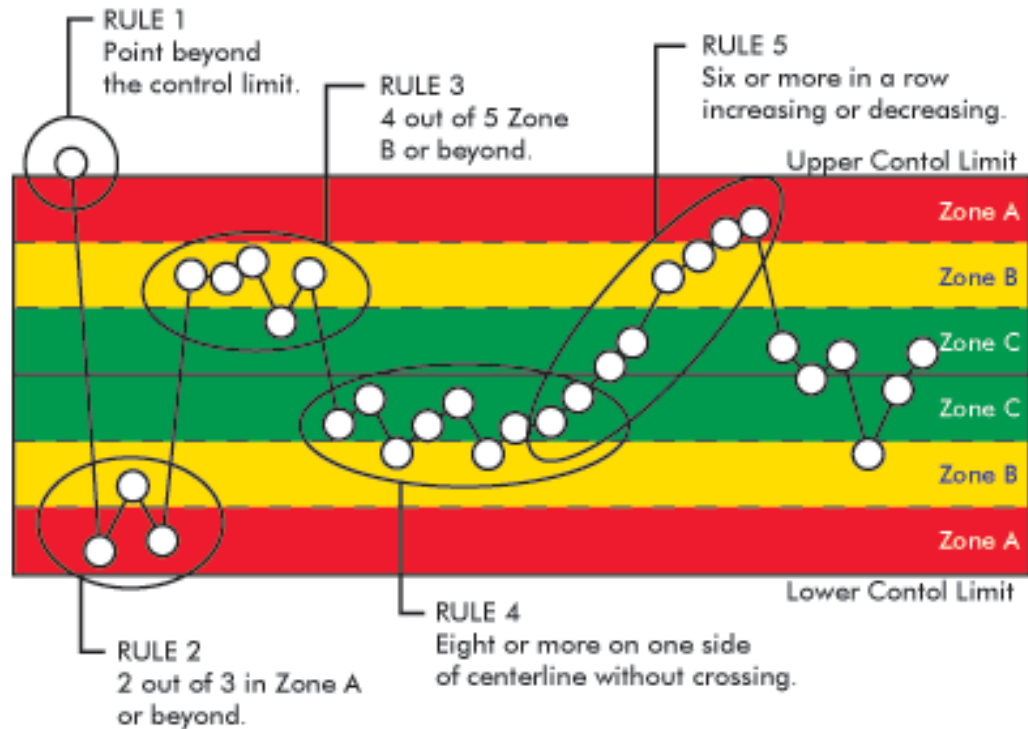
Start with the big picture first



Western Electric Rules

Traditional SPC analysis

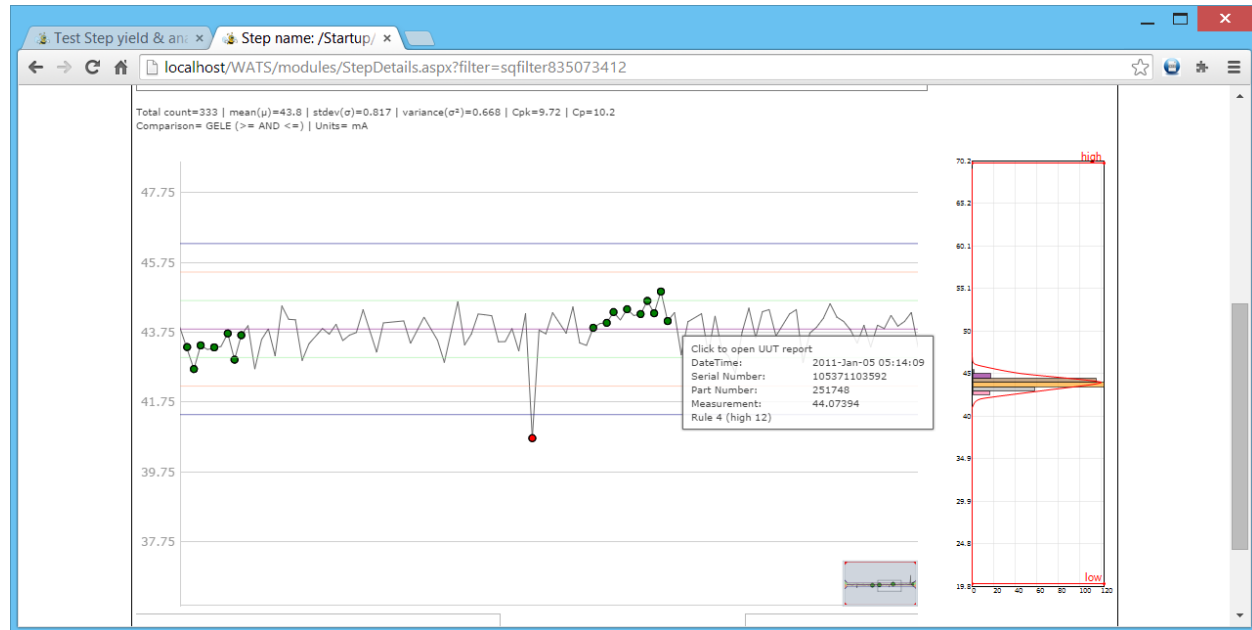
- Detects 'out of control' or non-random conditions



Western Electric Rules

Traditional SPC analysis

- Statistical uncertainty defined by WER, 1 false alarm per 91,75 observations – 110 false alarms per 10k
 - Useless for realtime analysis



Data Characteristics

- Data characteristics
 - Highly dynamic – components, 3rd party vendors, number of steps, operators, test machines, instrumentation, fixtures, processes
 - 100s of test sequences
 - 1000s of test steps
- Example from Aidon (Petri Ounila)
 - Batch size 10000 units
 - 357 total number of components
 - 137 different types of components
 - 37 component changes -> change every 280th unit
 - Process, operator, instrumentation changes

A change per every 10th product, or less



Traditional methods

Selecting KPIs



Origin of error



KPI on final product



'10X Cost Rule'



Top down approach

- Solid data acquisition system
 - Connected to NI platform and .NET IDEs
 - Scalable
 - Flexible
 - Any type of test report
- Alarm on FPY
- Dashboard components to view Cpk
- Data and trend analysis
- Correlation view
- Western Electric Rules
- Gauge R&R
- Integration with 3rd party tools



Yield Report

- Overview by pn, revision, site, process, period etc

Logged in as admin2 | Exit | Log Out | My Settings | Resource Center | Help | Dashboard | Print

Test & Repair
UIT report
Serial Number history
UUR report
Repair analysis
Repair Time
Export Wizard

Yield
Yield report
Product & Test yield
Test Stop yield & analysis
Periodic yield
Total Process yield
Rolled Throughput yield
Process Capability analysis

Station
Station report
OEE analysis
GR&R analysis
Connection & Execution time

Email
Yield Monitor
Summary Report

Reporting
Dashboard
Root Cause

Yield report

Product Group: (Any) Test Operation: PCBA test
Level: (Any) From Date (UTC): 2012-Jan-01 00:00
Part Number: To Date (UTC): 2012-Dec-31 23:58
Batch Number:
Station Name:
Top Count (max results):
Min Count (units):

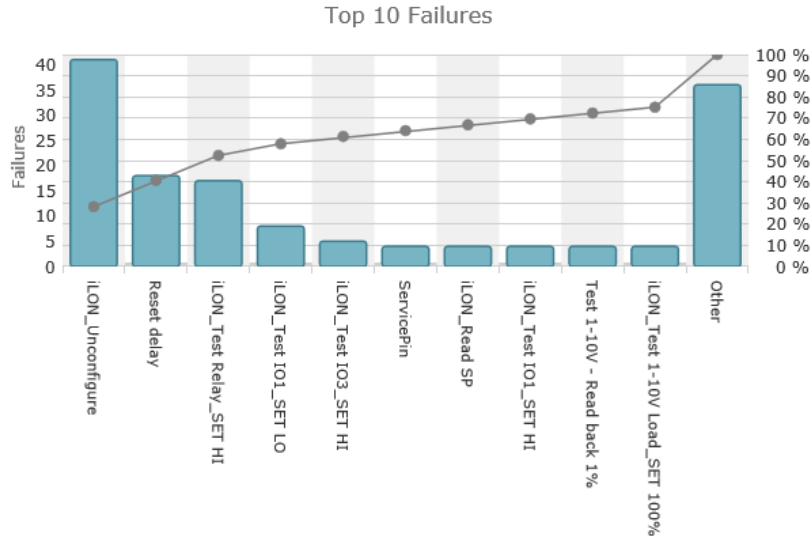
Apply filter: NIDays_2014 Clear filter Save filter

Part Number	Process	Total Count	FPY Count	FPY	SPY	TPY
OLC-140-C	PCBA test	1 371	1 054	76.9 %	94.5 %	97.7 %
OLC-140-P	PCBA test	1 290	1 051	81.5 %	91.5 %	95.0 %
OLC-130-C	PCBA test	601	455	75.7 %	93.2 %	95.5 %
OLC-130-P	PCBA test	601	440	73.2 %	93.8 %	96.8 %
OLC-140-Lite_C	PCBA test	34	18	52.9 %	88.2 %	94.1 %
OLC-140-Lite-P	PCBA test	23	20	87.0 %	87.0 %	91.3 %
OLC-140-Lite_P	PCBA test	12	12	100.0 %	100.0 %	100.0 %
OLC-140-Lite	PCBA test	1	1	100.0 %	100.0 %	100.0 %
OLC-140-C_Lite	PCBA test	1	1	100.0 %	100.0 %	100.0 %



What is failing the most?

- Pareto shows top 10 failures



Failures

Cumulative %

Select steps

- iLON_Unconfigure
- Reset delay
- iLON_Test Relay_SET HI
- iLON_Test IO1_SET LO
- iLON_Test IO3_SET HI
- ServicePin
- iLON_Read SP
- iLON_Test IO1_SET HI
- Test 1-10V - Read back 1%
- iLON_Test 1-10V Load_SET 100%

Display sequence calls

Following options will also apply to the table below:

Only count failures cause UUT failure

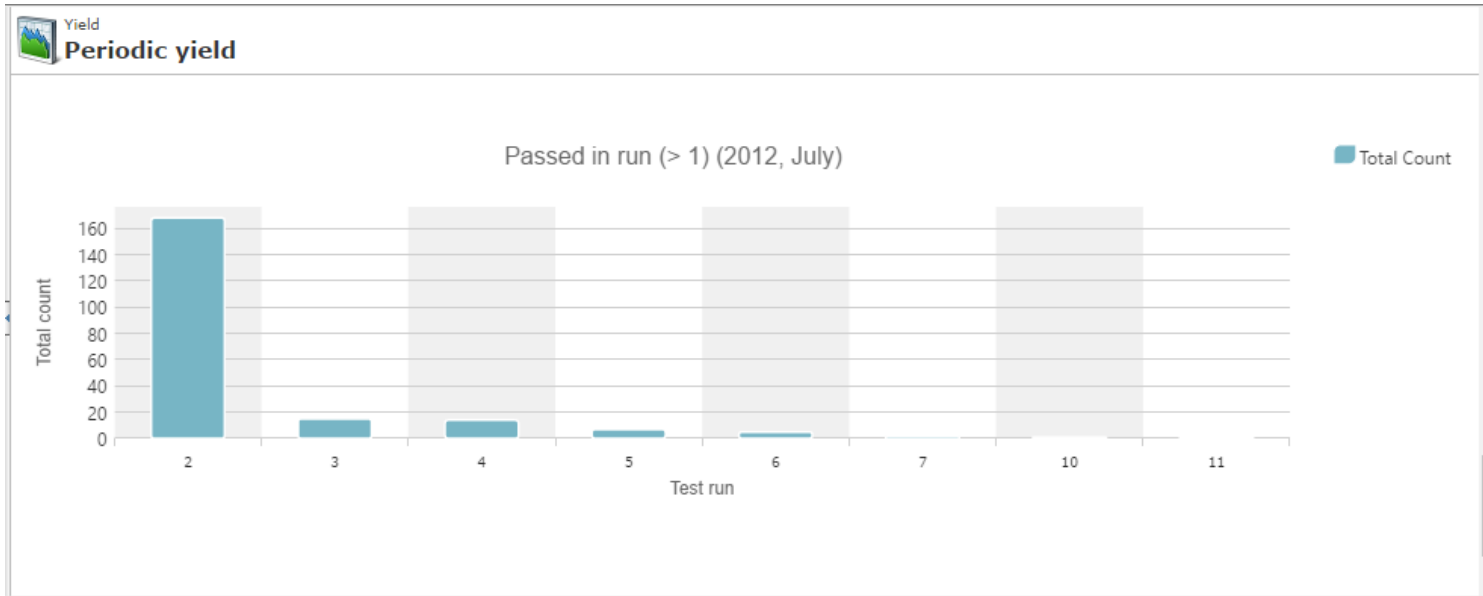
Step grouping:

Step Name Design Index Step ID Group

Apply Restore

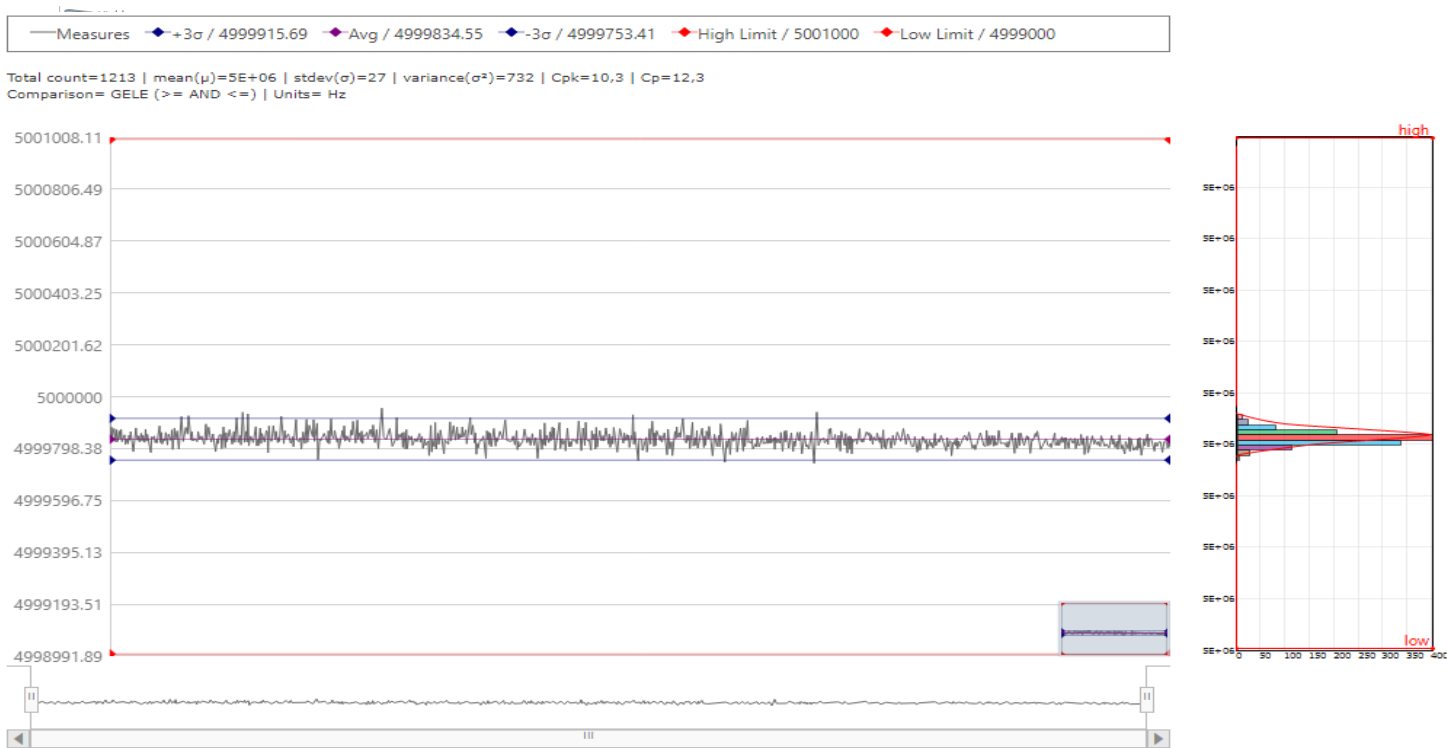
Retests

- Are you shipping products that has failed a test multiple times?



Process Capability Analysis

- Are your limits correct?
- FPY 99-100%, tests not failing



Repair

- A failed test is a symptom of a problem
- Knowledge base to guide repair operator

Etek Global Test System WATS

Test status: Failed

UUT Serial Number: 150671090194
 UUT Part Number: 218394
 Revision: 4
 Operator: nj2301
 Start Date/Time: 2015-Mar-01 13:22:37
 UTC Start Date/Time: 2015-Mar-01 05:22:37
 Execution Time: 59.46 seconds (59 s)
 Batch Serial Number: 0000136734
 Test Operation: PCBA Test
 ERROR code: 0

Station Data
 Misc UUT Info
 Subunit(s) Info

Sequence File: C:\Etek GTS\TestStand\218394\SeqFiles\218394_rev3.2_706020.2_CBPT_v10.0.seq
 Version: 10.0.0.0

Setup (3)

Set AC source cur lim 1A (step time: 0.0038589)

Etek Global Test System WATS

Repair Report

Serial Number: 150671090194
 Part Number: 218394
 Revision: 4
 Operator: n08202
 Start Date/Time: 2015-Mar-02 09:30:08
 UTC Start Date/Time: 2015-Mar-02 01:30:08
 UTC Finalized Date/Time: 2015-Mar-01 17:33:56
 Repair Execution Time: 3 Minutes, 47.2 seconds
 Repair Operation: Module Production Repair
 Test Operation: PCBA Test

Station Data
 Station Data (UUT):
 Referenced UUT Report

Comp Ref	Category	Code	Step Name	Comment	Image
NTC102	Solder Process	Insufficient solder	Measure +400V		

- Measure Boost (step time: 0.0232595) ✓
- Measure Boost (step time: 0.0228753) ✓
- Warning Top plate up (step time: 0.8280279) ✓

Repair

- A failed test is a symptom of a problem
- Knowledge base to guide repair operator

Test & Repair
Serial Number History

Product Group: (Any) Misc Info:

Site: (Any)

Serial Number: 151071097398

Part Number: 241122.105

Batch Number:

Hierarchical View Flat View

Apply filter Clear filter Save filter

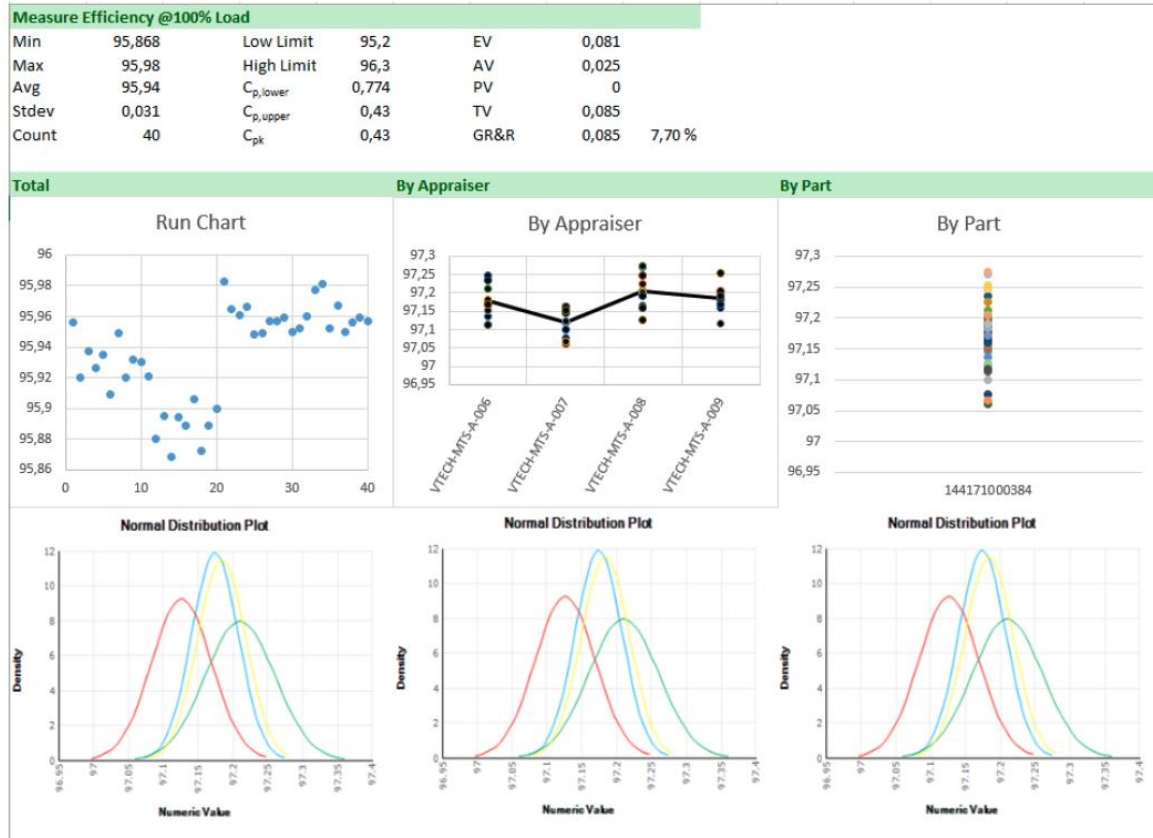
Hierarchical View 1

Serial Number		Part Number						
151071097398		241122.105						
	Revision	Process	Status	UTC Date/Time	Station Name	Location	Purpose	
	2.6	Verification Test	Passed	2015-Apr-07 08:31:16	-CBVI-001	Dongguan, China	CBVI	
	2.6	Final Function Test	Passed	2015-Apr-07 06:59:18	-MTS-A-006	Dongguan, China	Production testing	
	2.6	Burn-in Test	Passed	2015-Apr-06 18:07:46	-CBB12-006	Dongguan, China	CBB12	
	2.6	Pre Burn-in Test	Passed	2015-Apr-01 06:05:31	-MTS-A-005	Dongguan, China	MTS-A	
	2.6	Insulation Test	Passed	2015-Apr-01 03:47:05	-CBIT3-001	Dongguan, China	CBIT	
	2.6	Module Production Repair	Done	2015-Mar-31 19:46:32	-MTS-A-006	Dongguan, China	WATS Local Server	
	2.6	Final Function Test	Failed	2015-Mar-16 04:02:11	-MTS-A-006	Dongguan, China	Production testing	
	2.6	Burn-in Test	Passed	2015-Mar-15 09:58:14	-CBB12-006	Dongguan, China	CBB12	
	2.6	Pre Burn-in Test	Passed	2015-Mar-14 08:03:06	-MTS-A-005	Dongguan, China	MTS-A	
	2.6	Insulation Test	Passed	2015-Mar-14 03:17:19	-CBIT3-002	Dongguan, China	CBIT3	

1

Gauge R&R

- How much of the variation comes from the measurement system



Integrating with the Enterprise



Easy to use
Easy to implement
Easy to integrate



Enterprise tools

- Data made available through REST API
 - 3rd party analysis and presentation tools
 - Mobile apps



sparkcognition



Follow up on DATA from production

