



## 360° View of Product Quality

Nader Fathi, CEO  
[www.sigmaquest.com](http://www.sigmaquest.com)



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### Who is SigmaQuest ?

- The On-Demand Leader in Scalable Solutions for Product Quality Management
- Electronic System Brand Owners. Telecom, Consumer & Medical systems
-  **Agilent Technologies Preferred Supplier of Test Data Management & Analysis**

Number of Installations

150+

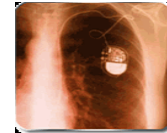
Selected Awards



## Over \$25B Warranty Expense, +4.8%

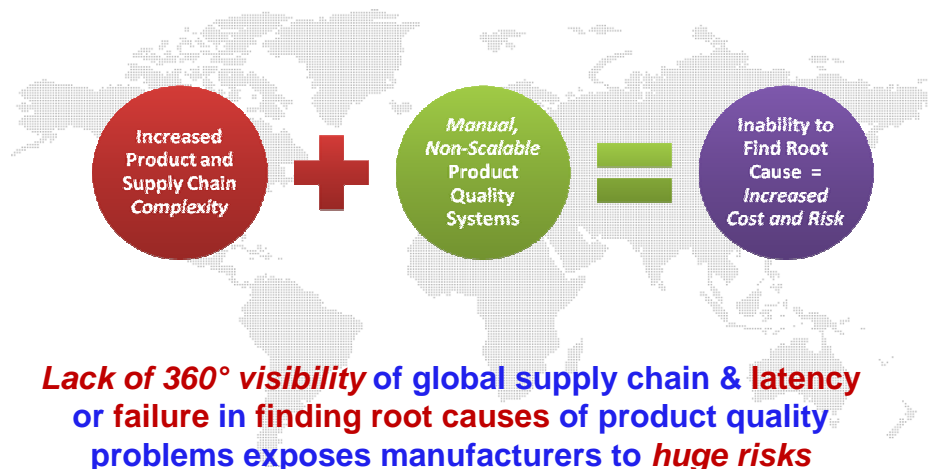
Top-50 spent roughly 2% of their product revenue on warranty claims

Company	Paid in 2007	Paid in 2006	Claims Rate
Johnson Controls Inc.	\$123	\$129	0.3%
Nortel Networks Corp.	\$182	\$267	1.9%
General Electric Co.	\$573	\$665	0.8%
Dell Inc.	\$1,189	\$1,217	2.2%
Honeywell International	\$203	\$230	0.7%
Seagate Technology	\$291	\$258	1.9%
Sun Microsystems Inc.	\$305	\$359	3.6%
Eaton Corp.	\$73	\$83	0.6%
IBM Corp.	\$607	\$762	2.8%
Fleetwood Enterprises	\$70	\$79	3.2%
Cisco Systems Inc.	\$504	\$390	1.6%
Delphi Corp.	\$128	\$140	0.6%
Apple Inc.	\$307	\$244	1.0%
Palm Inc.	\$103	\$73	8.6%
Tyco International Ltd.	\$69	\$83	0.6%
Microsoft Corp.	\$480	\$42	6.2%



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## M&A, Globalization Increase Product Quality Risk



Risk?

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## What Risk ?

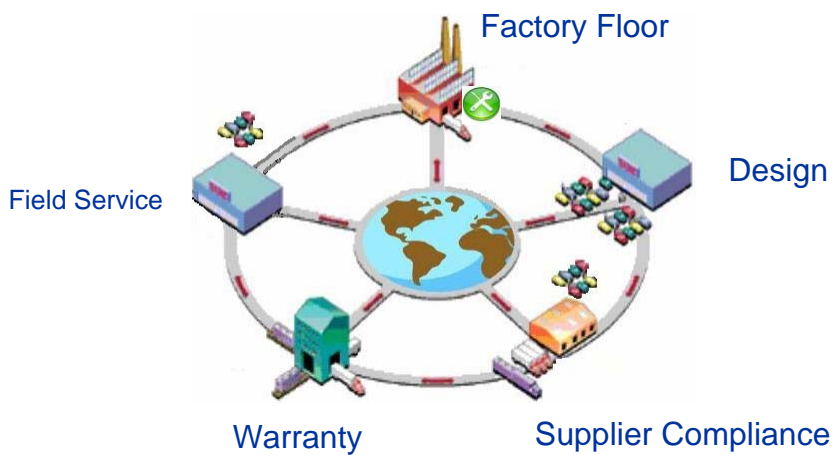
- Price increases due to poor yields
- End user imposed quality & delivery targets
- Intermittent Design Issues
- AVL Changes, “Quality Fade”, Inferior material
- Process violations
  
- Field Epidemic Failures & Recalls
- Litigation & Product liability
- Warranty reserve overruns
  
- Brand deterioration & Market Share Erosion

## Who owns the Risk?

	OEM/CM	ODM
Design	OEM	ODM
Component	OEM	ODM
Process	CM	ODM
Early Returns	CM	ODM
Long Term Returns	OEM	OEM
Brand Protection	OEM	OEM

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## 360° View of Product Quality



Who is at Fault?

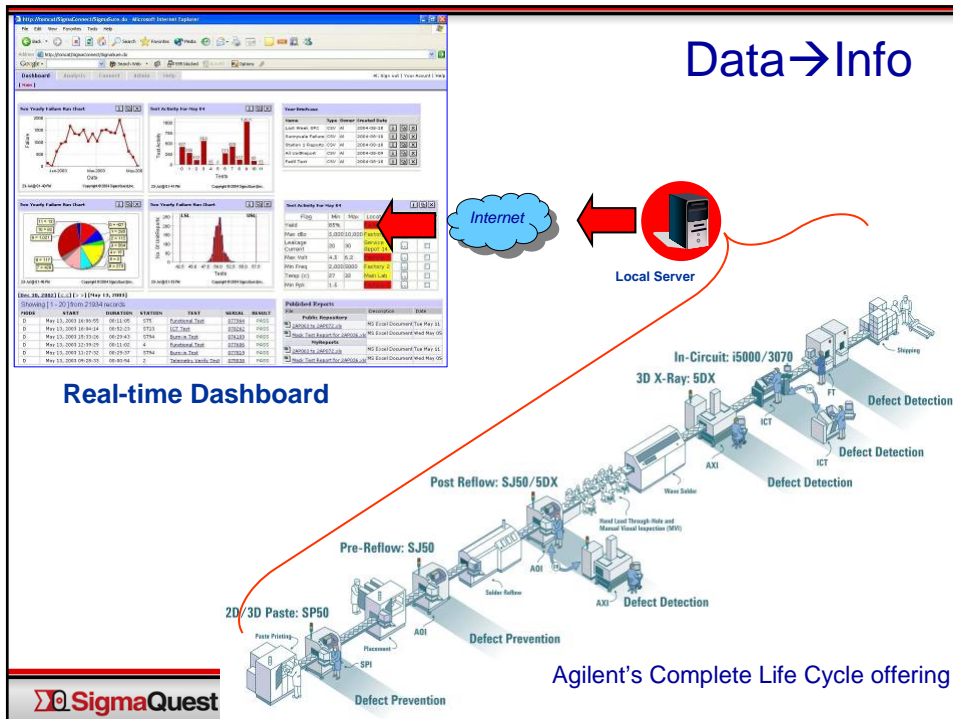
Design

Process

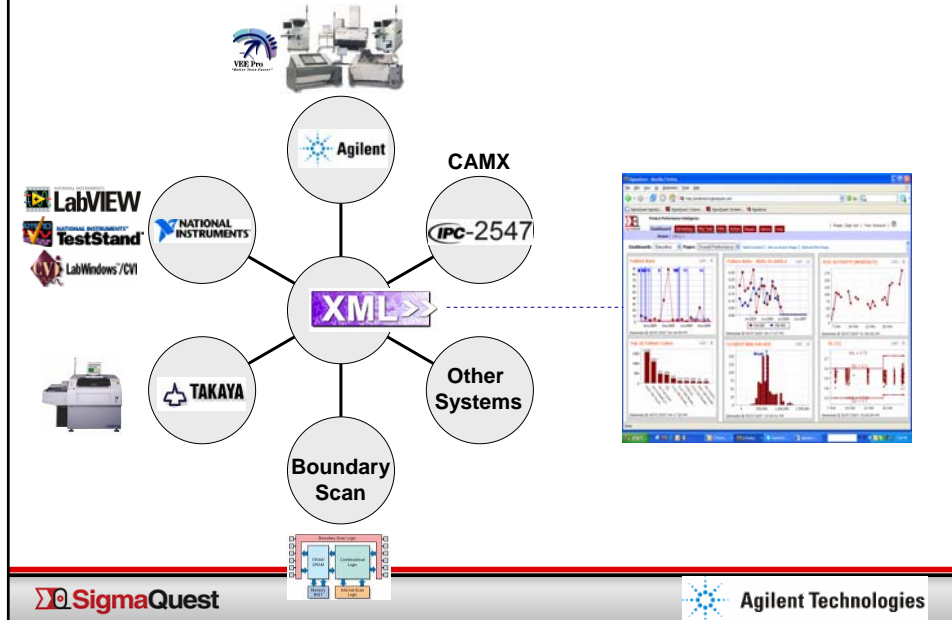
Material



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## Integration with Industry Standard Solutions

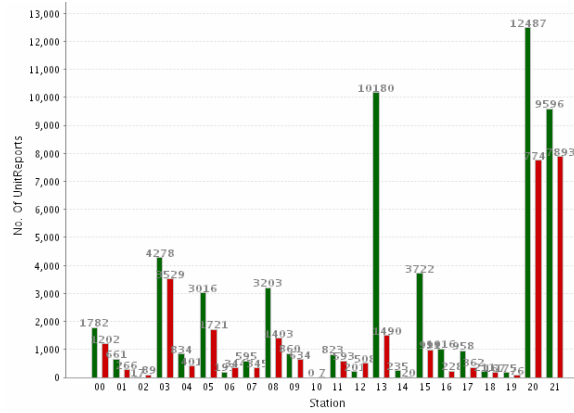


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## Sample Executive Dashboard



## Tester Performance



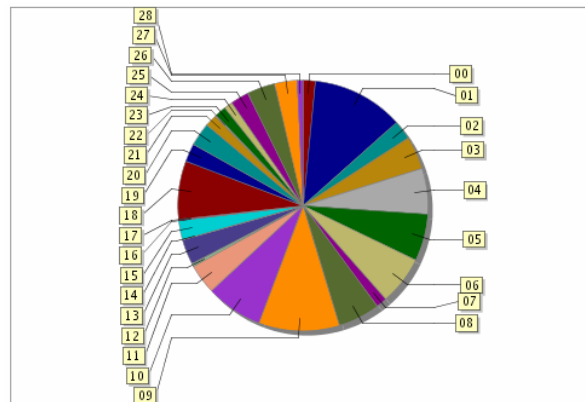
14-May @ 02:35 PM

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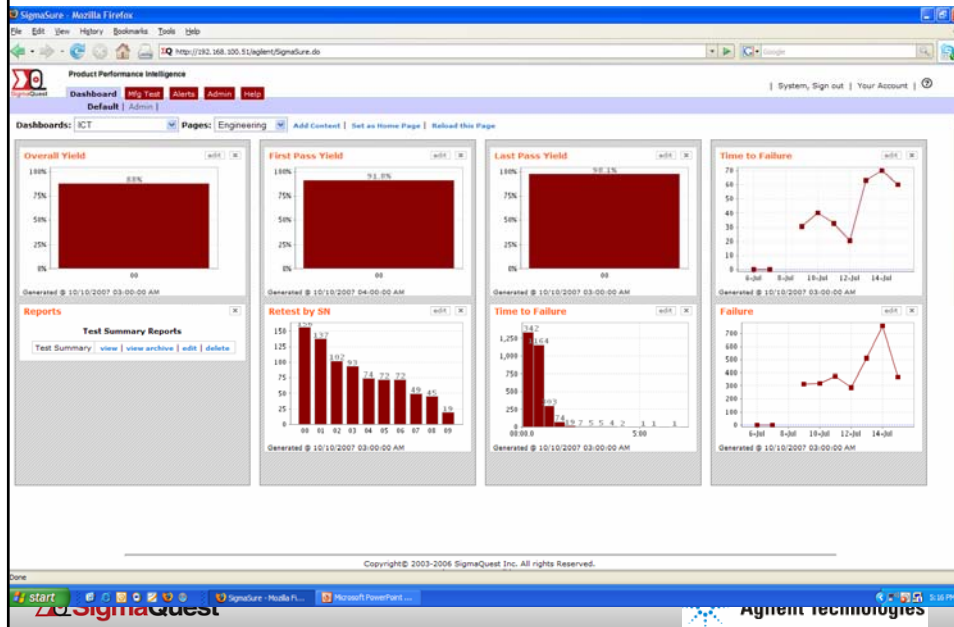
Legend				
Sl.	Station	Pass	Fail	Yield (%)
10	ICT/hp3070k	0	Z	0
02	ICT/hp3070c	17	89	16
12	ICT/hp3070c	201	508	28.3
06	ICT/hp3070k	193	344	35.9

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## Fixture Performance

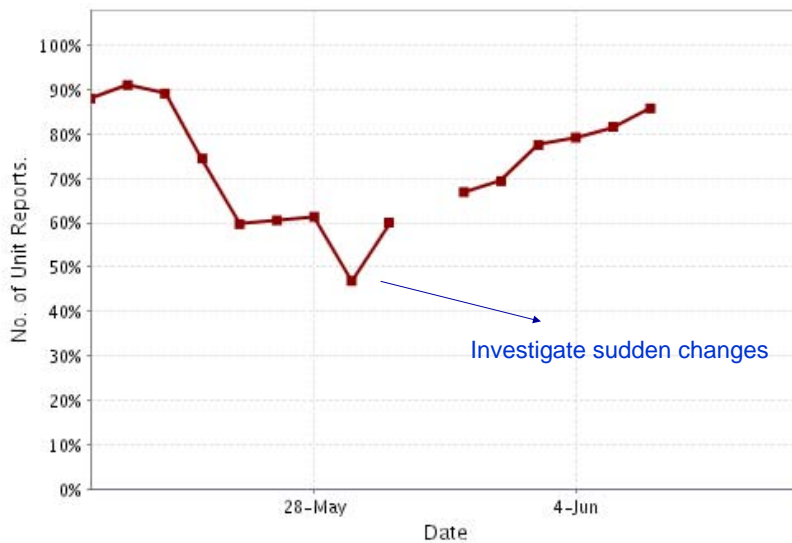


# Sample Engineering Dashboard



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## First Pass Yield

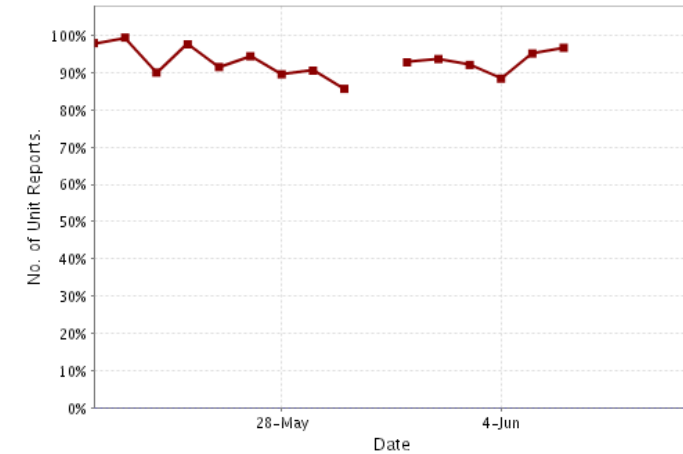


10-Jun @ 08-26 PM

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## Last Past Yield Fluctuation



10-Jun @ 08:27 PM

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## Sample 6-Sigma Dashboard

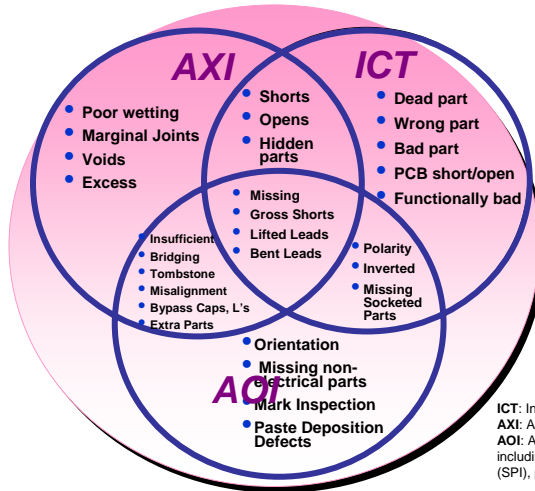
The dashboard displays several key performance indicators and reports:

- c337 Pass Reports:** Shows a pass rate of 9.88888117 with a control chart.
- Marginal Measurement Reports:** Lists reports for 'Escapes' and 'Maverick' with options to view, archive, edit, or delete.
- Maverick Measurement Reports:** Shows a report for 'Maverick: 53' with similar options.
- SPC Reports:** Includes a report for 'Cap SPC'.
- Targeted Data:** Multiple histograms and control charts for various targets, such as 'Targeted: 4' (USL=135.28) and 'Targeted: 1' (USL=1.02).

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Version: 6.1.0 Build: 0703



# How Good is my Test Coverage?



ICT: In-circuit Test  
 AXI: Automated X-ray Inspection  
 AOI: Automated Optical Inspection – including solder paste inspection (SPI), pre-reflow and post-reflow.



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# Management By Exception

Product Performance Intelligence

System, Sign out | Yc

Dashboard Mfg Test Alerts Admin Help

Show Alerts for past 30 Days

Name	Station Types	Sensitivity	Received On	Event Summary	Last Viewed By	Comments
1. FPY Alert	ICT	View Criteria CRITICAL	09/27/2007 03:24 PM (12 days ago)	View Details 96469832 : ICT Test => 75% 96469634 : ICT Test => 67.53% 96469832 : ICT Test => 75% 96469634 : ICT Test => 67.53%	View Recipients	Post/View Comments Total Posted: 0
2. Test Yield Alerts	ICT	View Criteria WARNING	09/27/2007 02:29 PM (12 days ago)	View Details ICT : ICT Test Yield => 86.05% ICT-ICT Test Yield => 89.08%	View Recipients	Post/View Comments Total Posted: 0
3. Consecutive Station Failures	ICT	View Criteria CRITICAL	09/27/2007 02:25 PM (12 days ago)	View Details Station Name: hp3070t6 => Failures: 10 Station Name: hp3070t6 => Failures: 8 Station Name: hp3070t6 => Failures: 15 Station Name: hp3070t6 => Failures: 9 Station Name: hp3070t6 => Failures: 12 Station Name: hp3070t6 => Failures: 7 Station Name: hp3070t6 => Failures: 8 Station Name: hp3070t4 => Failures: 8 Station Name: hp3070t4 => Failures: 15 Station Name: hp3070t4 => Failures: 16 Station Name: hp3070t4 => Failures: 9 Station Name: hp3070t4 => Failures: 13	View Recipients	Post/View Comments Total Posted: 0

# Repair & Root Cause

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## Visibility into Repair & Root Cause

Product Performance Intelligence

Dashboard Mfg Test Repair Admin Help | Roger, Sign out | Your Account

Reports | Admin | Forms | Wizards

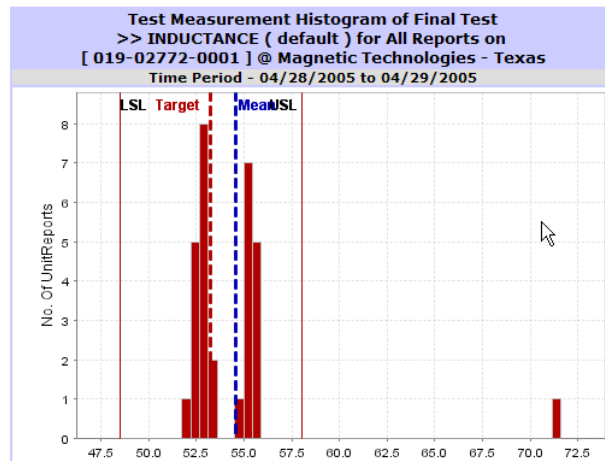
Showing 1 to 20 of 65

Repair Time	Operator	Part Number	Serial Number	Test Failures	Repair Details					
					Defect Code	Repair Code	Status	Pin	Ref Des	Comments
01/18/2007 09:39:38	pnguyen	403290	WAS31862NP10411	ICT Test • digital test-u4	TEST POINT CONTAMINATION	REFLOW PART	Repaired	8	u4	
					TEST POINT CONTAMINATION	REFLOW PART	Repaired	38	u4	
					TEST POINT CONTAMINATION	REFLOW PART	Repaired	32	u4	
					TEST POINT CONTAMINATION	REFLOW PART	Repaired	31	u4	
01/18/2007 09:37:07	pnguyen	403290	WAS31862NP10088	ICT Test • diode-d304:a	PART DEFECTIVE / OUT OF SPEC	REPLACE PART	Repaired		d304:a	
01/18/2007 09:33:48	pnguyen	403290	WAS31862NP10248	ICT Test • mixed-test-p1:res • resistor-p1:res	WRONG POLARITY	SEE COMMENT	Repaired		p1:res	remounted P1
01/18/2007 09:35:07	pnguyen	403290	WAS31862NP10408	ICT Test • digital test-u4	MISSING / INSUFFICIENT SOLDER	REFLOW PART	Repaired	31	u4	
					MISSING / INSUFFICIENT SOLDER	REFLOW PART	Repaired	8	u4	
					MISSING / INSUFFICIENT SOLDER	REFLOW PART	Repaired	38	u4	
					MISSING / INSUFFICIENT SOLDER	REFLOW PART	Repaired	32	u4	
01/18/2007 09:34:41	pnguyen	403290	WAS31862NP10252	ICT Test • digital test-u4	MISSING / INSUFFICIENT SOLDER	REFLOW PART	Repaired	14	u4	
					MISSING / INSUFFICIENT SOLDER	REFLOW PART	Repaired	8	u4	
					MISSING / INSUFFICIENT SOLDER	REFLOW PART	Repaired			

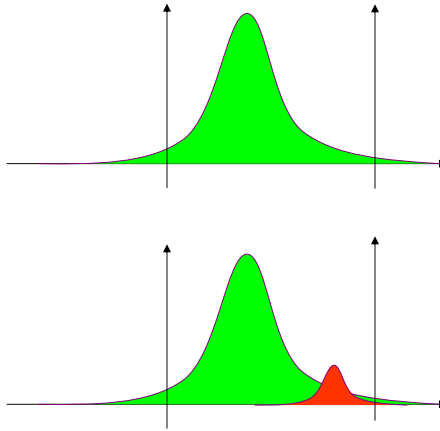
# Material Issues

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## Track Lot to Lot deviations



## Challenge: Identifying Maverick Lots



- Normal production

- A Maverick lot creeps in ...

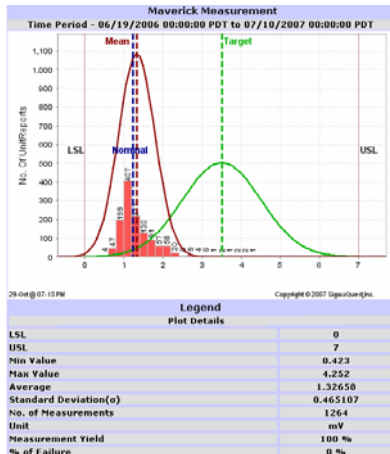
JESD50A  
DECEMBER 2004

JEDEC SOLID STATE TECHNOLOGY ASSOCIATION



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## Automated Maverick Analysis



Variation Details						
Ideal	Nominal	Lot	$\delta$ of Lot	% of $\delta$	Nominal $\sigma$	Lot $\sigma$
Mean	Mean	Mean	Mean			Deviation of $\sigma$
3.5	1.23137	1.32658	95.213E-3	7.7323	337.093E-3	465.107E-3
SPC Details						
Ppk	950.735E-3		Pp	2.50838		
Target	3.5		Ppm	524.904E-3		
Kurtosis	-2.99988		Ppu	4.06603		
Skewness	2.00659		Ppl	950.735E-3		
Item	Start Value	End Value	Count			
02	0.4	600E-3	4			
03	600E-3	0.8	47			
04	0.8	1	199			
05	1	1.2	407			
06	1.2	1.4	217			
07	1.4	1.6	130			
08	1.6	1.8	91			
09	1.8	2	57			
10	2	2.2	38			
11	2.2	2.4	20			
12	2.4	2.6	6			
13	2.6	2.8	9			
14	2.8	3	4			
15	3	3.2	6			
16	3.2	3.4	1			
17	3.4	3.6	2			



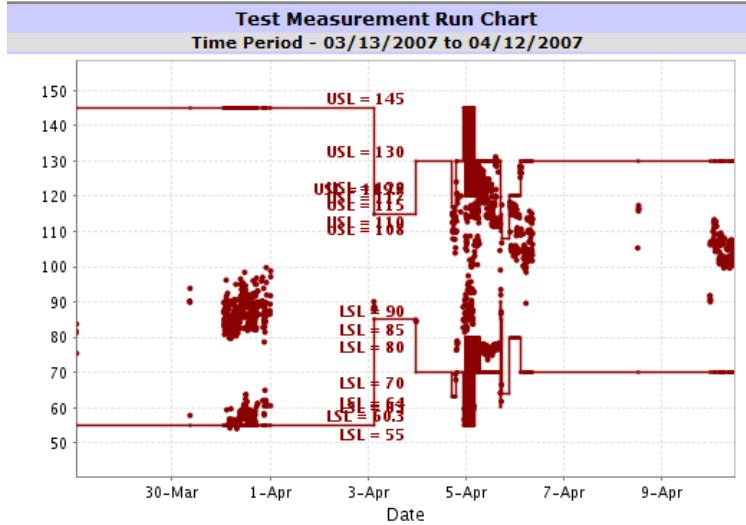
# Design Assurance

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# SPC Offenders

	ICT Test >> capacitor-c12 >> capacitor-c12	ICT Test >> capacitor-c16 >> capacitor-c16	ICT Test >> capacitor-c15 >> capacitor-c15	ICT Test >> capacitor-c10 >> capacitor-c10	ICT Test >> capacitor-c >> capacitor-c
Ppk (Ppk)	0.33	0.55	0.88	1.53	1.54
Defects Per Million (DPM)	0	0	0	870.95	0
Cp (Cp)	1.27	1.67	1.46	1.57	2.59
Cpk (Cpk)	0.33	0.55	0.88	1.53	1.89
Subgroup Size (n)	72	73	72	13,778	9
Lower Specification Limit (LSL)	0	0	0	0	0
Upper Specification Limit (USL)	0	0	0	0	0
Sample Minimum (Min)	0	0	0	-0	0
Sample Maximum (Max)	0	0	0	0	0

## Manage Specs to Improve Yield

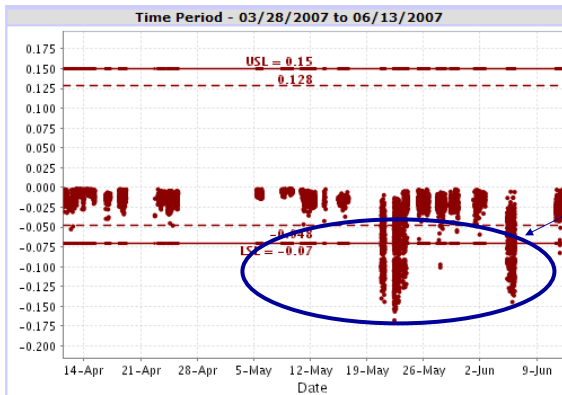


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## Why Are They Failing?



Design or Component owned  
by OEM

OR

Process – owned by Mfg'er

22-Jun @ 11-09 AM

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SL	Legend
01	ICT >> ICT Test >> measure-q13%syncfet_qf1 >> measure-bnfet_on >> measure-bnfet_on @ All Reports on FoxConn China/Makalu: USL = 0.15 LSL = -0.07 Min = -0.1677878 Max = -0.001303537 No. of Measurements = 8152

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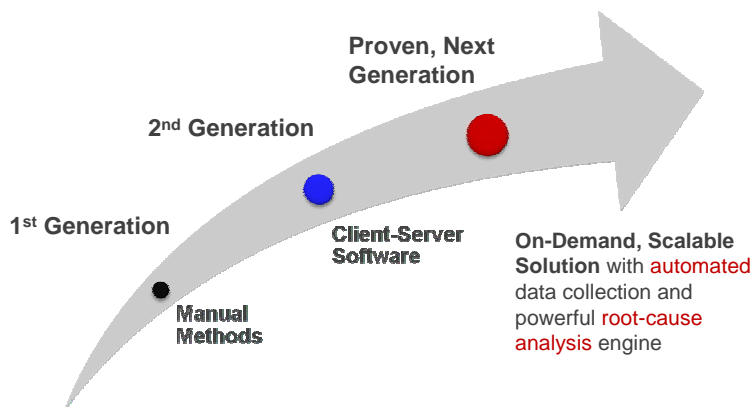
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Help is Here!

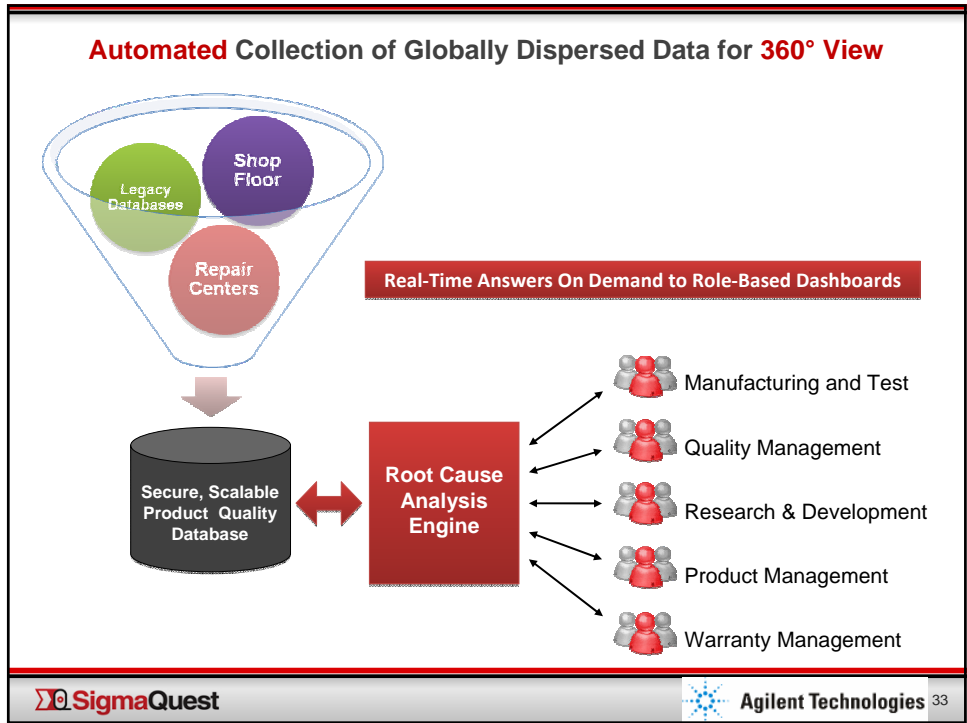
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## On-Demand, Scalable Solutions

### Evolution of Product Quality Management







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### Before & After

	Before	After
Corrective Action	Reactive, Sluggish	Proactive, Responsive
Latency of Information	Weeks	Minutes/Hours
Accuracy of Reports	Questionable, subject to interpretation	High, Machine to Machine
Exception based management	Manual, Labor intensive, Lots of Travel	Automatic, Efficient
Material / Inventory Liability	High, Slow response means deeper recalls	Low
Collaboration	Disconnected, Win-Lose	Collaborative, Win-Win

SigmaQuest
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## October 21 Webinar, 10AM

### *Common OEM-EMS Disputes and How to Avoid Them*

Symphony  Consulting



paramit corporation

- Examining at Inventory, quality & Price issues

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Nader Fathi, CEO

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