“Eliminate Test”
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Thanks go to Valor
Sponsors of this presentation

Assembly Done Better
Motivation

I get asked; “how do I eliminate test?”

“My SMT process has”:
Reduced in cost
Become quicker
Become more flexible

“But my test process has”:
Increased in cost…….
“Lean Test”

- test cycle time
- test bottlenecks
- test WIP
- test diagnostics
- test rework
- test NTF’s
- test Capital
- test NRE’s
- test returns
- test DFT requirements

In the language of ‘Lean’
These are all forms of “waste”
“Lean Test”

• Lean principals have had little traction in test: so far!?
  • ‘Fujitsu experience’

The reasons are:

**Test is complex**
  Product and process knowledge required

**Test is not always sequential**
  Test has multiple outcomes

**Test fulfills multiple functions:**
  Regulatory compliance
  Customer satisfaction
  Product validation
  Assembly quality
  Vendor parts quality
Why?

• Product managers comfort Zones
  • Little understanding of test
  • Test introduces constraints

• Metrics
  • Lack of industry recognised metrics
  • Product quality not process capability

• Data accuracy and latency
  • Lack of data sensors
  • SMT equipment can report parametric data
  • Non standard data and control formats
    • SCADA is the base level SMT standard
Lean Principals

Established what our performance could be

‘the future state map’

Compared with the current performance

‘the current state map’

Identify, and close

‘the performance gap’

The B. S. view of test:

The ‘roadblock’ is not in our limited
Imagination of what can be achieved.
but in our working from accurate
performance data.
Manufacturing Solutions

ERP

Analysis & Planning
- Traceability
- Kitting Area Management
- Scheduling
- Process Planning
- Analysis & Repair
- Quality Reporting

Data Collection
- Material Registration
- Station Monitoring
- Material Monitoring
- Low Level Warning
- WIP Tracking
- Quality Monitoring

Supervisory & Control
- Setup Verification
- Program Validation
- Tools Maintenance
- MSD Control
- Enforced Routing
- Alarms

Production Stations

Supervisory Control and Data Acquisition (SCADA)
Manufacturing Execution Systems (MES)
ISA95 Manufacturing Enterprise Systems Standards and User Resources
Inspection and Test Data

Support for Full Process Flow
Inspection, Test and Repair Data Points

SMT Line → Manual Assembly → Test Group → Outgoing

- PCB ID labeling
- Printer
- Universal MC1
- Universal MC 2
- Inspection
- Oven
- Repair
- NG
- OK

- MA Group
- Wave
- T/U + Inspection
- MA WIP Store Area
- NG
- OK

- ICT Station
- FCT Station
- Repair Station
- Outgoing Inspection

WIP point only
WIP Point
Operator interface
Quality data collection
Test Cost Reduction Plan

• Basic steps:
  • Capture data
  • Introduce yield prediction
  • Set production targets
  • Monitor results gap
  • Establish conditional action processes
  • Monitor changes
  • Update predictions
  • Introduce for all NPI’s
Remove the Sources of Data Errors

- Poor test process
- Poor coverage reports
- Poor routing control
- Poor test stability
  - Platform
  - Interface
  - Tolerance margining
  - Capability
- Long data latency
- Poor root cause analysis
  - Diagnostic skills
  - Diagnostic routing
  - Process correlation
- High retest rates
  - NTF etc.
Test ‘Elimination’

• Accurate data will drive test cost reduction
  • Poor tests
  • Overlapping tests
  • High process yields
  • Vendor corrective actions
“Stretch Goals”

  Presents the task more clearly:-
  Stretch Goals are “the art of the possible”

Establish what can be done
  Benchmark against the best
  Not just within our own experiences
  Challenge the excepted limitations