Poster Session 2

ARCHIVE 2012

Sure, podium presentations are great, but sometimes it's nice to have a one-on-one chat with the author. And, we all wonder: how many people are inclined to ask those provocative questions in front of the whole audience?

With a variety of topics being addressed, poster sessions offer the perfect opportunity for authors and attendees to interact directly and even share ideas in an informal setting while enjoying some refreshments.

Novel Approach to Detect and Diagnose Load Board Problems Early in the Production Flow

Maroon Maroon, Gustavo Cozacov—Intel Corporation

Development of Pressure Sensitive Conductive Rubber (eM-PCR® /HAH-PCR®)

Josh Jin, Hiroe Mochizuki, Jack Liang—WinWay Technology Co., Ltd.
Daisuke Yamada, Kazuhiro Chishima, Noriyuki Takeda—JMT Microtech Inc.

BGA Spring Probe for Fine Pitch and High Current

Fred Megna—MJC Electronics Corp.
Eichi Osato—Micronics Japan Co., Ltd.

Tools for the Trade – Assuring Socket Quality

Jay Kim, P.E.—Western Specialty Technologies LLC
Victor Pyo—OKins Electronics Co., Ltd.

BiTS Burn-in & Test Strategies Workshop
BiTS 2012

intel

Novel Approach to Detect and Diagnose Load Board Problems Early in the Production Flow

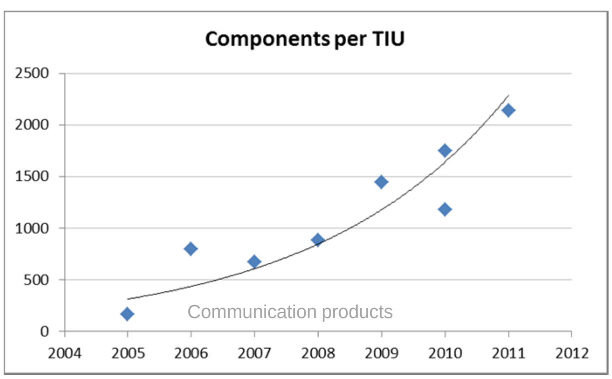
Maroon Maroon, Gustavo Cozacov
Intel Corporation

Load boards are still a critical component in the testing environment and any failure can cause delays in the delivery of the units due to unnecessary retests and additional yield lost, affecting directly the cost the components under testing.

This work explains a new methodology implemented in order to reduce load boards maintenance related costs

Motivation

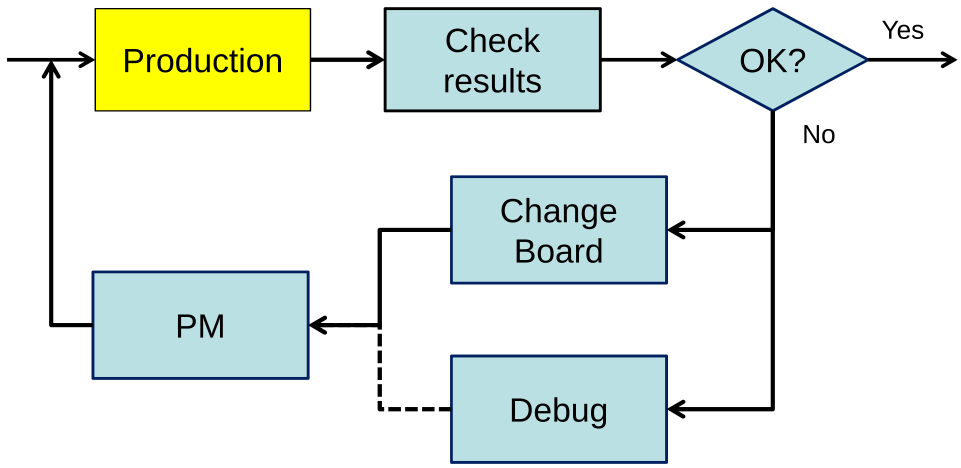
As the number of interfaces of modern devices increases, production load boards become more and more complex as well. Number of passive and active components increased exponentially during the last 10 years and it is not strange today to count thousands of components in a single board.



A quick and efficient board check test that can pinpoint any board malfunctions is becoming critical to reduce yield loss and equipment downtime

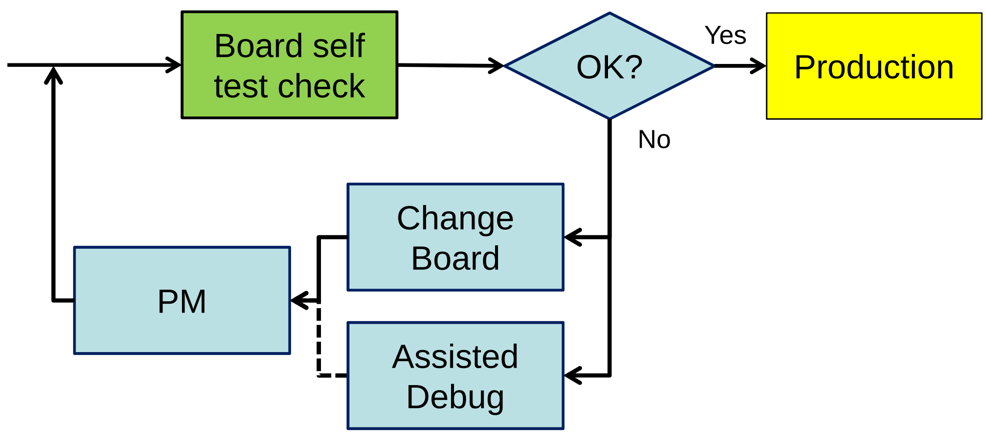
Current approach

Current approach is based on a retrospective analysis and periodic maintenance, this methodology has the problem that generally the failures are detected after silicon test run and not before it.



New methodology

The chosen methodology is based on a board **self-test** that run automatically when the test program is loaded or the board is replaced. The coverage of the self-test **can be adjusted** addressing the critical components we have on board



Self Test board check implementation:

Several alternatives were evaluated like:

- Complete DFT on board
- Additional load-board mini-tester
- Extensive PM
- Special tests on ATE with minimum board changes

The last approach was finally selected since it offers a considerable coverage together with a high flexibility doing minimum changes on the load board.

Coverage:

The coverage is flexible and depends mostly on how much effort is invested in the development of the test itself. Basically it is possible to check most of the paths and components in the board.


Relays Using V/I measurement or TDR


HSIO pats using conical inductors


Resistors using V/I measurement


Critical capacitors: forcing current and measuring voltage


Active components: different methods according to the device


Tracks: resistance or TDR

Conclusion

This approach is a complete HVM solution already implemented in many products providing a strong tool to quickly diagnose and fix any board issue before starting HVM production run.

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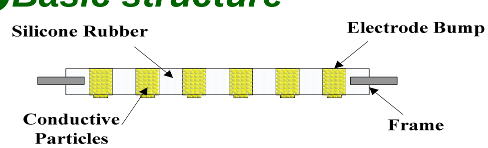
Development of Pressure Sensitive Conductive Rubber (eM-PCR® /HAH-PCR®)

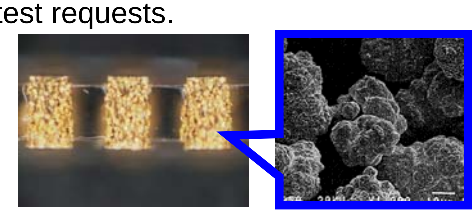
Josh Jin / Hiroe Mochizuki / Jack Liang
WinWay Technology Co., Ltd.
Daisuke Yamada / Kazuhiro Chishima / Noriyuki Takeda
JMT Microtech Inc.

PCR® has been developed for high performance testing that needs low inductance, low resistance and low contact force application. PCR® is commonly used in memory, and IC testing field to satisfy different application on analog, digital, and RF test requests.

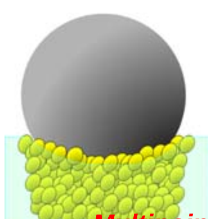
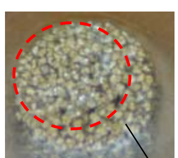
●*Basic structure*



Thinner Sheet thickness 0.35~1.3mm

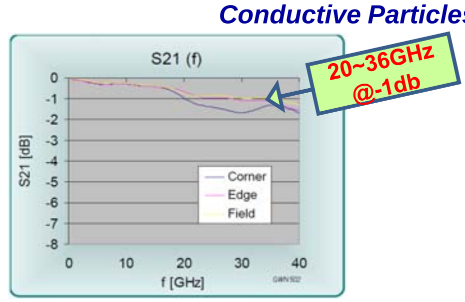


Conductive Particles

Contact area

Multipoint Contact



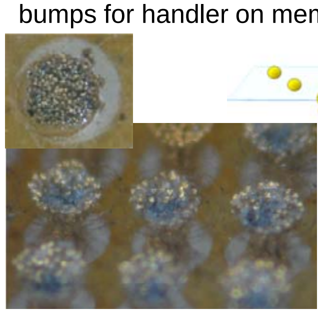
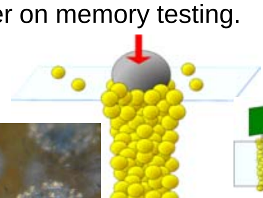
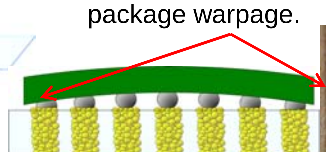
Excellent Electrical Performance

●*What's the concern?*

Electrode bump damage is caused by high speed impact or uneven contact.

High speed impact damage on PCR® bumps for handler on memory testing.

Uneven contact caused by variability of package lot, solder ball coplanarity or package warpage.

Poster #2
1

What's the Solution?

Impact Damage by Memory Handler Testing

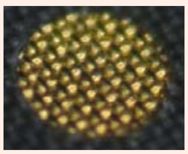
Bump Denting on High pin counts BGA Package Testing

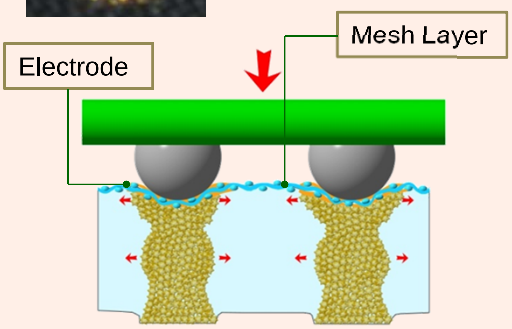
Improvement Direction

Enhance bump surface protection

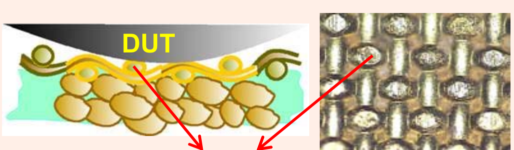
Increase compliance contact travel

eM PCR®

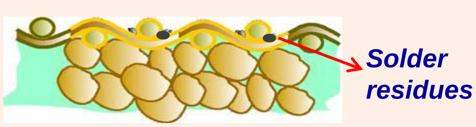




A firm polymer mesh on eMesh PCR® surface will help endure the contact impact from memory handler, bumps are hardly damaged and lifetime is widely improved.

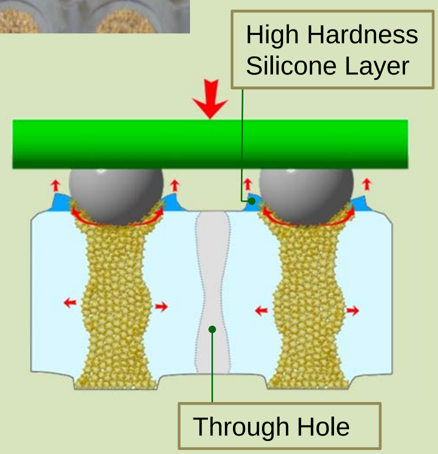


Each crossing points of mesh surface will contact with solder ball.

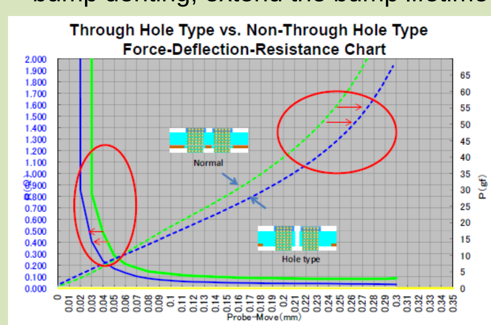


Solder residues will be trapped into the recessed mesh grills, thus each contact point with ball will not be contaminated by solder.

HAH PCR®

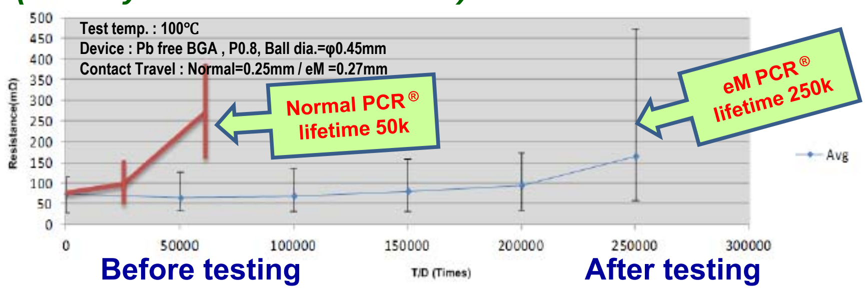


Adding through holes between bumps will help bumps deform more compliantly. Handler compression force will not over concentrate at bump surface layer, and advanced prevent bump denting, extend the bump lifetime.

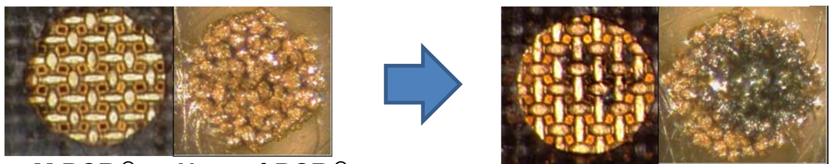


Normal PCR® vs eM PCR® Durability Test Result

(Memory Handler In-house Test)



Before testing **After testing**



eM PCR® Normal PCR® eM PCR® (T/D 250k) Normal PCR® (T/D ≦100k)

eM PCR Customer Application Case

Normal PCR® vs. eM PCR® (Memory Production Result)

Application : DDR3 / LPDDR **Package : BGA/P0.8**

	Lifetime	DUT off Rate
Normal	30～70k	5～10/256(2~4%)
eM	100～200k	0/256 (0%)

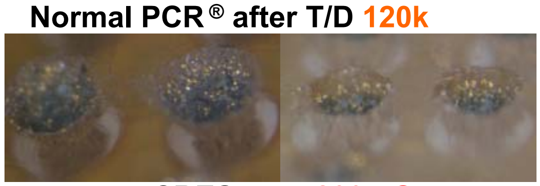
HAH PCR Customer Application Case

Normal PCR® vs. HAH PCR® (ATE Production Result)

Application : Media processor
Package : BGA35x35 /P0.8 /Pin count 1437

	Lifetime	Yield
Normal	120k	95%
HAH	230k	98%

Normal PCR® after T/D 120k



avg. CRES over 200mΩ

HAH PCR® after T/D 230k

avg. CRES around 55mΩ

Summary

eM PCR®	HAH PCR®
◆Firm polymer mesh to endure impact ◆Reduce solder contamination ◆Improve reliability and DUT off rate ◆Improve PCR® lifetime ◆Suitable for smaller BGA package test	◆Enhance bump surface strength ◆Increase contact travel ◆Improve reliability and test yield ◆Improve PCR® lifetime ◆Suitable for larger BGA package test

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MJC
MEC

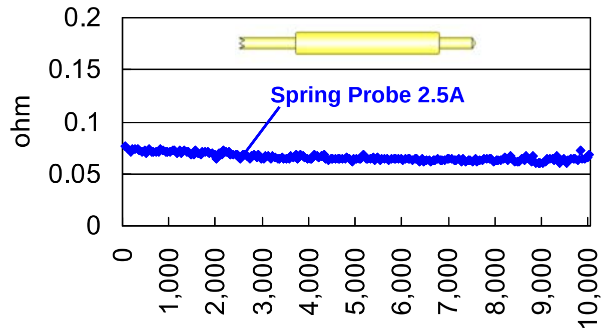
BGA Spring Probe for Fine Pitch and High Current

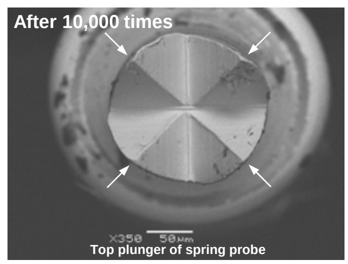
Eichi Osato, Micronics Japan Co., Ltd.
Fred Megna, MJC Electronics Corp.

Recently, there is a special demand for BGA testing. That is “high current capacity” (more than 2.5A). Generally, spring probes are most often used for BGA testing. They consist of [barrel tube], [plunger] and [coil spring] machined wire rod. MJC evaluated a general spring probe, which is for 0.4mm pitch, 35gf of spring force, and plunger material of special steel (SK), to evaluate how it performs when we apply pulse current (2ms) of both 2.5A and 10A.

Evaluation-1

Spring probe (P0.4mm) --- Impressed current 2.5A (Pulse 2ms)

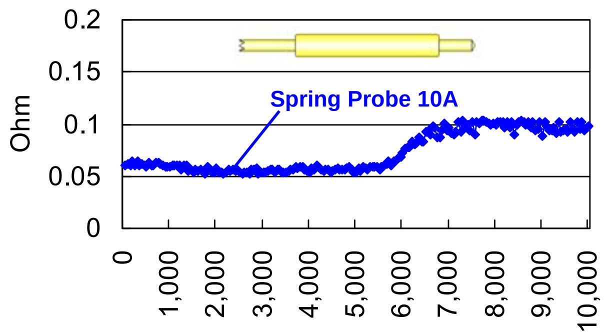


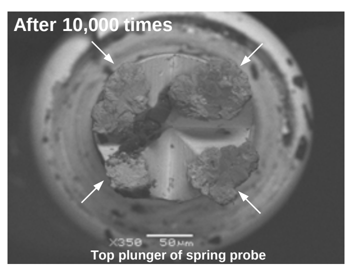


Min: 0.061ohm Max: 0.076ohm
Avg: 0.066ohm Std: 0.003

Evaluation-2

Spring probe (P0.4mm) --- Impressed current 10A (Pulse 2ms)

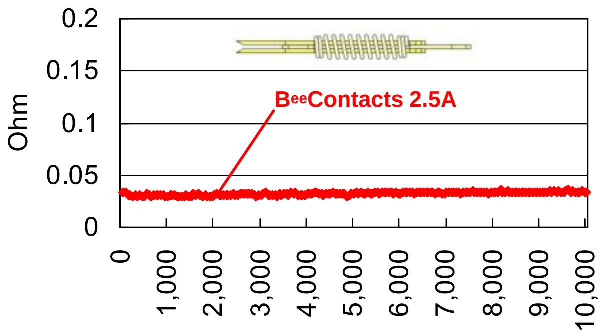


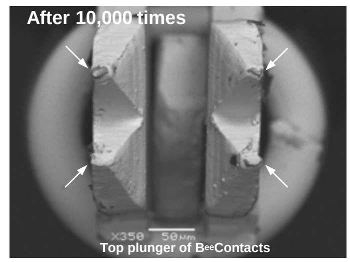


Min: 0.053ohm Max: 0.104ohm
Avg: 0.073ohm Std: 0.051

After 10K contacts with a pulse current of 2.5A, the spring probes didn't suffer any negative effects to contact resistance or pin tip shape. However, after we raised the current to 10A, the contact resistance became unstable and the pin tip shape was dramatically changed.
In contrast, we evaluated the pressed contactors (BeeContacts) with same procedure. The specifications were same with the spring probe, for 0.4mm pitch, 35gf of contact force. Plunger material was different, it was BeCu plated with Au.

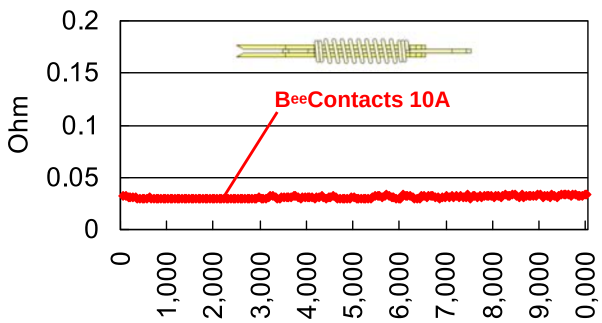
Evaluation-3
BeeContacts (P0.4mm) --- Impressed current 2.5A (Pulse 2ms)

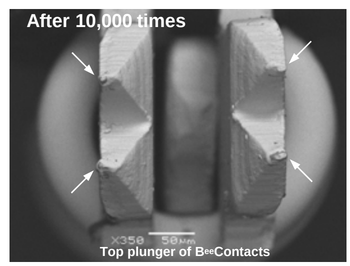




Min: 0.030ohm Max: 0.036ohm
Avg: 0.032ohm Std: 0.001

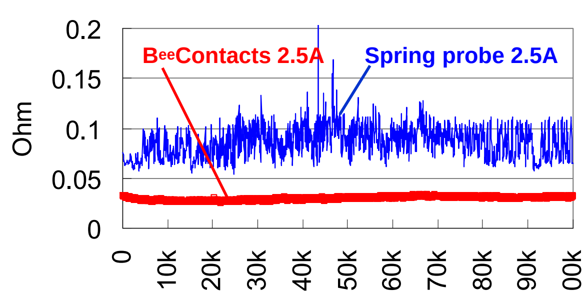
Evaluation-4
BeeContacts (P0.4mm) --- Impressed current 10A (Pulse 2ms)





Min: 0.029ohm Max: 0.034ohm
Avg: 0.031ohm Std: 0.001

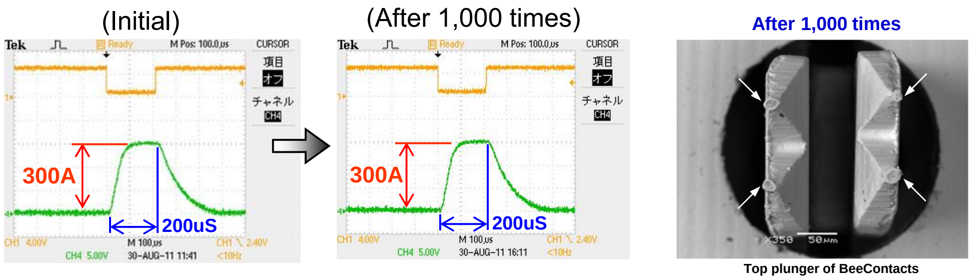
Evaluation-5
Spring probe (P0.4mm) and BeeContacts (P0.4mm)
--- Impressed current 2.5A (Pulse 2ms)



As a result of Evaluation 1 to 4, the contactors pressed from plate (BeeContacts) perform better than spring probe machined from wire rod. We continued the 2.5A evaluation (Evaluation 3) up to 100K contacts, and we found that pressed contactors were exceptionally suited for high current testing.

We tried further evaluation for the pressed contactors (BeeContacts) to apply 300A of pulse current (200us) and we checked the waveforms of initial and after 1K contacts. (Test sample: 100 pcs, 10x10 Grid Array, Pitch 0.4mm)

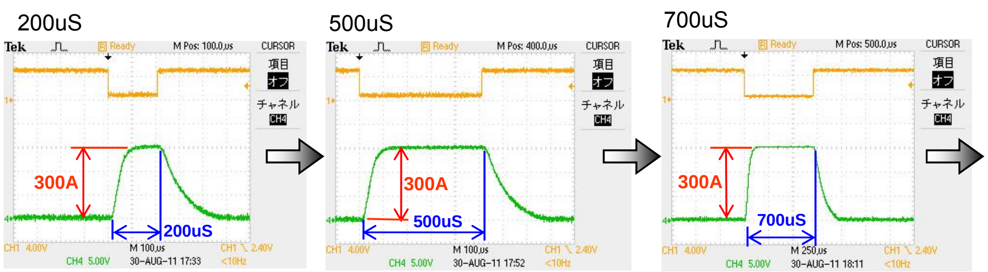
Evaluation-6
Waveform of output current
BeeContacts (P0.4mm) --- Impressed current 300A (Pulse 200us)

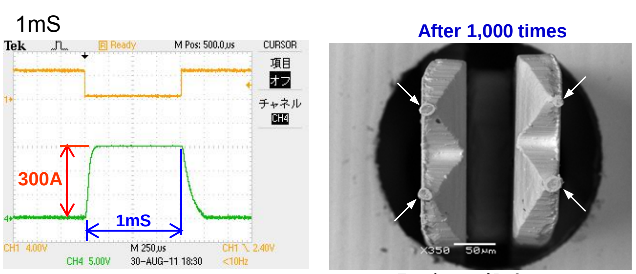


Top plunger of BeeContacts

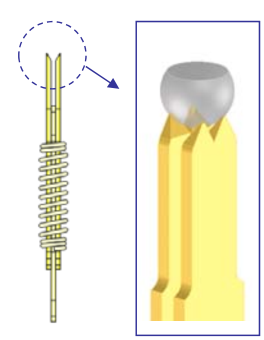
As a result, the waveforms were very stable even after 1K contact. Therefore, we extended the pulse step to step, 200us→ 500us→700us →1ms, and checked the waveforms each step.

Evaluation-7
Waveform of output current
BeeContacts (P0.4mm) --- Impressed current 300A





Top plunger of BeeContacts



Summary
・High current testing (up to 2.5A)
Pressed Contactor outperforms Spring Probe machined from wire rod
・Pressed contactor (BeeContacts) can achieve high current testing of 300A

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OKins
OKins Electronics Co., Ltd

Tools for the Trade – Assuring Socket Quality

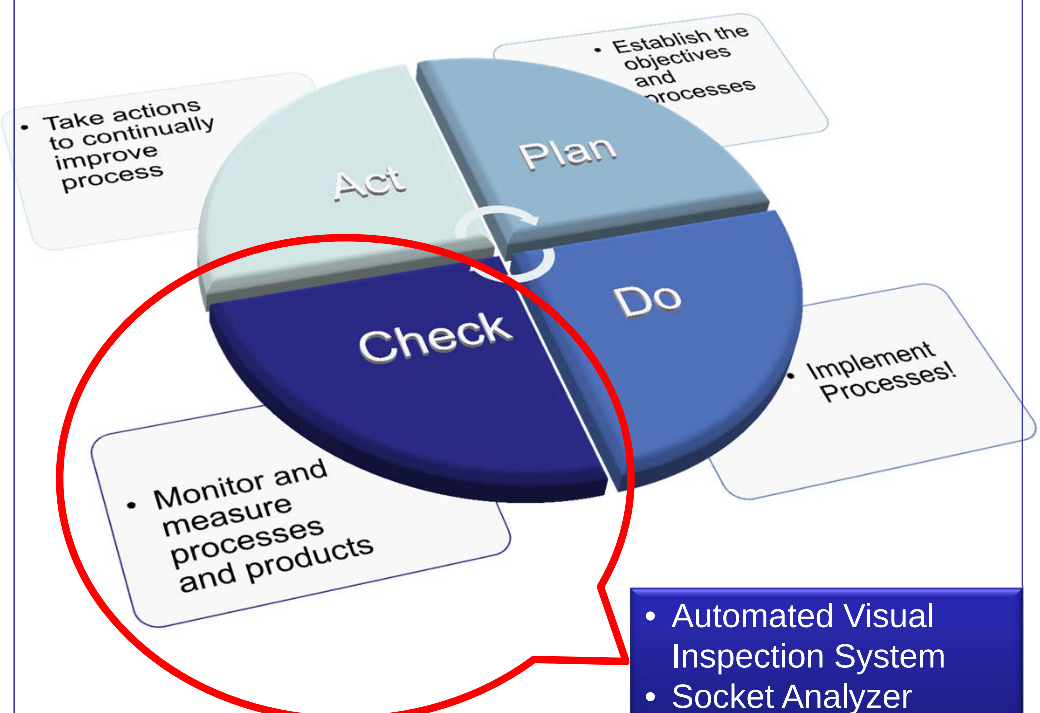
Jay Kim, P.E., Western Specialty Technologies LLC
Victor Pyo, OKins Electronics Co., Ltd.

Quality Assurance

The planned and systematic activities implemented in a quality system so that quality requirements for a product or service will be fulfilled.
(American Society for Quality)

Quality Assurance Tool

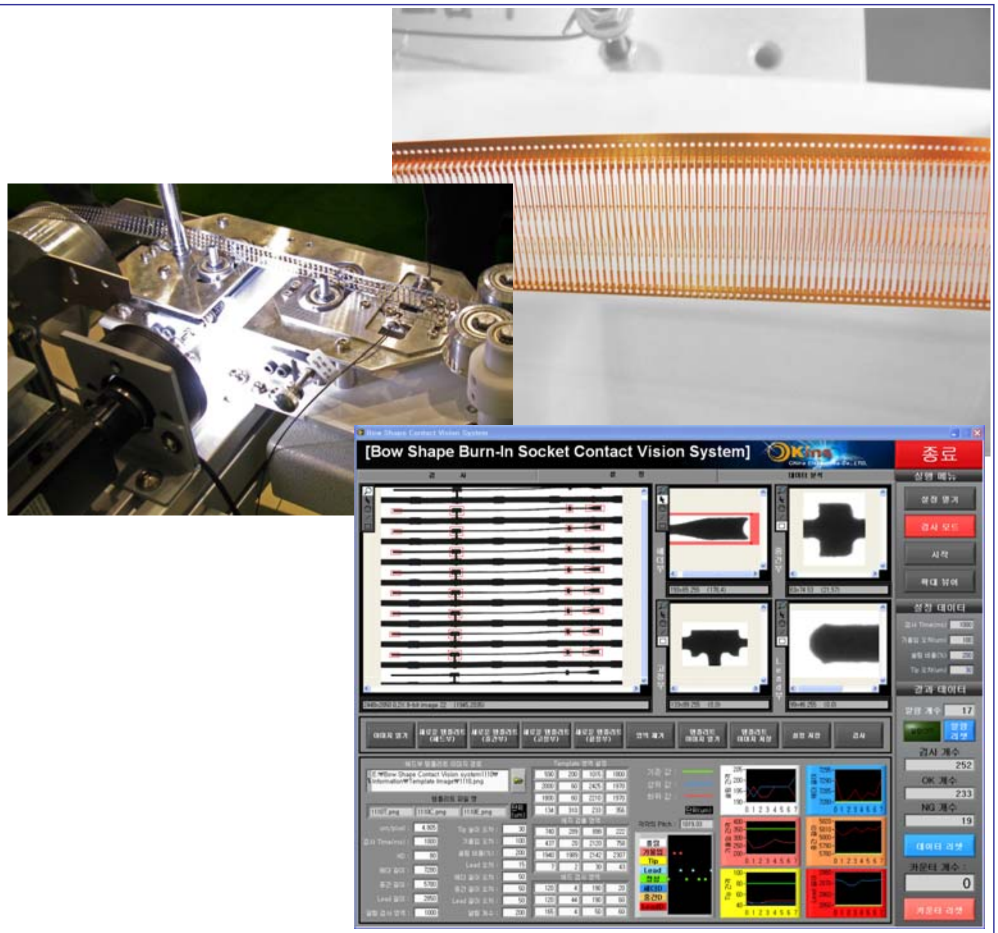
Deming's PDCA cycle is a popular quality assurance tool.



- Automated Visual Inspection System
- Socket Analyzer

Automated Visual Inspection System

- Application: stamped contact pins for burn-in and test sockets
- Requirements:
  - Inline inspection, without interrupting production flow
  - Simultaneous Micro and Macro area inspection for speed and accuracy

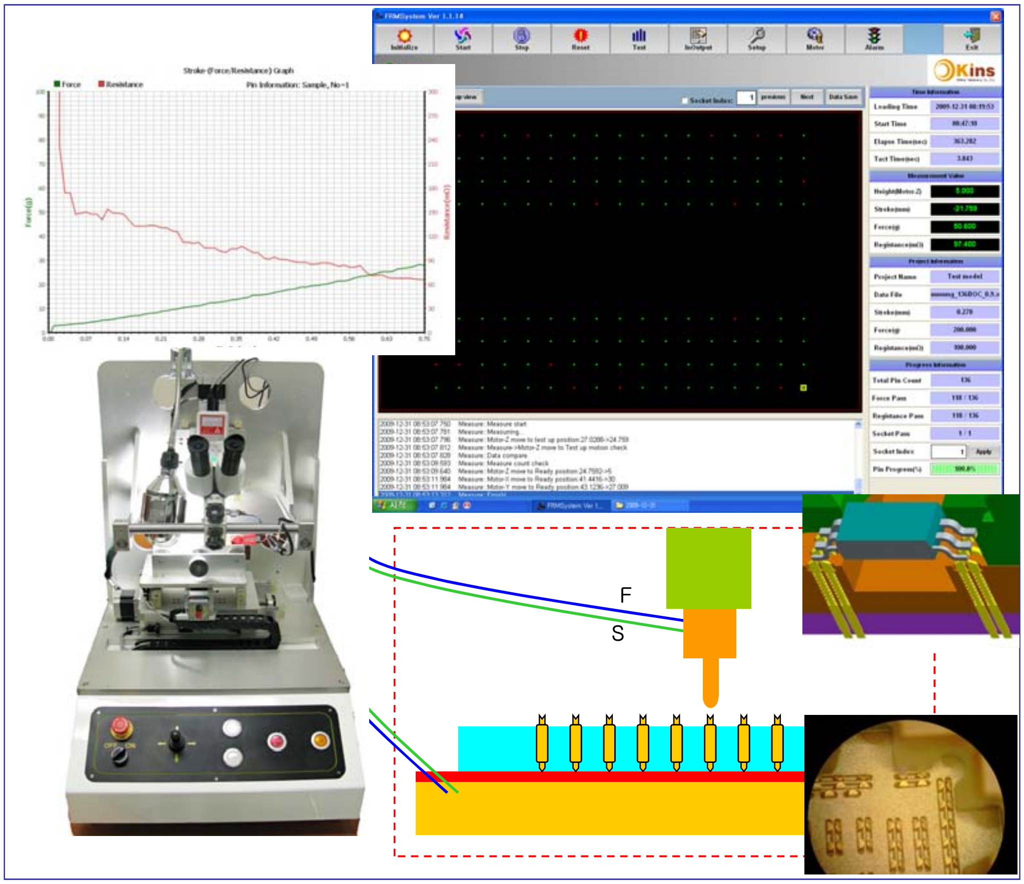


Result

- Significant increase in contact pin **quality**
- Production **yield** increase through prompt action for out of control issues

Socket Analyzer

- Application: Automated measurement of contact resistance, force and displacement (stroke).
- Requirements:
  - Contact resistance and contact force vs. displacement (stroke) per pin
  - Automatic probing after initial in-situ guidance



Result

- Better socket characterization by measuring the three parameters: Contact resistance (Cres), contact force and displacement (stroke)
- Incoming / outgoing inspection of socket QA
- Test socket performance monitoring throughout production