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MAXCOM TOOLING PTE LTD

Evaluation Report

April 08, 2013

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Used XXX-Pin Recovery through Replating

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Background

- CMG is segregating the spin and contact fingers in the following categories
  - CLASS A - or the brand new pins.
  - CLASS B - or the pins that are used but still in good shape and plating condition.
  - CLASS C- Or the pins or contact with faded contact tips
  - CLASS D- Or the totally defective pins. This are either bent, burnt or broken pins

Actual Picture of the S Pin segregation

- Maxcom came up with an idea of saving the “CLASS C” pins by having them replated. Target Price is more than 50% of the OEM value

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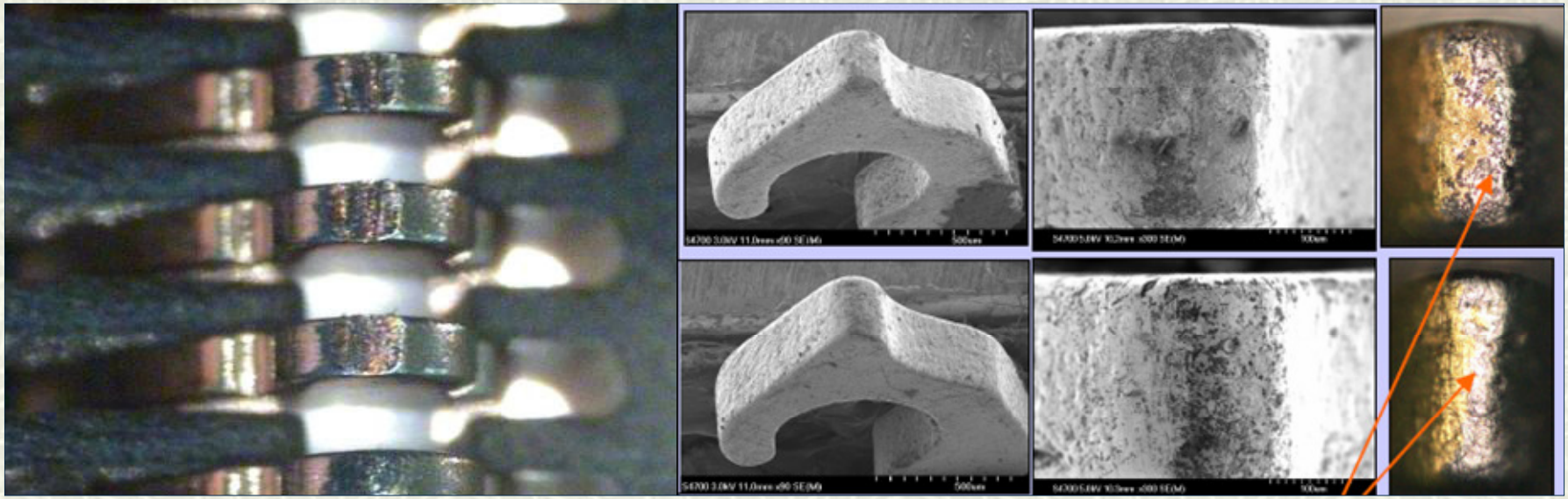
Illustrations



Faded XXX Pin (CLASS C) Sample

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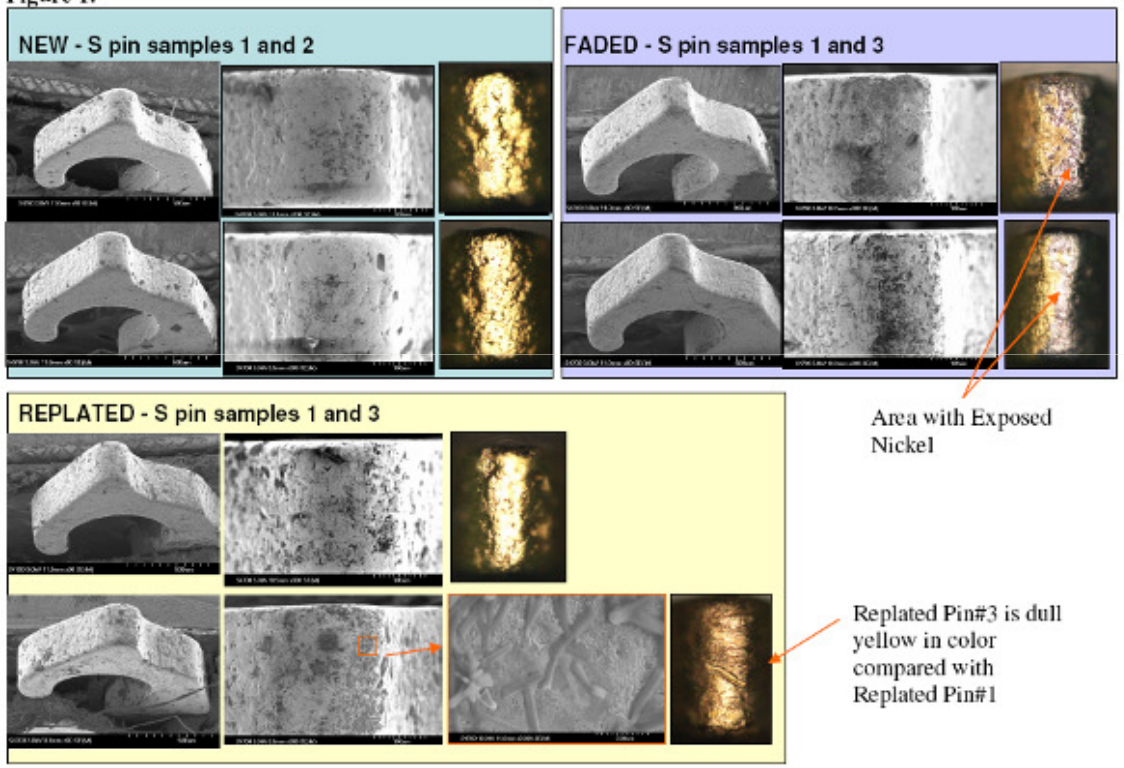
Failure Analysis- Scanning Electron Microscope

Figure 1:



SN 1-6: SEM and Optical image comparison of the different S pin tips.

Morphological analysis revealed that brand new pin has more even surface compared to the replated pins. Faded pins are also analyzed for reference.

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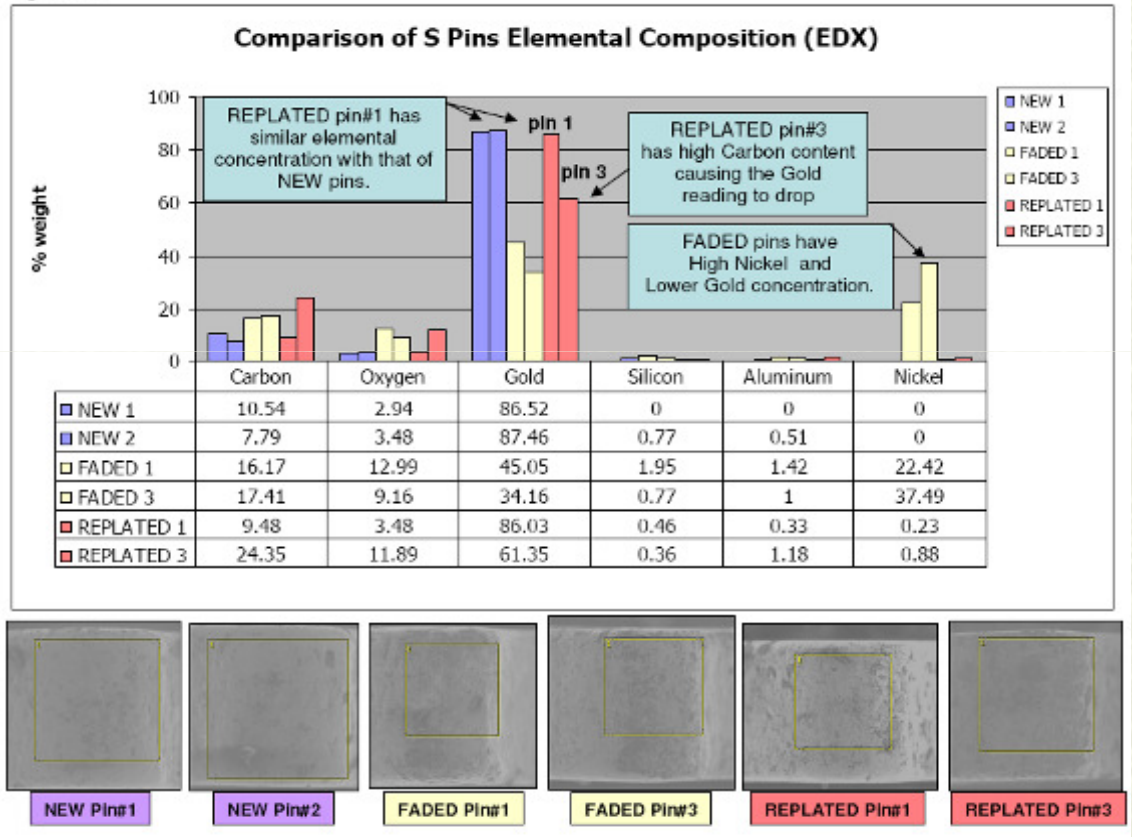
Failure Analysis- Energy Dispersive X-ray

Figure 2:



	Carbon	Oxygen	Gold	Silicon	Aluminum	Nickel
NEW 1	10.54	2.94	86.52	0	0	0
NEW 2	7.79	3.48	87.46	0.77	0.51	0
FADED 1	16.17	12.99	45.05	1.95	1.42	22.42
FADED 3	17.41	9.16	34.16	0.77	1	37.49
REPLATED 1	9.48	3.48	86.03	0.46	0.33	0.23
REPLATED 3	24.35	11.89	61.35	0.36	1.18	0.88

Elemental Composition Analysis shows that REPLATED pins has similar elemental concentration and composition with that of NEW pins.

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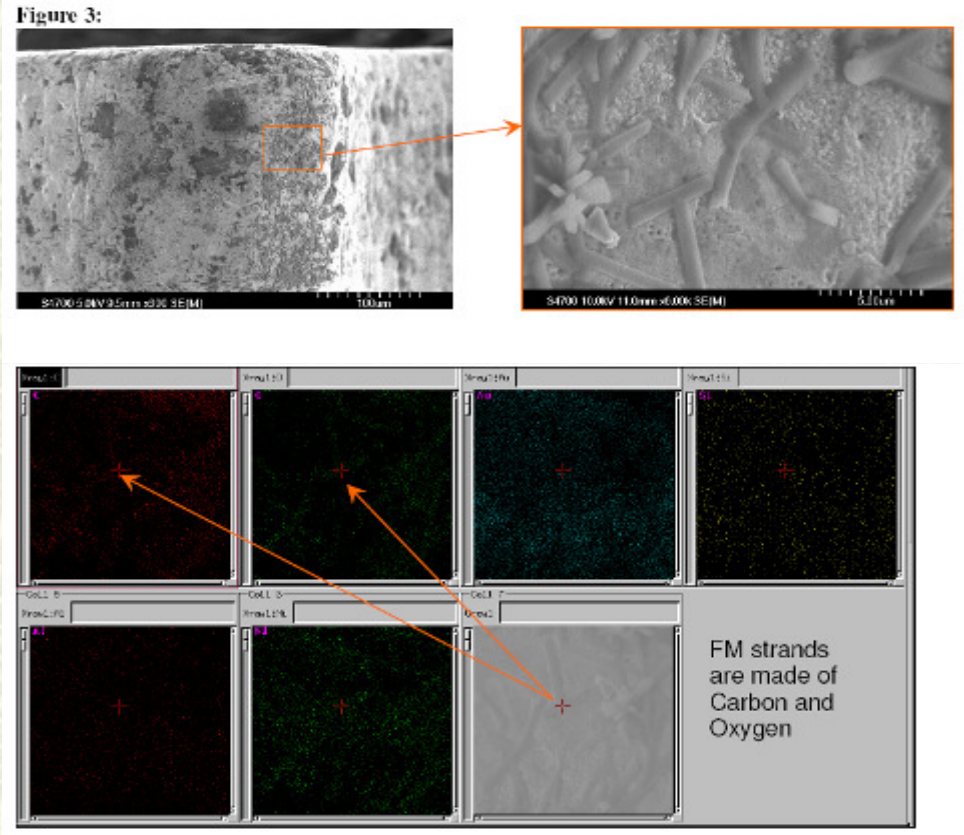
Failure Analysis- Energy Dispersive X-ray



One of the REPLATED pins was observed to have strands of FM. SEM/EDX and elemental mapping confirmed that the strand of FM are made up of Carbon and Oxegen.

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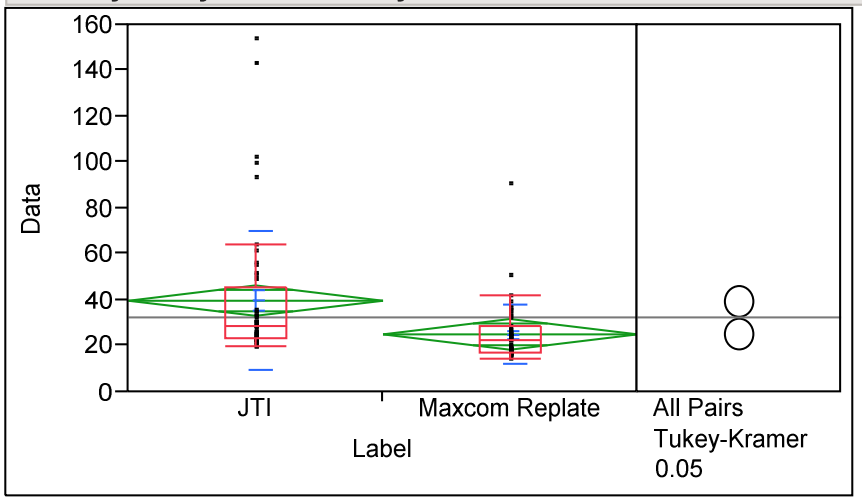
Electrical Test- IMT 200CT Resistance Testing



Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
JTI	48	39.9333	30.3430	4.3796	31.123	48.744
Maxcom Replate	48	25.2333	12.7089	1.8344	21.543	28.924

Graph above shows the resistance comparison of XXX brand new pins and replated pins using IMT 200CT. Mean and variance of the two resistances are statistically different. Replated pins has a better average resistance and standard deviation.

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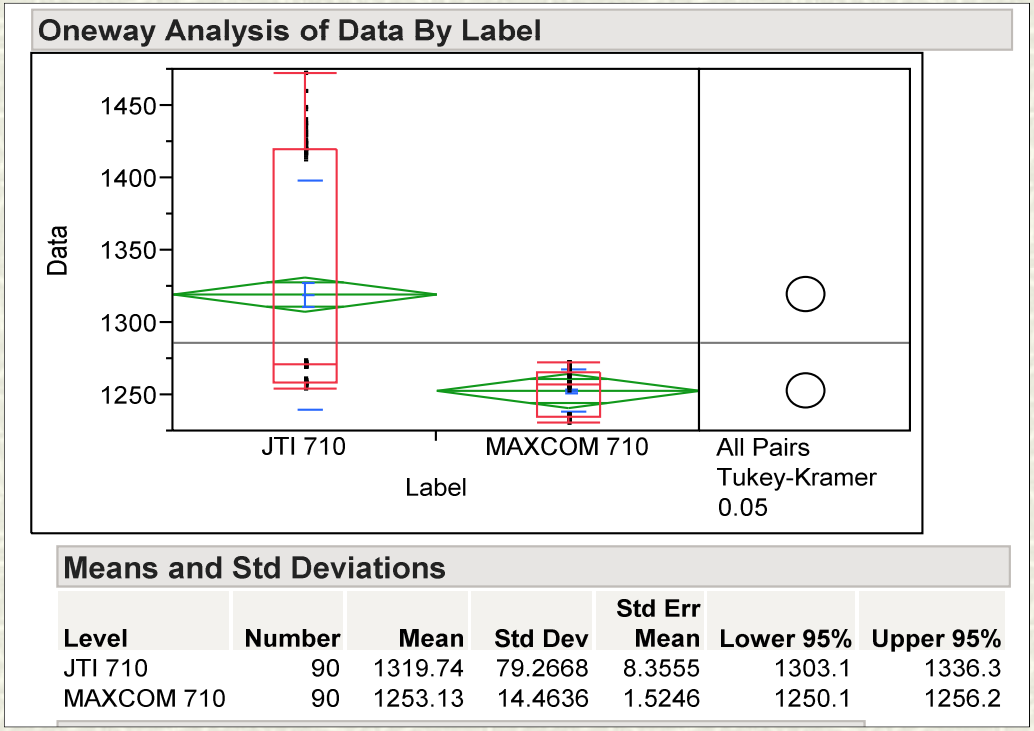
Electrical Test- GBD on PF58 PRODUCT (Param710)



Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
JTI 710	90	1319.74	79.2668	8.3555	1303.1	1336.3
MAXCOM 710	90	1253.13	14.4636	1.5246	1250.1	1256.2

Graph above shows the resistance comparison of XXX brand new pins and replated pins using actual product. Mean and variance of the two resistances are statistically different. Replated pins has a better average resistance and standard deviation.

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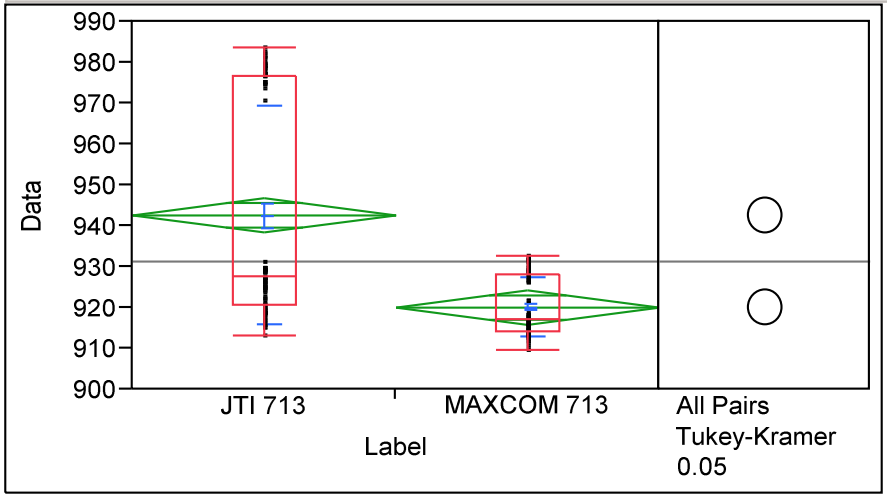
Electrical Test- GBD on PF58 PRODUCT (Param713)



Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
JTI 713	84	942.667	26.7747	2.9214	936.86	948.48
MAXCOM 713	84	920.076	7.2644	0.7926	918.50	921.65

Graph above shows the resistance comparison of JTI brand new pins and replated pins. Mean and variance of the two resistances are statistically different. Replated pins has a better average resistance and standard deviation.

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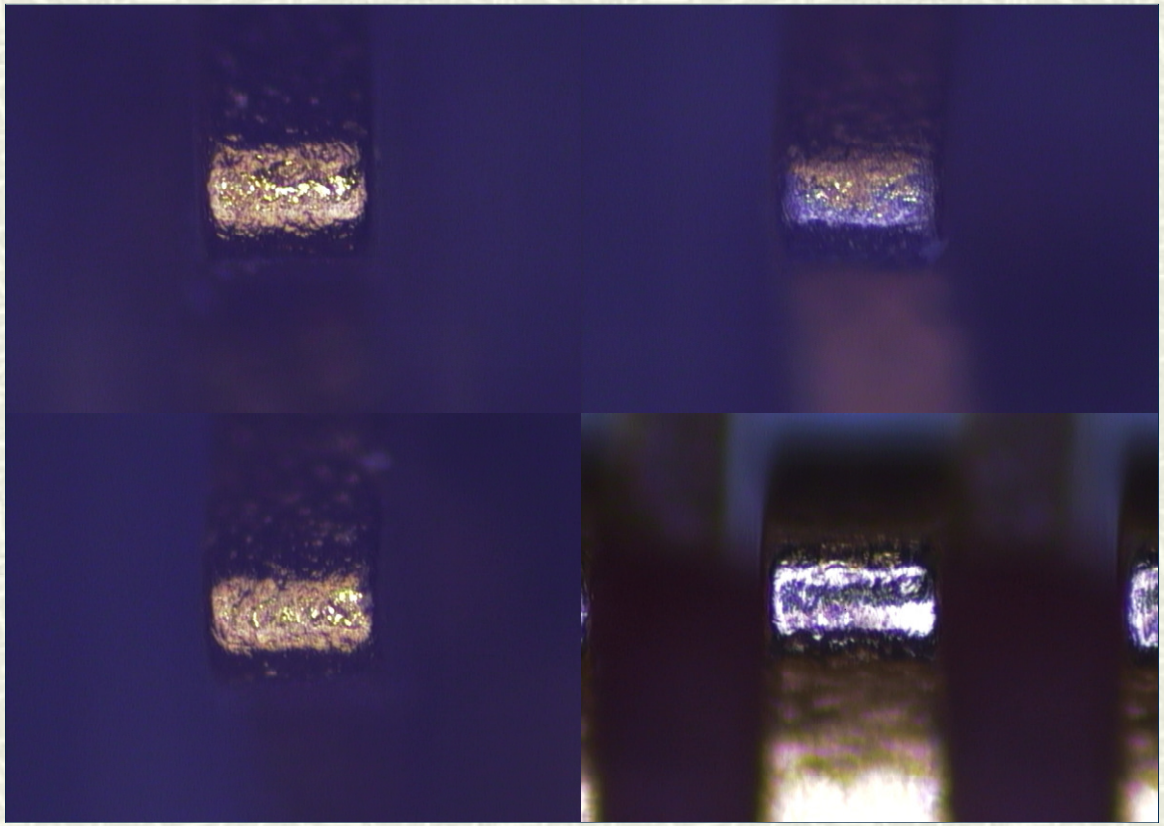
Production Evaluation



Replated Pins are tested for production use on AET V8 handler, uFLEX Tester. The replated pins are damaged on its 216.3Kth insertions. Brand new pins has an average of 250K insertions

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Cost Analysis

COST SAVING PER PIN

Given Data:

New Pin Cost $2.7

New Pin Life 250K insertions

Replated Pin Cost $1.6

Replated Pin Life 216.335K insertions

BREAK EVEN POINT

Let "Break Even Point" = X

X =[$1.6 (250K)]/ $2.7

=148,148 insertions

CHECKING:

SAVINGS if actual replated pin life is also 250K

= $2.7- $1.6

=$1.1 per pin

NEW PIN COST PER INSERTION

= $2.7 / 250K insertions

= $0.0000108 / insertions

NUMBER OF GAINED INSERTIONS

= Replated Pin Life – Break even point

=68, 152 insertions

ACTUAL SAVINGS PER PIN

= Number of gained insertions X Cost per Insertions

=68,187 insertions X $0.0000108/ insertions

=$0.74 per pin

250K insertions- Break Even Point (148,148) = 101,852 insertions

101,852 X $0.0000108

=$1.1 per pin

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Cost Analysis

POTENTIAL SAVINGS (AMU BASED)

For Pin Model 122069 Alone,

Given Data:

New Pin Cost	$2.7
Replated Pin Cost	$1.6
Actual Savings	$0.74/ Pin

AVERAGE MOTHLY USAGE = 1913.1667 pcs (For Building 2 Only)

Potential Savings is Savings per pin X AMU X 60% Recovery Rate X 12

$10, 193 per Year for Model 122069 only

Note: We have more than 40 models of S-Pin; 3 models are Highly Consumable (> 1K AMU), 11 Models with Average AMU (>100 AMU) and 26 Low Consumption Models (<100 AMU)

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Cost Analysis

POTENTIAL SAVINGS (Direct Savings)

More than 3,000 pins are ready to be replated

10,000 pins are for segregation and replating

Approximate recovery rate is 50-60%

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Conclusion and Recommendation

- Replated S- pins has a courser contact surface compared to the brand new pins. Theoretically, this is the reason why replated pins has a better contact resistance, it has a better scrub to the device pad compared to smoother surfaces.
- Replated pins has the same elemental concentration and composition with that of new pins.
- Replated S pins has a better contact resistance compared to the brand new pins.
- Replated pins has an evaluated lifespan of 216.3K insertions
- Cost saving per pin is computed as $ 0.74 USD
- Potential savings for model 122069 alone is $10,193 per year
- **S Pin Replating is recommended for mass production**
- **Implement to other Contact Element**