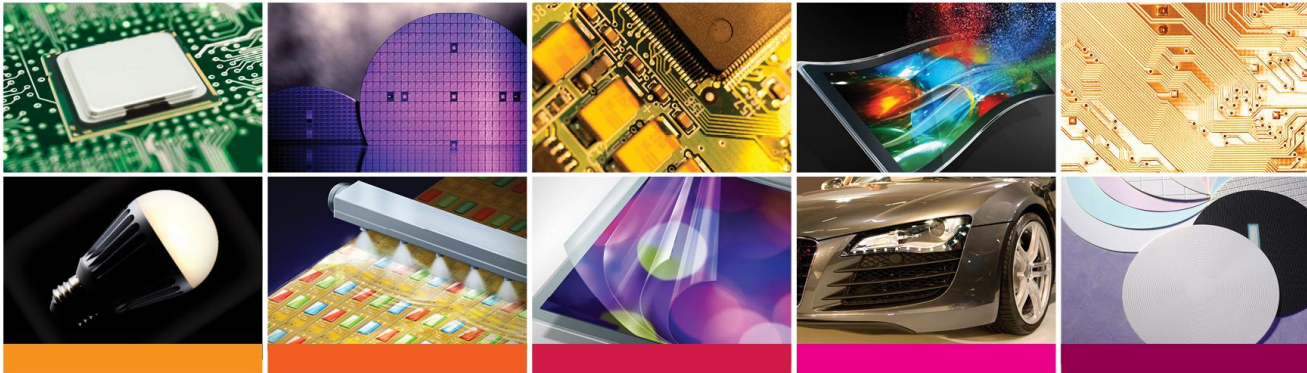




Electronic Materials



ELECTROPOSIT™ 1500 Acid Copper **For High Layer Count Through Hole Plating**

Interconnect Technologies
Dow Electronic Materials

ELECTROPOSIT™ 1500 Acid Copper Key Benefit for High Layer Count

- Able to plate Through Hole and Via Hole**
- Can be conducted with higher current density to accelerate production**
- Perform exceptional throwing power, surface distribution, and leveling**
- Compatible on hoist type and VCP type equipment**
- Excellent thermal resistance**
- Easily analyzed and controlled by conventional CVS**



ELECTROPOSIT™ 1500 Introduction Outline

1. Market Trend of Thick Panel

2. EP1500 Operating Parameter

3. Performance Result

- at Hoist type equipment with air agitation (AR<16, BT<5mmt)**
- at Hoist type equipment with spray eductor (AR<17, BT<6mmt)**
- at VCP equipment (AR<14, BT 2-3mmt)**

4. Reliability performance

5. Maintenance/ Consumption

6. Summary



Market Trend of Thick Panel

EP1500
Target

Trend 1 : Traditional back panel

- 3-5 mm with aspect ratio 8:1 to 10:1 holes

Trend 2 : High end thick board

- 8-10 mm thick board with up to 16:1 holes
- Mixing design: High aspect hole with HDI design

EP1500
Target

Trend 3 : New comers

- 2-6 mm with high aspect ratio 10:1 – 16:1 holes



Operating Parameter

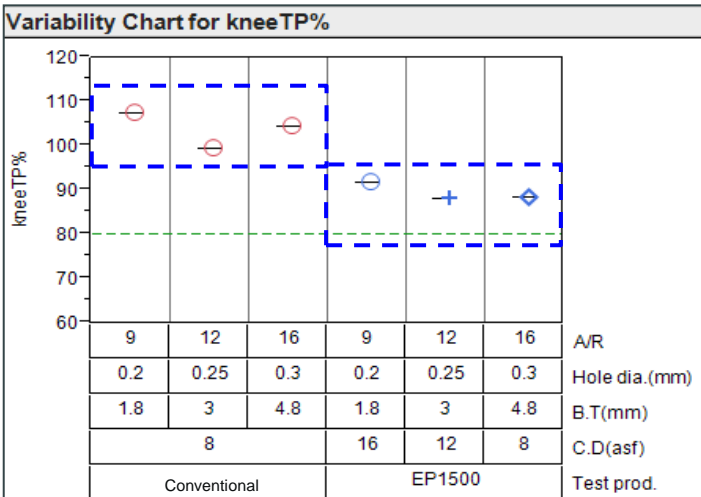
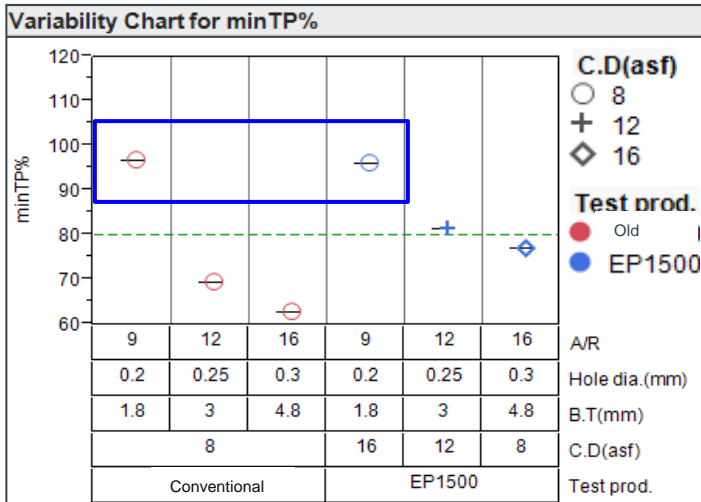
Component	Items	Operation conc.	Range
Inorganic component	CuSO ₄ (g/L)	75	55~85
	H ₂ SO ₄ (g/L)	200	190~230
	Cl(ppm)	55	45~65
Organic component	EP1500 Brightener (ml/L)	1.0	0.4~2.0
	EP1500 Carrier (ml/L)	12.5	10.0~15.0
	EP1500 Leveler (ml/L)	1.5	1.0~2.0




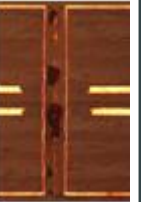
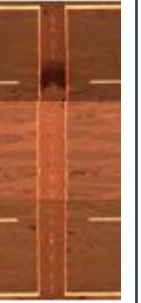



Apply at Hoist Type Equipment with Air Agitation

TH TP% Performance

- EP1500 can be operated with relatively high CD compare with conventional product.
- EP1500 can achieve 20-30% TP% improvement compare with conventional product.

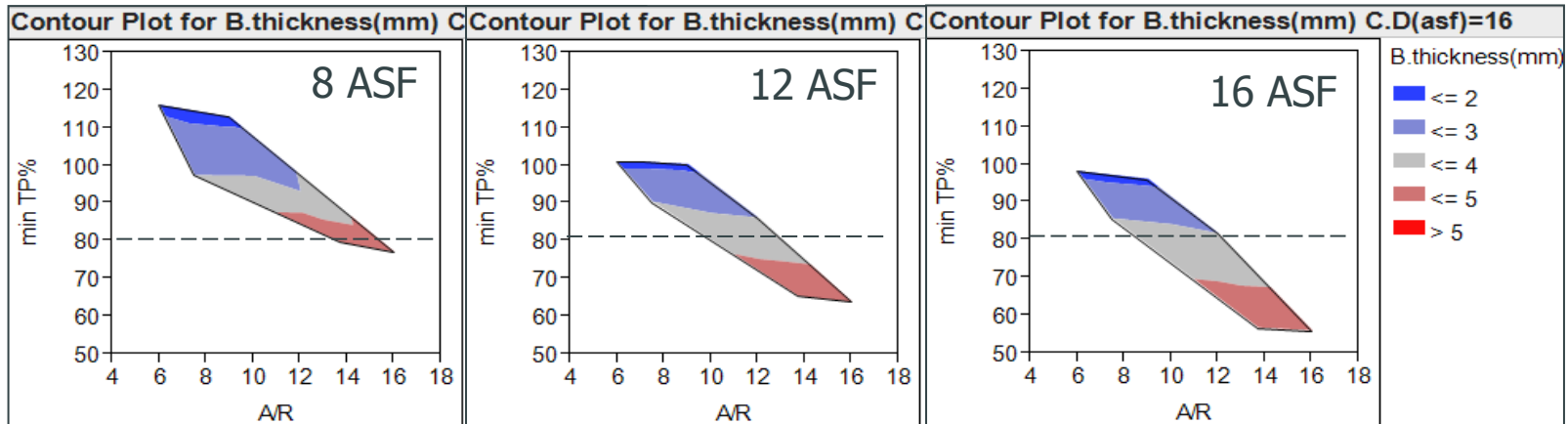
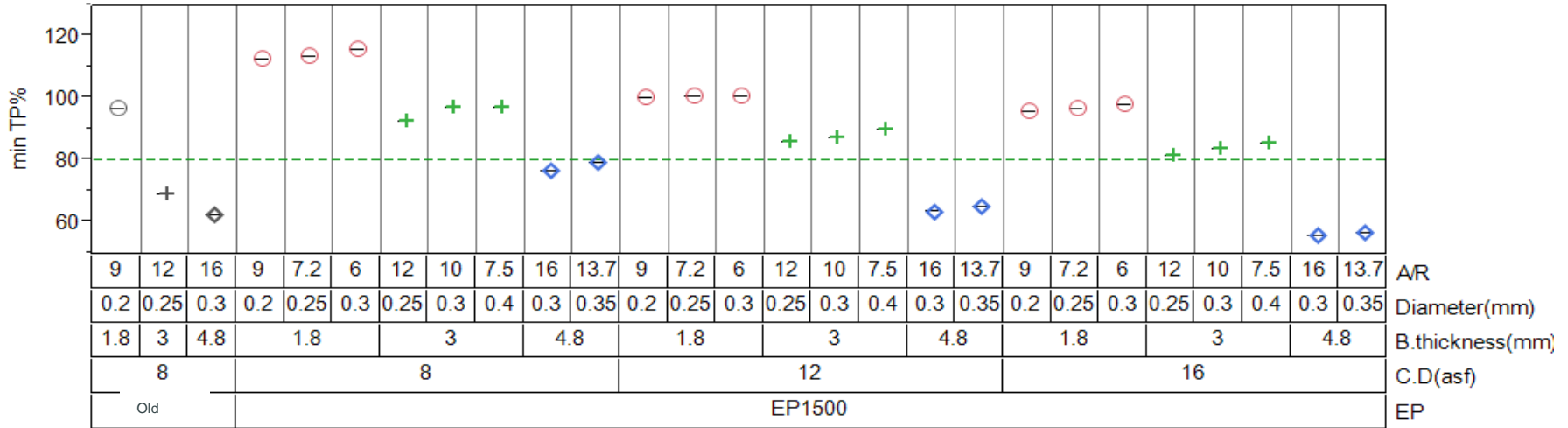


		Conventional			EP1500		
C.D		8ASF			16ASF	12ASF	8ASF
Thk		1.8mm	3.0mm	4.8mm	1.8mm	3.0mm	4.8mm
Dia		0.2mm	0.25mm	0.3mm	0.2mm	0.25mm	0.3mm
AR		9	12	16	9	12	16
Cross-section							

Apply at Hoist Type Equipment with Air Agitation

TH TP% Performance

Variability Chart for min TP%



Lower CD \approx 8ASF:
can achieve TP% $>$ 80 for
<5mmt BT, AR \leq 15 board

Mid CD \approx 12 ASF:
can achieve TP% $>$ 80 for
<4mmt BT, AR \leq 13 board

High CD \approx 16 ASF:
can achieve TP% $>$ 80 for
<3mmt BT, AR \leq 12 board



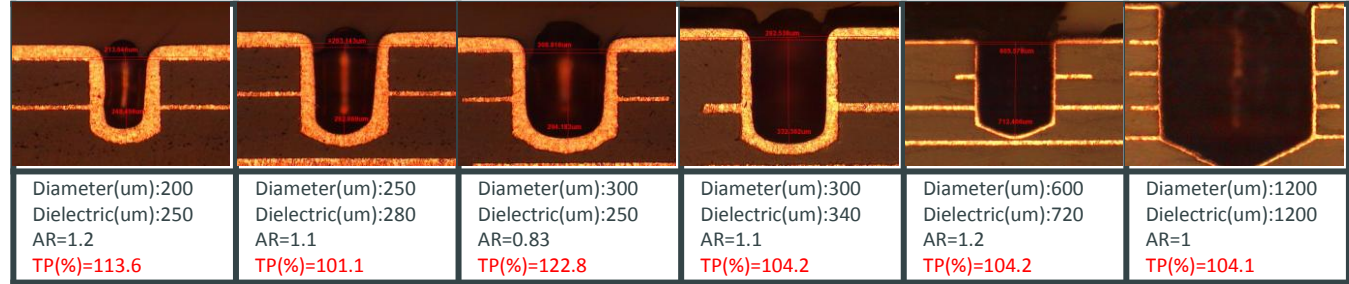
Apply at Hoist Type Equipment with Air Agitation

TP% of Drilled BV

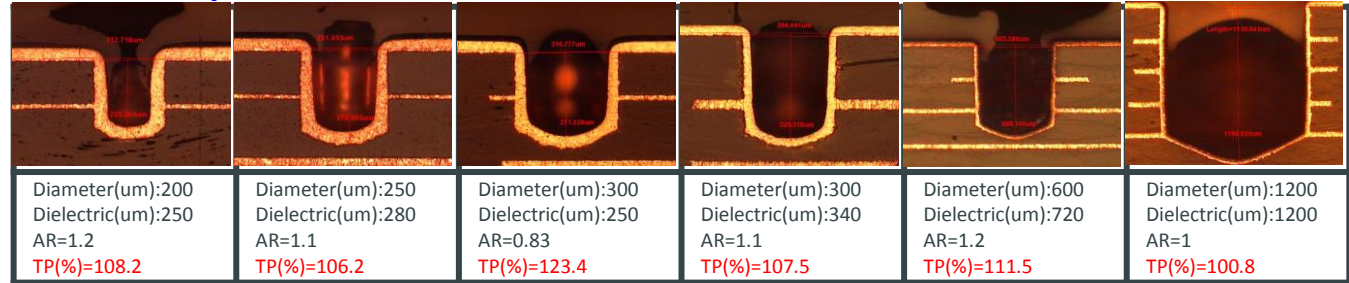
• Test conditions:

Chemicals Parameter	Control
CuSO4.5H2O (g/Lt)	120
H2SO4 (g/Lt)	200
Cl ⁻ (mg/Lt)	55
EP 1500 Brightener	1.0
EP 1500 Carrier	12.5
EP 1500 Leveler	2
Temperature (°C)	23
Cathode C/D (ASF)	10/15
Plating times(min)	80

Flash seed layer

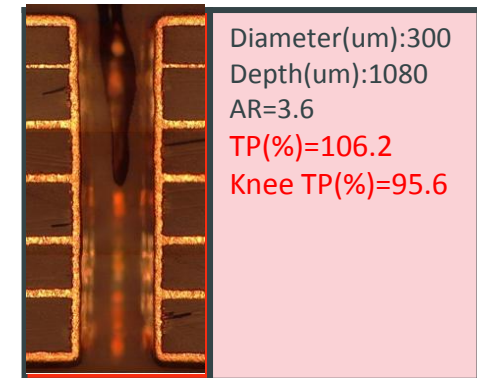
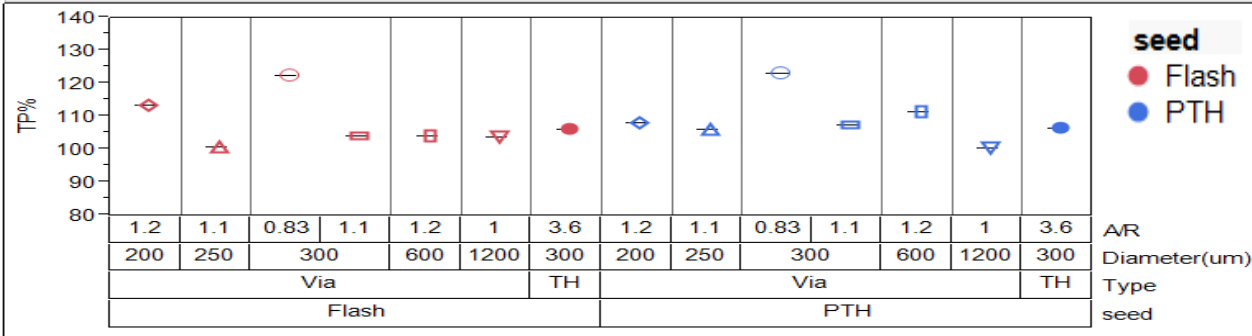


PTH seed layer



➤ TP of mechanical drilled via:

Variability Chart for TP%



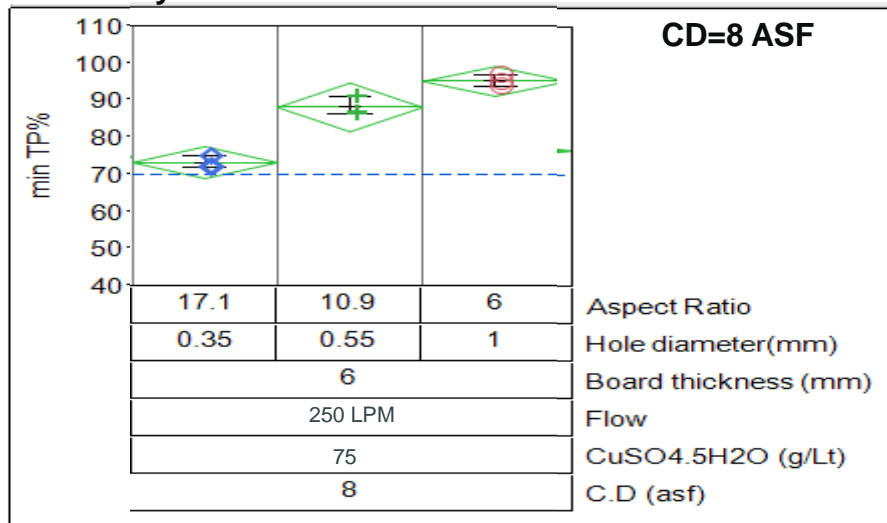
Apply at Hoist Type Equipment with Spray Eductor

■ Able to conduct Higher Layer Thick Board

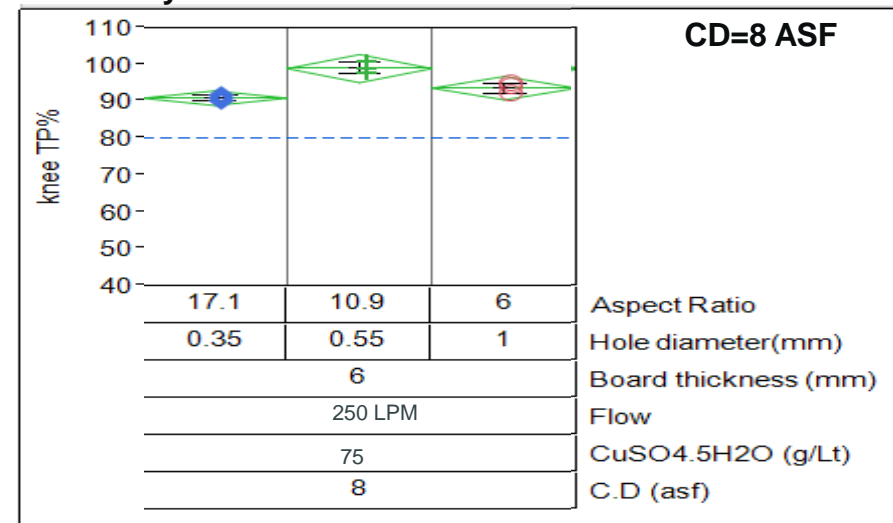
Suggest to apply with lower CD & Eductor design

Current Density	<8ASF
Swaying Distance	75mm / Direction
Swaying Speed	0 & 1.5 m/min
Flow Type	Eductor (Max. 500LPM)
Spraying Display	12 Nozzles

Variability Chart for min TP%



Variability Chart for Knee TP%



Applied on Hoist Type Equipment with Eductors

TP% Cross Section Check

Board Thickness= 6.0mm

CD=8 ASF

	Φ 0.35mm, A/R=17.1	Φ 0.55mm, A/R=10.9	Φ 1.0mm, A/R=6.0
TP	75%	90%	95%
Photos of OM			

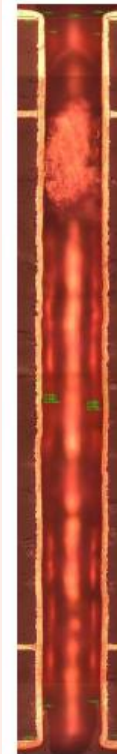
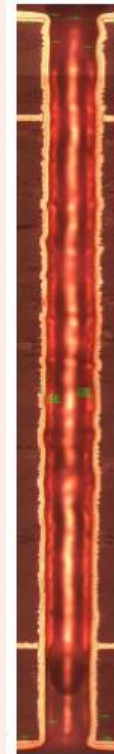
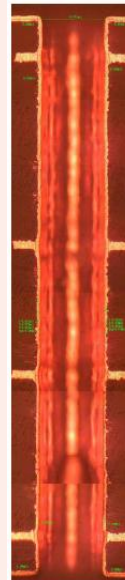
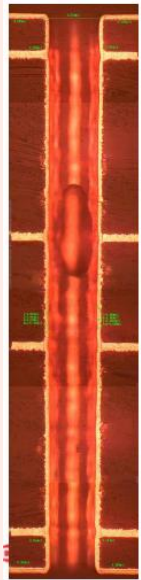


Apply at VCP Line

TH TP% Performance

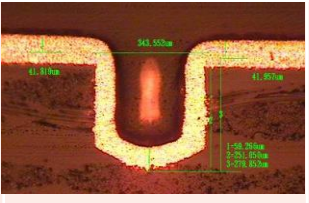
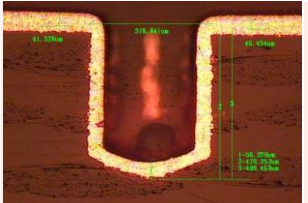
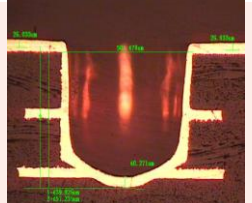
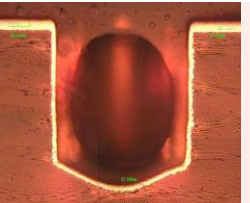

Panel THK (mm)	2.0	2.0	3.5	3.5
Diameter (mil)	8	10	10	12
CD (ASF)	19	19	12	12
AR	9.7	7.8	13.8	11.6
Surface (mil)	0.55	0.56	1.12	1.17
TP%	90.9%	94.1%	87.3%	86.7%

Cross Section



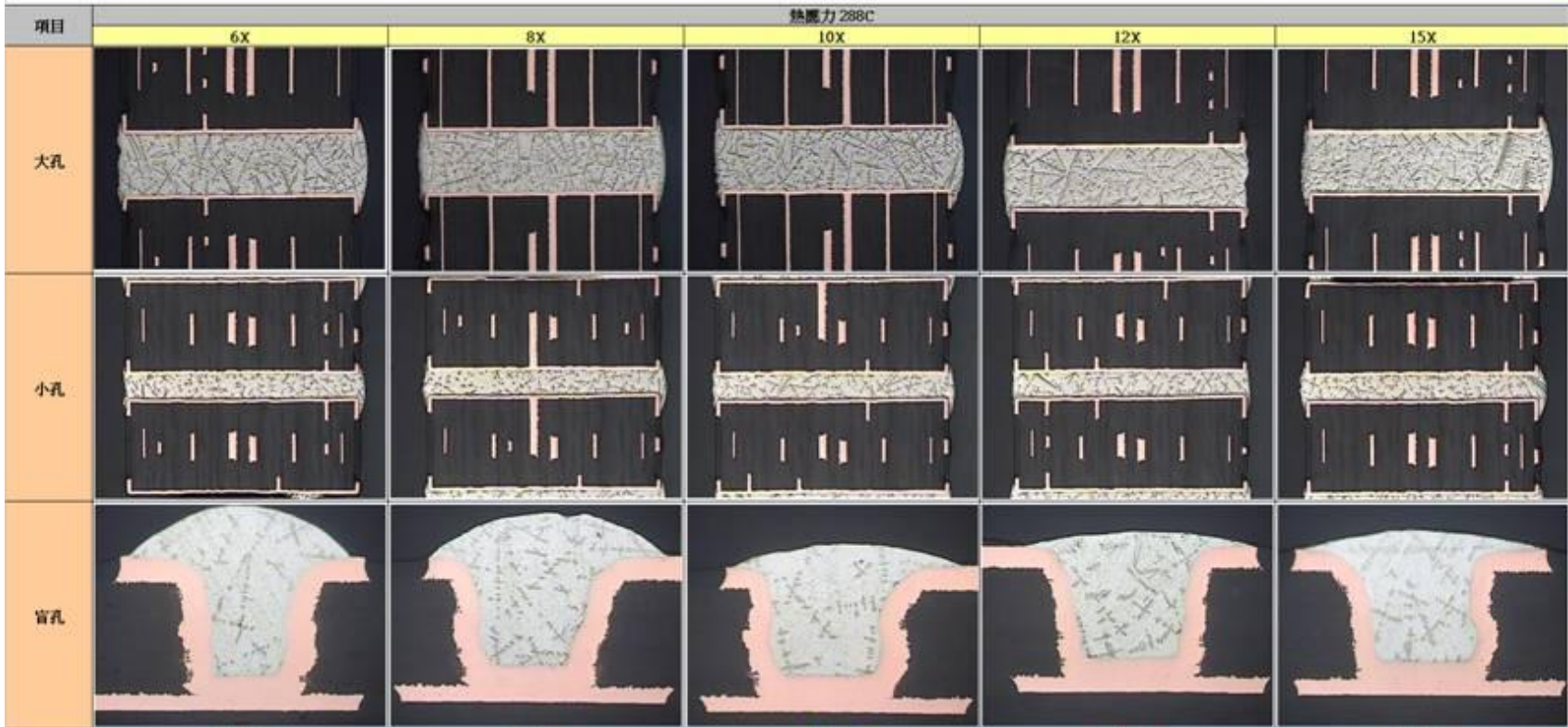
Apply at VCP Line

BV TP% Performance (2/2)

	BV 350 um	BV 400 um	BV 500 um	BV 900 um	BV 900 um
Panel THK	1.6 mmt	1.6 mmt	1.2 mmt	1.6 mmt	1.6 mmt
Via Depth	11.02 mil	19.31 mil	457.47 um	821.73 um	1162.34 um
Surface THK	41.83 um	40.43 um	26.03 um	38.62 um	38.81 um
AR	0.82	1.29	0.91	0.91	1.30
TP%	141.7 %	136 %	154.7 %	104.9 %	107.5 %
Cross Section					

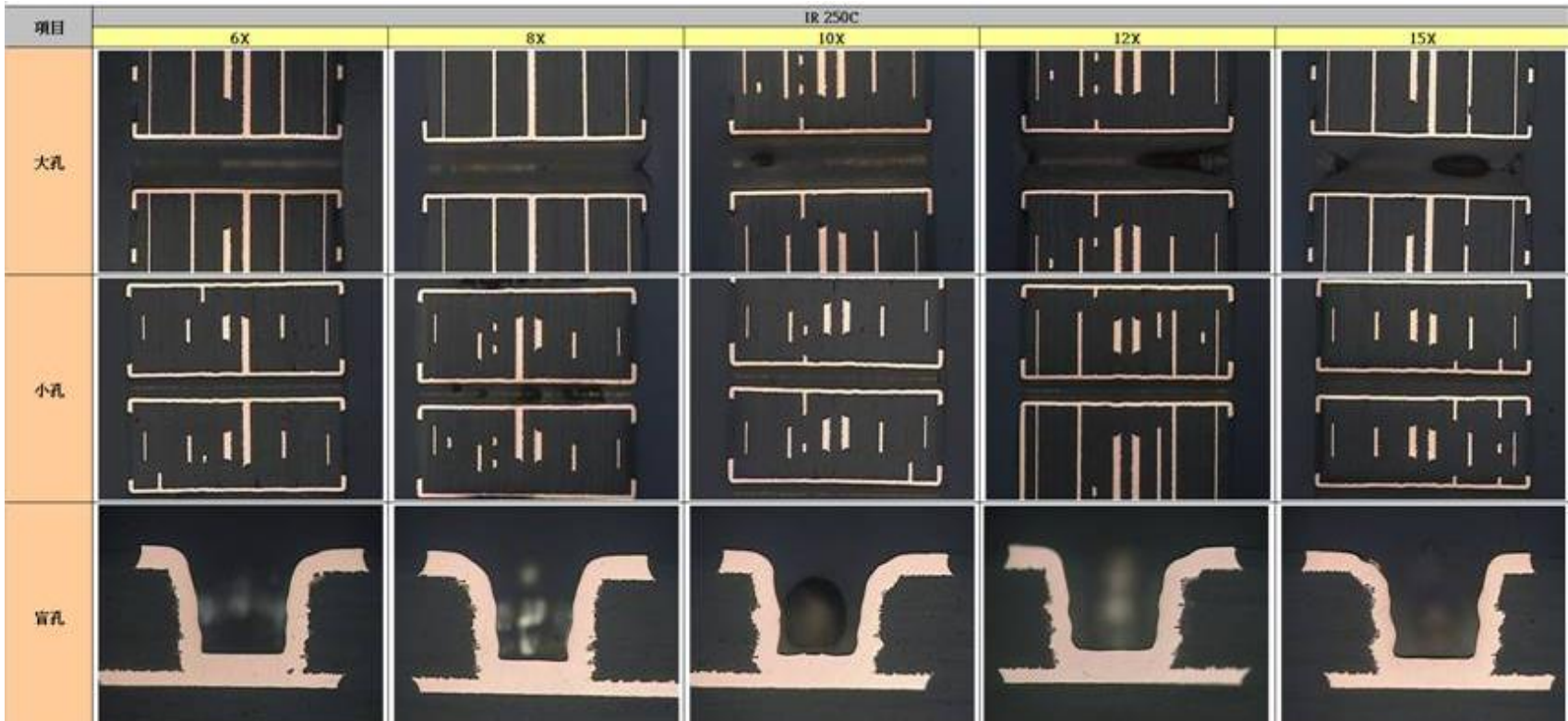


Pass reliability test- Thermal Stress



Thermal Stress 288 °C
6, 8, 10, 12, 15 cycles

Pass reliability test- IR Reflow



IR re-flow 250°C
6, 8, 10, 12, 15 cycles

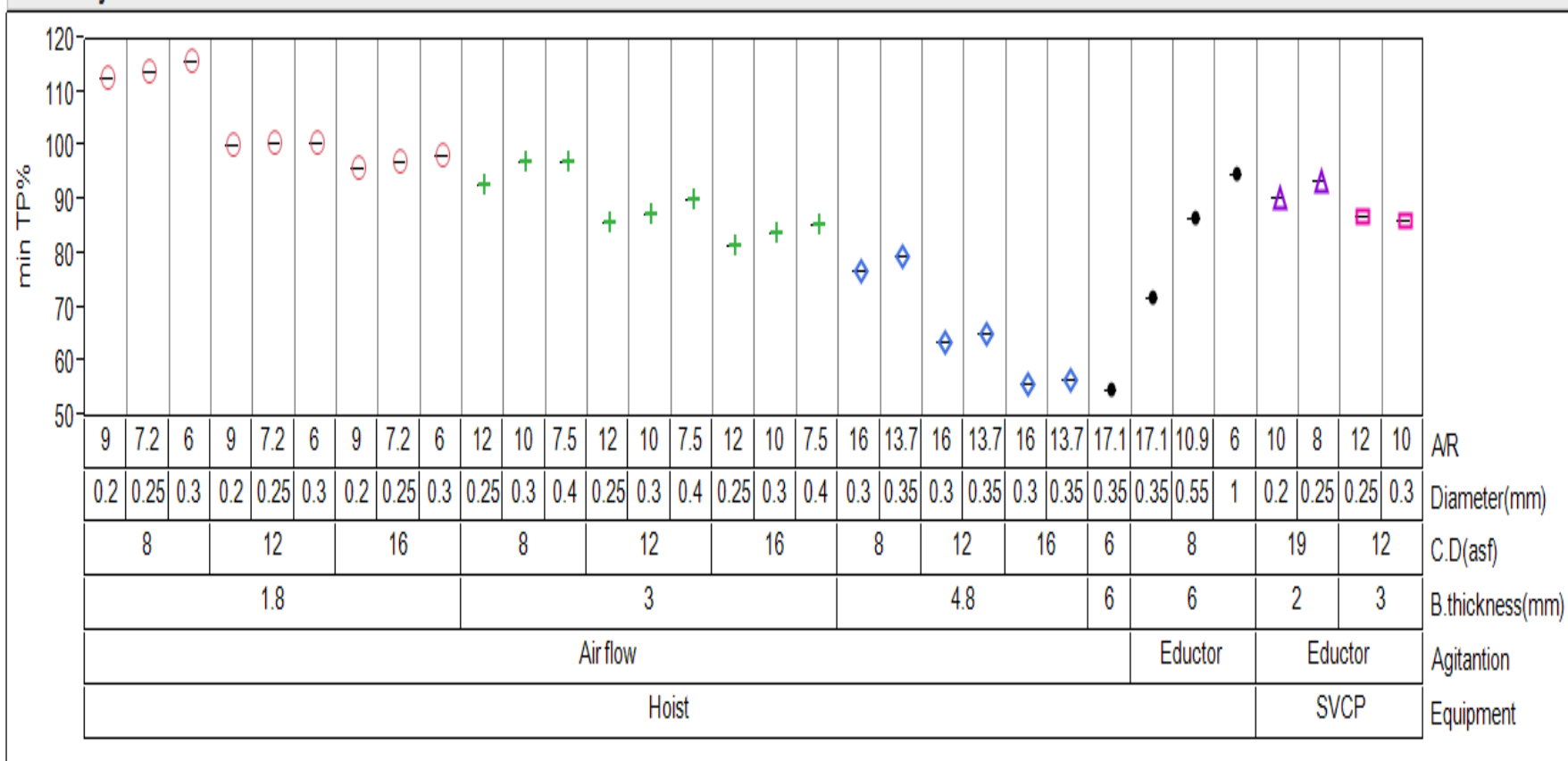
Maintenance Method and Consumption

Item	Content
New make-up	<ol style="list-style-type: none">1. Inorganic dummy 2hrs(cycles) by 5ASF.2. After add organic agent, dummy 4hrs(cycles) by 10ASF.
Re-start	<ol style="list-style-type: none">1. Within 24 hrs without producing, dummy 2hrs(cycles) by 10ASF2. Over 24hrs without producing, dummy 4hrs(cycles) by 10ASF
AC treatment	Conduct monthly, 3g/L to polish
Bath life	~ one year ~ 1,000AH/Lt
Consumption	ELECTROPOSIT™ 1500 Brightener Solution≈ 5,000 AmpHr/L ELECTROPOSIT 1500 Carrier Solution≈15,000 AmpHr/L ELECTROPOSIT 1500 Leveler Solution≈ 28,000 AmpHr/L



ELECTROPOSIT™ 1500 Acid Copper Performance Summary (1/2)

Variability Chart for min TP%



ELECTROPOSIT™ 1500 Acid Copper Performance Summary (2/2)

✓ **Hoist Type Equipment with Air Agitation**

■ Achieve TH TP% > 80% on the condition of:

- CD ≈ 8ASF, BT < 5mmt, AR ≤ 16
- CD ≈ 12ASF, BT < 4mmt, AR ≤ 13
- CD ≈ 16ASF, BT < 3mmt, AR ≤ 12

■ Good performance on mechanical drilled hole (BV&TH TP > 90%).

✓ **Hoist Type Equipment with Spray Eductor**

■ For Higher Layer Count application (BT = 6mmt, AR = 17), suggest to conduct with eductor and lower current density (< 8 ASF), TP% can hit 75%.

✓ **VCP Type Equipment**

■ Can achieve high production efficiency (CD = 19ASF)

■ TH TP% > 85% on BT 3.5mmt @ AR = 14

■ BV TP% > 170% on BT 2mmt @ AR < 1

Passed Thermal Stress (288 °C, 15 Cycles) and IR-reflow (250 °C, 15 Cycles) reliability test.





**Thank
You**

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