



## **VFS Applications and Brief Spec.**

- The world leader of De-Void Solution for process improvement and cost reduction
- Global sales performance of Semiconductor, PCB, MEMS and Optoelectronics
- Mass production de-void experiment of DAF, DAP, UF, FOW, NCP, NCF...etc.
- APT unique non-coupling design can guaranty longer motor life time
- Broaden process window and strengthen reliability through assistance of void free solution
- SECS/GEM interface for integration with factory production monitoring and logging systems





Power	220V/380V 3P 50/60 Hz
Temperature Range	RT~200C Max. 200°C
Temp. Uniformity	$\pm$ 3°C @ 5 ~ 8 kg/cm <sup>2</sup> (without loading)
Temp. Controller	PID Auto temp. controller. + SCR
Pressure	Max. 8 kg/cm <sup>2</sup>
Pressure Uniformity	±0.1kg/cm²
Operation Interface	PLC+PC Base
Recorder	Digital Recorder
Software Support	SECS/GEM or PLC Link
Chamber Certification	Taiwan / China / USA / Japan / Korea / EU
quipment Certification	Semi-S2 / CE / UL
Cofety Design	Multiple protective sensors for pressure &
Safety Design	temperature
PM & Calibration	Temperature / Pressure Reading Ports

Best machine



### **Application examples**

### **1D Package**

Void would ruin product reliability and performance in advanced package. *APT* is capable to offer our experience to enlarges process window, strengthens reliability and enhances production yield through void free solution.



#### **Case1: Memory Card (Flash)**

Brand	Туре	Thickness (um)	D/A condition	Curing Condition
Nitto	EM310-25	25	Temp.: 120°C, Force: 10N, Time: 0.3S	A

Before

After



#### **Case2: BGA (Flash)**

Brand	Туре	Thickness (um)	D/A condition	Curing Condition
Hitachi	FH-900	25	Temp.: 150°C, Force: 10N, Time: 0.3S	A

Before

After



#### Case3: wBGA (DRAM)





NBGAStudy Case Study Advantages for Void Free Oven Implementation

#### 1. Cost Saving

Current	Recommended	Down %
70um stencil	60um stencil	
55um paste	45um paste	18%

#### 2. Performance

Current	Recommended	Enhance %
D/B f: 35N; D/B t: 0.5S	D/B f: 35N; D/B t: 0.1S	24.2%

#### **Enable to enhance DB UPH**

Hitachi CM-700	Package Code	Gross die No.	WT Yield (%)	SBT Aot	chip /SBT	Chip C/T (sec)	Change Wafer (sec)	Average Change	Load & unload (sec/lot)	Total C/T sec/chip	UPH Øxhip/ha)	Daily Capacity 20.2 Hrs	Monthly Capacity
512M	*8	1206	80%	60	90	1.955	64	0.053	120	2.050	1.756	35.5	1065
R 512M	28	1206	80%	60	90	1.555	64	0.053	120	1.650	2.181	44.1	1323

#### 3. Value Added

More reliable quality & More wider process window

- no void/delamination



### **Application examples**

### **3D** Package

Void would ruin product reliability and performance in advanced package. *APT* is capable to offer our experience to enlarges process window, strengthens reliability and enhances production yield through void free solution.









## **Via Filled**



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## Wafer Level



### **Features of APT VFS Design**

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## **7** Unique Design

Unique Design	Features				
1. No Coupling Motor	- No need to maintain - High reliability				
2. Valve for Outgas	- To prevent unstable pressure issue which could cause low yield				
3. O <sub>2</sub> ppm Control Module	- Oxidation Prevention - Yield Improvement				
4. De- Outgas Module	<ul> <li>Yield improvement by reducing device and chamber contamination</li> <li>To minimize maintenance difficulty</li> </ul>				
5. Temperature Ramp UP Module	- Wider Process window - Throughput improvement				
6. Termperature Cool Down Module	<ul> <li>Cost saving</li> <li>Throughput improvement</li> </ul>				
7. Most Safe Design	<ul> <li>Experienced various national regulations include ASME, JIS, GP, KOSHA, CNS</li> <li>Minimize thermal stress to vessel</li> </ul>				
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## **1. No Coupling Motor**

#### **Unique Design**

#### **No Coupling Motor**

#### Feature

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no need to maintain



#### **Description:**

Coupling is a very critical strength of the such this high pressure oven. It's key function to couple the fan motor to the chamber and at the same time to achieve highest quality and reliable pressure environment in the chamber. The common design that used air or water cooling coupling, is un-reliable and require high maintenance. The differences in environment between the inner and outer chamber (high versus normal temperature/pressure), will result in high wear and tear of the coupling. The expected life-span is only 3-12 months. When coupling is damaged or de-graded, it causes air & water leakage. Normally, replacement and re-calibration of such coupling takes one or more days to complete.

#### **APT Unique Design:**

APT has been solved this potential problem without coupling design for 8 years.

## 3. O2 ppm Control

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Regarding to oxidation prevention, the features of APT special O2 ppm control function offers

- monitor O2 ppm
- control O2 ppm
- lowest N2 consumption
- any level of O2 ppm

during curing process and protect user's right of



## 3. O2 ppm Control

N2 usage volume :

of people of the second secon

✓ N2 usage price per year :

APT special O2 control function can prevent oxidation issue happened

with lower N2 usage during curing process.

**Lowest N2 Consumption** 



## 4. De-Outgas Modules

✓ w/o de-outgas module:



APT de-outgas module:
 Font Dor
 Font Filter
 Font Filter
 Filter
 Filter
 Filter

**De-Outgas** 

Module

**APT unique de-outgas module has :** 

- a. Minimize chamber maintain frequency
- b. Yield enhances by reducing device contamination issue
- c. A smart design to collect the condensed outgas
- d. Saving the filter cost

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**APT Patent Design** 

### **5&6. Temperature Controllability**

APT provides wide range T. control with optional module adoption





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#### **Engineering comment: better reliability**

Stress occurs while product is cooling. APT's innovation can keep the pressure while cooling is proceeding and release pressure until room temperature. Such process keep product and equipment in better stress release situation.



### 7. Advantages for new Safety Design

#### Air Cooling advantages:

#### (Cont')

1.Save the cost of process cooling water (Case study by city water cost) ex: 10L/m, 40 mins cooling time need 400L per cycle 5 cycles per day, it means 2000L Water Water cost in Taiwan is 100 USD per Chamber/Month

2.No risk of chamber body damage According to physics, Stainless will be ageing if cooling by water. In long term usage, with Hot/Cold interchange cycle, the welding line is easy to get weak and brittle, then, become water leakage while the curing is running.

**3.Higher cooling speed with safer/faster design: No Hot/Cold interchange cycle** 



## **Ex: Water Cooling Chamber leakage**







# ~Thank you for your attention~

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