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spotlights

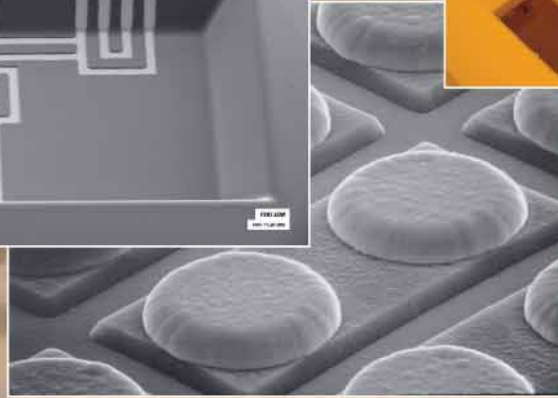
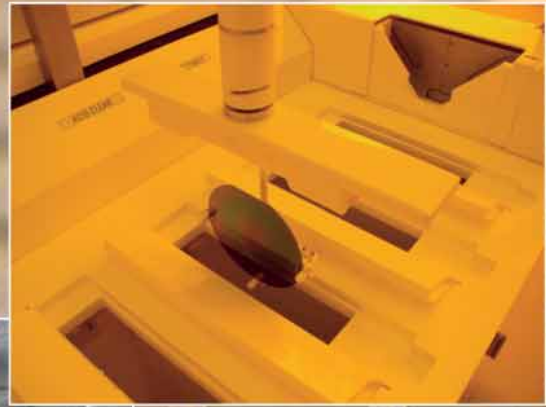
***Multi-Chip Assembly -
Two Systems In One
For 60 % More Output***

***Laurier M9 Is The Equipment Of Choice
At Finland's Biggest
Contract Research Center***

***Meco's Additive Copper Process
Is Taking Off On The FAP 650***



Volume 06 / Number 3



Meco wafer technology & tools

The enabling system solution for wafer level packaging

Meco EDRC

Electro-deposition of conformal and uniform resist coating on 3D wafer topographies (e.g. MEMS).

Meco UBM

Chemical deposition of nickel and gold bumps on aluminum bond pads for Flip Chip and WLP applications.

Meco WEP

Electro-plating of various metals on wafers for advanced packaging applications.



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Two Systems In One Increase Productivity Of Multi-Chip Assembly - Parallel Dispensing And Bonding Systems Produce Up To 60% More Throughput



by Manfred Glantschnig,
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Datacon Technology GmbH

An increasing variety of functions and a short time-to-market for innovative products are today's challenges for equipment in the semiconductor industry. Despite their increasing functional scope, modern electronic devices are becoming smaller and smaller, reaching the market in ever-shorter product cycles, and are subject to strong cost pressure.

Future-proof through evolution

This diverse requirement spectrum served as a model for the further development of the 2200 apm+ Multi-Chip Die Bonder into the 2200 evo: What for Datacon is the logical evolution of its platform concept can signify a revolution for the user. To begin with, all established features of the platform were retained: the modular machine concept, high precision of $\pm 10 \mu\text{m}$ @ 3 sigma, small footprint, and an availability of more than 98%. The 2200 evo handles just as smoothly as all machines in the 2200 series.

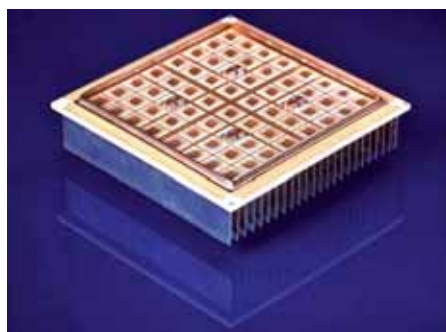
The real milestone is the use of a separate dispense system, which works in parallel with the standard bonder/dispense system for direct die assembly and flip chip, thus considerably increasing the throughput.



Datacon 2200 evo

Together with the unique platform concept, this additional axis can not only serve as a dispensing or stamping system, but also do epoxy inspection without scarfing bonding speed. The customisation possibilities of the 2200 evo offer a variety of other options to make use of additional axis such as flux spraying for flip chip packages or placing adhesive tapes which becomes more popular in the area of flash memory packaging and generally stacked dies.

At the same time all axes have become more dynamic, a fast CMOS camera saves valuable milliseconds, and the wafer cartridges based on the SEMI-standard also fit into the compact housing with its less than 1.5m²



Example of an SIP package.

footprint. Furthermore, a throughput of up to 7,000 UPH and a yield of more than 99.95% ensures the lowest total cost of ownership.

New bond head and dispense system

The bond head has also been improved for the 2200 evo. A force range of 50 g to 10,000 g is available. To cover this range, air bearings are used for this system. Also a closed loop system allows to monitor the force applied during bonding for quality control and also to overcome bond force instability due to the well-known substrate warpage problems.

Even a heated version of the bond head is available for the 2200 evo. 350 °C can be applied to the tip. The temperature is thereby controlled via the machine software. Together with the tool changer this can be a very flexible bonding system using heated and cold tools in one process cycle.

Because it is anticipated that the proportion of flip-chip-assembled ICs in SiPs will rise sharply in the next few years, future-proof multi-chip die bonders such as the 2200 evo can handle both assembly types: direct as-

sembly and flip chip with the associated dipping station. The adhesives used come either from a dispenser directly on the bonding system or from the separate, retrofitable dispense system with the same drive technology as the bond head and its own camera. The system applies a 2 mm x 2 mm cross-pattern in just 0.5 seconds. It is fitted with a tactile sensor for the substrate height to detect fluctuations in the substrate thickness and to compensate for them through calibration of the dosing needle.

This precise setting is especially important for the assembly of small dies and for controlling the BLT via the volume of material used. Because the fill layers often form part of the dielectric of adjusted lines, filter components and antennae, exact adherence to their thickness has a significant impact on the high-frequency characteristics of SiP components. Because this kind of data can also be crucial for the subsequent component fitting, it is passed on internally to the pick-and-place module.

One machine's MCM capability

It is clear from the requirements catalog that SiPs, MCMs, stacked dies, and hybrids can require a larger range of components, which should preferably be applied in a single pass: Bare dies and ICs in a package, passive and active components, filters and transformation networks, as well as mechanical parts, MEMS and antennae structures. With the 2200 evo, the wafer magazine therefore holds up to 25

wafers, which can be fed with SEMI-compliant 12" wafer handling, the ejection carousel holds 5 ejectors for die sizes of 0.17 mm through 50 mm, and the automatic tool changer can access 14 tool positions for pick and place. Added to this are different epoxy applications either from the combined bonding/dispense system or from the separate dispensing station.

Assembling electronic and mechanical parts in a single pass

The example of the camera module VisionPak® from Amkor, which is often used in cellphone cameras, aims to show that the 2200 evo platform can also take on the work of assembly robots. For this purpose a CMOS image sensor must be placed on the substrate, the IR filter must be inserted, and a lens holder must be attached. Special requirements here include high positioning precision, a clean-room environment for the assembly, and a high throughput.

Thanks to the 2200 evo's $\pm 10 \mu\text{m}$ specification, the required positioning precision is easy to implement. The clean-room conditions are satisfied by a clean-kit option, which enables production in a clean-room class 100 environment (particle size below $5 \mu\text{m}$). Finally, an optimized camera system on the bond-head ensures – together with the high possible bond forces – that the 2200 evo as a complete assembly platform for the camera module also delivers high throughput of these in-demand products.



View on the integrated dispense axis and dispenser unit for parallel dispensing and pick&place in combination with the main axis (not shown here).

Building large production lines on a modular basis

Lastly, for very large production quantities the modularity of the Datacon platform can be used to beneficial effect by simply setting up several 2200 evo Multi-Chip Die Bonders consecutively, possibly supplemented with parallel-operating dispense systems and inter-linked via a transport system. With the small footprint of 116 cm x 122 cm, even extended production lines for high-volume manufacture thus take up only a little valuable floor space.

Conclusion

Thanks to the open platform architecture in hardware and software, and the modularity and versatility of the 2200 evo, customized assembly lines for single-pass multi-chip applications can be built, which require minimal floor space, can be easily operated via a user-friendly user interface, and deliver high-quality products cost-effectively.



Automatic 7-slot tool changer (expandable to 14 slots)

Datacon Delivers Laurier M9 Ultra High Accuracy Flip Chip Die Bonder To VTT Technical Research Center Of Finland

Datacon Technology GmbH has delivered a Laurier M9 ultra-high precision flip-chip die bonder to Finland's leading independent research organization VTT. According to VTT, the Laurier M9 flip-chip die bonder will be used in a broad range of development projects in the realm of opto-electronic, RF and MEMS applications. VTT Technical Research Center of Finland is the biggest contract research organization in Northern Europe to provide high-end technology solutions and innovation services.

Against intense big-name competition, VTT decided to select the Laurier flip-chip platform because of its highly flexible solution for ultra-high precision flip-chip die bonding processes. In the most basic system configuration, the Laurier M9 flip-chip die bonder performs cold compression, thermo-compression, adhesive



Laurier M9

cure and solder reflow – all without the need for hardware changes. VTT will acquire the M9 system including an optional ultrasonic bond head. The precision flip-chip bonder is used to bond photonic devices (VCSEL, edge emitting laser, photodetector), RF devices and MEMS devices on various substrates, such as, low temperature co-fired ceramics and polymer as well as silicon substrates.

The M9 flip-chip die bonder offers a highly flexible, semi-automatic bonding process at an extraordinary small footprint. Its placement accuracy reaches down to ± 0.5 micron, while at the same time providing bonding forces up to 50 kg (M9A), or 200 kg (M9G). The M9 system reliably performs at temperatures up to 500 °C. Upper and lower heads and chucks are heatable with ramping and cool-down feasible. Among the advanced features are closed-loop feedback temperature and force maintenance routines.

The M9 bonder has a split-optics system which permits auto-vision and pattern recognition. The system provides automatic alignment. It is compatible with Windows XP. Its main applications are in semiconductor and optical component assembly processes, including focal plane arrays, LCD displays, BGA (FCIP), die-to-wafer, FPA, VCSEL, MEMS, 3D Stacking, etc.

Datacon is the European distributor for Laurier systems. Both Datacon Technology GmbH, based in Radfeld, Austria, and Laurier Inc., of Londonderry, New Hampshire (U.S.), are part of BE Semiconductor Industries N.V., the world's leading supplier of advanced packaging equipment.

About VTT:

VTT Technical Research Center of Finland was established in 1942. With a highly educated staff of more than 2,700, VTT provides research and development services to companies and research organizations all around the world. Among VTT's ongoing activities is the SmartPack international cooperative project, which is targeted at new versatile applications for smart systems. Through its broad knowledge base of world-class technologies and applied research and by relying on its international scientific network, VTT upgrades its customers' competitive positions, creates new business intelligence and adds value to their technology portfolios. www.vtt.fi

Datacon And EV Group Extend Cooperation On Advanced-Chip-To-Wafer Technology (AC2W) And Installed EVG540C2W System

Datacon Technology GmbH and EV Group, a leading supplier of wafer-bonding and lithography equipment for the advanced packaging, MEMS and semiconductor markets, announces the installation of an EVG540C2W System at Datacon. During the long-term cooperation and development agreement in the field of

advanced-chip-to-wafer (AC2W) technology, Datacon extends their Application Lab with EVG equipment.

The unique AC2W technology combines Datacon's leading expertise in flip chip-bonding and key bonding technologies with the unique wafer-level know-how from EV Group. Founded in 1980, EV Group is a global supplier of wafer bonders, lithography tools, thin wafer-, temporary bonding- and debonding-equipment, cleaners and inspection systems for semiconductor, MEMS and emerging nanotechnology markets. EV Group holds the dominant share of the market for wafer bonding equipment and is a leader in lithography



Meco's Additive Copper Process Is Taking Off: The First Meco FAP Systems Are Being Installed At Customer Site

Meco's new development, Flex Antenna Plating (FAP) changes the market for low cost RFID antenna making rapidly. Recent customer investments in the FAP system show that more and more RFID in- and outsiders selected the additive copper process as the best way towards high volume, low cost antenna production.

Web width upgrade

To improve output even more Meco upgraded its FAP line to a web width from 430 mm (17") to 650 mm which increases the throughput by 50 %. Both web widths can be offered, the choice is yours.

System scalability, high output

Meco offers the modular FAP line configurations with 4, 8, 12 or even 16 plating drums. The 4 drum FAP configuration can reach a throughput of 35,000 UPH for UHF antennas

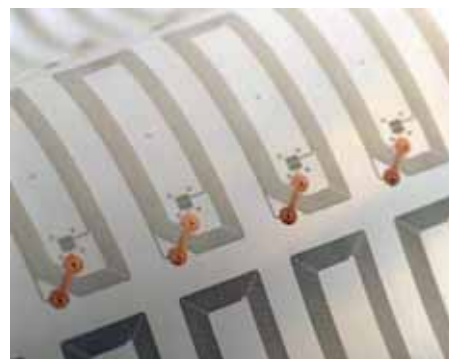


Meco FAP 650

and a 12 drum FAP system goes even beyond 100,000 UPH!

Duplex "Strap" plating via through hole connection

Meco offers also a new feature on its FAP line portfolio, an integrated punch-unit. For HF antenna designs (13.56 MHz) a strap connection is required to complete the loop antenna. In the past, these bridge connections were



Plated "strap" at backside of antenna



Close-up detail of punch-unit

made by a metal strip or by an isolating and conductive ink track. This costly "strap" making process will become history when you start using Meco's integrated duplex plating process. Meco developed a fully automated punchunit which enables you to electroplate the antenna pattern and strap connection within the same production cycle. In this way the antenna is after plating ready to go for direct flip chip die-attach on for example the 8800 FC Smart Line of Datacon.

for advanced packaging, MEMS and Nanoimprint Lithography (NIL). The company's unique Triple I approach (Invent - Innovate - Implement) is supported by a vertical infrastructure, allowing EV Group to respond quickly to new technology developments, apply the technology to manufacturing challenges and expedite device manufacturing in high volume. Headquartered in St. Florian, Austria, EV Group operates via a global customer support network, with subsidiaries in Tempe, Arizona; Albany, New York; Yokohama and Fukuoka, Japan; and Chung-Li, Taiwan.

In the AC2W technology single chips are temporarily placed onto an undiced wafer with

highest accuracy and high speed by a Datacon Flip-Chip bonder, whereas as next step, those stacked-chips are permanent bonded on wafer-scale onto through the EVG-bonding system.

During the initial phase which started with the R&D project, the technology offers high device density through stacked devices, short interconnects and higher functional density for applications. The technology provides unique advantages for chip manufacturers as it enables the integration of various device processes such as hybrid integration of IC and MEMS functionality.

Advanced-chip-to-wafer-technology (AC2W) can generate packages that are an alternative to expensive embedded processes. It saves device manufacturers time and money by combining the highest throughput and utilization of well established flip-chip and die attach processes with the permanent bonding process under well-controlled process parameters.

With these equipment installations, Datacon and EVG are now able to demonstrate and run the complete AC2W-process including finest metrology technologies within one lab, enabling most efficient and comprehensive process development capabilities.



Christmas Greetings



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