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Plasma surface treatment in chip manufacturing – selective, inline, and cycle-time optimized

Plasmamatreat has developed a fully automated Openair-Plasma system based on current industry requirements

Semiconductors are in short supply right now and demand is showing no signs of easing off. With this in mind, increasing throughput is just as important as increasing yield to deliver a high quality product. In its capacity as a long-standing and experienced supplier, the technology leader Plasmamatreat GmbH from Steinhagen, Germany, has therefore faced up to the increased challenges and developed a fully automated inline system for selective pretreatment with Openair-Plasma that is designed according to market requirements. In doing so, customers benefit from a flexible, potential-free, high-speed treatment.

Vacuum plasma has been used for many applications in the semiconductor industry over the years. The Openair-Plasma process from Plasmamatreat, on the other hand, facilitates a fast, inline process for pretreatment under atmospheric conditions that is suitable for surface treatments such as microfine cleaning, activation, and plasma coating. This technology can be used in a variety of ways in the field of semiconductor manufacturing – for example, it enables microfine cleaning in the packaging processes, thereby replacing the vacuum chamber in the production of chip packaging in an efficient and cost-effective manner.

Other areas of application include wire and die bonding, thermal compress bonding, and pre-molding. “As an established system supplier, we accepted a request from a long-standing customer to develop a special system for them, which is called a Plasma Treatment Unit (PTU). In order to adhere to the customer’s speed specifications, we worked with a dual-lane concept for this PTU, which allows us to treat components in parallel on two conveyor belts within a single system. This PTU can selectively pre-treat JEDEC trays handling 8 to 128 components on defined depositing devices, for the subsequent thermal compress bonding process and is designed for maximum throughput,” explains Nico Coenen, Market Segment Manager Electronics at Plasmamatreat, with regard to the key challenges.

Comprehensive options

The PTU, which is designed for the specific process engineering sequence of semiconductor manufacturing, can be seamlessly integrated into production lines. It offers various kinematics and automation options, such as precise-fit handling of assemblies and components, and allows efficient surface treatment. “Since we already produce fully automated systems for other industries, we already had the internal design

and automation expertise required to develop and implement this customer system,” elaborates Nico Coenen.

“In order to develop an inline-capable system for the semiconductor industry and be able to guarantee the highest possible cycle times, we had to take several process steps into account and implement these with precision as early as the conception phase,” stresses Coenen. For example, Plasmamatreat developed the dual-lane concept specifically for high-speed treatment of up to 1.5 m/s. The dual-lane-concept is essentially suitable for various applications, with the system designed for both JEDEC trays and lead frames. It has different processing concepts according to the cycle time, and communication within the production line takes place via the standard equipment interface protocol interface in the semiconductor industry, SECS/GEM.

With regard to the work steps, these are all recorded in the PTU and the traceability of the treatment is ensured by reading barcodes on the chips. One of the many benefits of this is that it records where exactly the individual components were selectively treated and whether, for example, only the top of a component was treated with plasma. Furthermore, the testing capacities at the Steinhagen site were expanded and a Class 6 clean room was set up for this special project and others.

About Plasmamatreat

Plasmamatreat is an international leader in the development and manufacture of atmospheric plasma systems for the pretreatment of substrate surfaces. Whether plastic, metal, glass or paper – the industrial use of plasma technology modifies the properties of the surface in favor of the process requirements.

Openair-Plasma® technology is used in automated and continuous manufacturing processes in almost every industrial sector. Examples include the automotive, electronics, transportation, packaging, consumer goods and textile industry, but the technology, cost and environmental advantages of the plasma technology are used in medical technology and in the renewable energy sector as well.

The Plasmamatreat Group has technology centers in Germany, USA, Canada, China, and Japan. With its worldwide sales and service network, the company is represented in more than 30 countries by subsidiaries and sales partners.

Pictures:



Captions:

With the dual-lane concept, the first conveyor belt transports two filled trays one after the other to defined positions where the plasma treatment takes place. As soon as the treatment of the components on the first conveyor belt is completed, the two plasma jets move to the second conveyor belt and process the components located there.

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