MULTIVACUUM – THE FUTURE OF SOLDERING

Milestones in Vacuum Soldering Technology

Back in 1999 ASSCON's invention of the worldwide first vapour phase vacuum soldering process has already set a milestone for industrial electronic production. The vacuum soldering process proofed as a successful solution for constantly challenging soldering tasks while process windows were getting continuously smaller.

The rising number of vapour phase vacuum soldering systems in the electronic industry proofs the essential impact of this vacuum soldering process. However the soldering tasks of the future will require an advanced vacuum technology.

Multivacuum – The Soldering Process of the Future

The essential quality features required for these future applications are provided by the multivacuum soldering process. In the multivacuum soldering process assemblies are subjected to several vacuum applications during the soldering process, with the option of applying vacuum processes both before and during the melting of the solder paste.

Applying vacuum processes before the liquidus temperature is reached is particularly useful for removing any voids encapsulated and caused by printing or pick & place processes - for example while scooping out the soldering paste during the printing process - even before the soldering paste is molten. This way the voiding potential is eliminated before the heating process is even started.

The main causes for gaseous voids remaining in the solder joint during later production processes are therefore traced back to the outgassing of components, printed circuit boards and basic materials, as well as reactive gas released in the removal of oxide layers through the fluxing agent.

The multivacuum process helps to effectively remove these voids from the still liquid solder joint by allowing assemblies to be subjected to several independently controllable vacuum processes in a short-term sequence. Multiple successive

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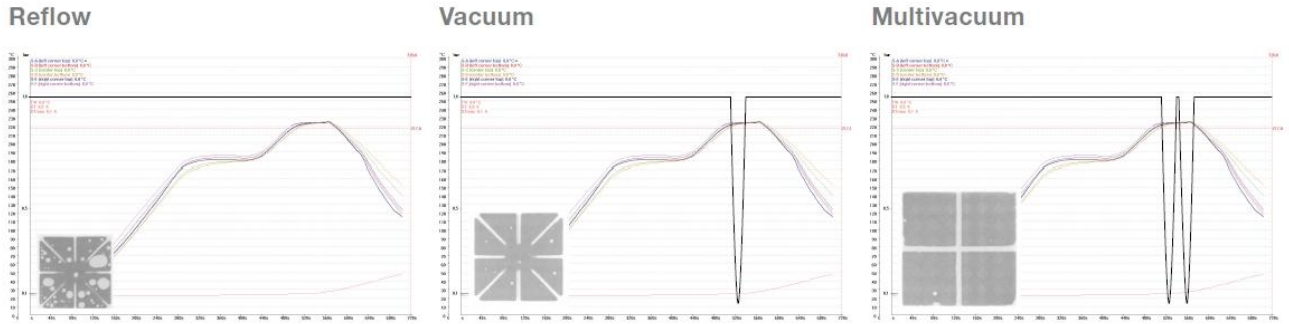
evacuations shift voids encapsulated in the solder joint in a manner ensuring that they reach its periphery, where they can be removed very effectively. Especially with large soldered joints, this enables the elimination of a significantly greater number of voids than would be the case with a single vacuum operation alone.



The multivacuum process in particular also enables void-free solder joints where products with an above average outgassing potential are concerned (e.g. high number of layers in multi-layer, large processors). Gases entering to the solder joint in a first vacuum stage can additionally also be effectively removed from the still liquid solder joint in subsequent vacuum stages.

Once the last vacuum stage is completed, the solder joint needs to be cooled down to bring it below the liquidus temperature immediately. Installation of the vacuum zone outside the hot process area hence ensures that an effective cooling process can already be started with the ventilation of the vacuum chamber.

Besides this the multivacuum process also offers the additional essential advantage of minimizing the risk of soldering defects. If a large void is exposed to vacuum too quickly or if the vacuum is too intense, this can often lead to solder balls, bridging and, in extreme cases, even a dislocation or blowing of, literally, of the components. The multivacuum process now allows these large voids to be exposed to several graded vacuum cycles in an extremely short processing time. This means that the void can be removed from the solder joint in several small steps, obviating the soldering defects mentioned above.

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Applications of the Future

The applications of the future will call for electronic assemblies of the highest efficiency. Electromobility, regenerative energies, aerospace, medical and military applications – they all demand top performance from their electronic components. Without an optimal connection of the components which allows for maximum performance whilst simultaneously conducting any generated heat away, meeting these requirements can no longer be assured. The component and connection geometries have already undergone significant change and will also continue to change in future. Power electronics assemblies require correspondingly large connecting pads. But in addition to this they also call for void-free solder joints if the assembly is to achieve maximum efficiency. This makes the task of ensuring void-free solder joints in vacuum soldering processes all the more difficult.

The increasing demands placed on the electronic assemblies of the future run directly parallel to the call for maximum fail-safety. The applications of future electronic assemblies will come to include more and more central areas of daily supplies such as, for example, the power supply by means of regenerative energies, or electromobility. The failure of electronic assemblies is no longer acceptable here. Productivity and security of supply are subject to maximum requirements. Whereas voids in solder joints present a considerable risk of failure. To avoid them will hence be one of the main targets for the soldering process of the future.

The same applies to the lifetime of these assemblies. Extending it significantly for the assemblies of the future will be essential. Void-free solder joints will be mandatory for realizing this target.

3D-MID applications will also come to play an even more central role in the optimization of electronic components and realization of sustainable products. In this respect, the most extensive void elimination achievable in solder joints using temperatures that are homogenous and as low as possible can only be ensured by vacuum soldering in the vapour phase.

The multivacuum soldering process gives the answer to the challenges of future products and is another milestone from ASSCON in the vacuum soldering technology. It overcomes the limits of modern soldering processes and starts the future of electronic assembling. See for yourself and get convinced of the results that can be achieved with this process!

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