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IPC-7526 Stencil and Misprinted Board Cleaning Handbook

Back in the "good old days," stencil cleaning was effortless and effective. CFC-based solvents were sprayed or wiped onto a stencil with apertures hundreds of times larger than modern-day components. The stencil cleaning process was not considered a value-added procedure; instead it was the cleaning of a production tool. How times have changed. The late-1980s ushered in the end of most of the popular solvents, and the machines that consumed them. Assemblers turned to alternative cleaning agents, including IPAs and other solvents.

Now, chemicals are expected to be safe for the environment, the stencil, and the operator. They must cost less, smell better, and provide improved cleanliness results. Stencil cleaning equipment needs to use the new breed of safe chemistries, produce unwavering degrees of unparalleled cleanliness, and discharge absolutely no harmful substances down the drain or up the stack.

Modern SMT assemblies with ultra-fine-pitch, BGA, chip-scale package (CSP), and flip-chip components increase requirements for absolutely clean stencils. IPC reports that 70% of SMT defects are due to paste printing issues. A large percentage of printing errors can be traced to partially clogged stencil apertures left by inadequate cleaning. The electronic assembly industry fights the battle of shrinking values. Increased worldwide pressures to produce higher-quality products at lower prices create an environment where production yields must remain high, and costs low. One could conclude that adequate stencil cleaning is key to high production yields, low defect rates, and increased reliability.

A successful stencil cleaning process is more than the absence of solder paste in a stencil aperture. Add in increasing environmental pressures that limit acceptable cleaning chemicals and virtually prohibit effluent discharge with hyper-sensitive human safety initiatives, and the stencil cleaning process becomes even more complicated.

It is no coincidence that IPC has released its Stencil and Misprinted Board Cleaning Handbook (IPC-7526, February 2007). IPC-7526 discusses the importance of stencil cleaning including objectives, contaminant removal characteristics, various stencil cleaning processes, and environmental considerations. Previously, stencil-cleaning methods and technologies have largely remained unregulated. Some stencil cleaning technology, although effective, damages modern stencils. Other technologies, while safe on a stencil's delicate surface, are ineffective at removing solder paste from fine-pitch stencils. The absence of any stencil cleaning standard has encouraged the propagation of questionable stencil-cleaning methods.

IPC-7526 is a modern, relevant stencil cleaning standard. It accurately addresses current technological, environmental, and safety concerns. Some stencil cleaning methods will not find sanctuary in IPC-7526. For example, while IPC-7526 recognizes many stencil cleaning methods, it does provide compelling arguments addressing the effectiveness of specific stencil cleaning methods. Although IPC-7526 acknowledges the widespread use of manual stencil cleaning methods, it warns that the inherent limitations and hazards usually outweigh the benefits.

IPC-7526 provides a warning about stencil cleaning systems using "sponges," as they commonly allow solder balls to be re-deposited onto the stencil. Perhaps the biggest impact of IPC-7526 is the rinse cycle in a stencil cleaning process. In recent years, stencil cleaning equipment manufacturers have introduced systems that wash stencils using solder-paste-removing chemicals, without a traditional water rinse.

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Equipment using “rinseless” technology seemed attractive to would-be buyers due, in part, to their lower cost and smaller footprint. IPC-7526, however, uses the word “rinse” 49 times within the standard. In fact, it recommends that a rinseless process be “qualified” to ensure that chemicals left on the stencil do not affect the printing process negatively, and that residual chemicals don’t cause delamination of the stencil’s elastomer frame.

IPC-7526 addresses the technical aspects of stencil cleaning with sections covering recommended watt densities of ultrasonic stencil cleaners and thermal expansion hazards of excessively hot cleaning solutions. It also covers the requirements of a discharge permit and associated liabilities of open-loop stencil cleaners. The ever popular use of IPA now comes with environmental VOC restrictions and flammability warnings. Wastewater concerns are addressed as they relate to heavy-metal, pH, COD/BOD, toxicity, and other concerns. As IPC-7526 warns of the hazards and liabilities associated with discharging a stencil cleaner’s effluent, it provides information on closed-loop processes involving carbon and ion-exchange media, as well as the use of evaporators to eliminate discharge to drain.

Conclusion

IPC-7526 is a comprehensive standard that addresses the pros and cons of several cleaning technologies, while also considering operator safety and environmental compliance. Because most surface mount assemblers clean stencils, and proper stencil cleaning has never been more important, I consider IPC-7526 a must read. IPC-7526 is available free of charge from the IPC store at www.ipc.org.

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