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Environmentally Certified Technologies

CURRENTLY VIEWED BY INDUSTRY AS "THE BAD GUYS," REGULATING AGENCIES SUCH AS THE U.S. ENVIRONMENTAL PROTECTION AGENCY HAVE A PLAN TO IMPROVE THEIR IMAGE AND HELP MANUFACTURERS ATTAIN THEIR GOALS.

By William C. Schreiber

There was once a time when precision cleaning required minimal thought. Just about anything that was dirty could be placed inside a vapor degreaser and emerge clean and dry in a matter of minutes. Today, precision cleaning decisions are seemingly endless with ever-changing environmental regulations, user safety issues and product compatibility concerns. Technologies range from spray-in-atmosphere to ultrasonics to spray under immersion using aqueous, solvent or semi-aqueous chemistries. Which method works and with what chemistry? Will the process be safe or even allowed by the regulating agencies?

Few stencil cleaner manufacturers will guarantee the performance or environmental soundness of their systems, placing printed circuit board (PCB) manufacturers in the position of having to evaluate stencil cleaners for efficacy, safety and health concerns, while balancing environmental restrictions with cost and overall processing speed. Because there are no industry standards for stencil cleanliness, it has been relatively easy for suppliers to claim, without any hard evidence, that they have a safe and effective method of stencil cleaning.

The Environmental Protection Agency (EPA) and the Air Quality Management District (AQMD) tell users what cannot be used; however, where can industry find out what works or what is permitted? Is it the EPA? Or will AQMD have the answers? If all else fails, call the Occupation Safety and Health Administration (OSHA) -- right?

The terms EPA, AQMD and OSHA are often revered by industry with the same affection as the IRS. Most managers believe that nothing good ever came out of a visit from the EPA or AQMD. Times are about to change.

The regulating agencies, EPA and AQMD, are making an attempt to change their image from the "guys in the black hats" to a "white hat" image that actually helps industry.

Enter the CAS and ETV Programs

The AQMD has implemented the Clean Air Solvent (CAS) program. Manufacturers can submit their products to the AQMD as candidates for CAS certification. A chemistry that is certified as CAS will exempt the companies that use it from record-keeping requirements and emissions fees under AQMD regulations Rule 1171, covering solvent cleaning operations, and Rule 1122, covering solvent degreasers.[1] The use of CAS-certified chemistries could save companies thousands of dollars in emission fees and record-keeping expenses.

To qualify for CAS certification, the AQMD must find, via laboratory analysis, that the product has:

- 50 grams per liter or less of smog-forming VOCs, such as alcohol or terpenes
- No toxic constituents
- No ingredients that contribute to global warming (GWC)
- No ingredients that deplete the Earth's protective ozone layer (ODC)
- No volatile organic hazardous air pollutants (VOHAPs)
- A low smog formation rate

A CAS certification certifies the chemistry only -- not the process. Users should be cautious when selecting a CAS-certified chemistry for use in a hazardous cleaning process such as stencil cleaning. While the chemistry alone may be acceptable, when mixed with a hazardous contaminant such as lead from solder paste, the resulting wash solution and associated waste stream may be hazardous and environmentally problematic.

In an effort to help speed the implementation of environmentally safe products and processes, and to help consumers verify the efficacy of these solutions, the EPA began its Environmental Technology Verification (ETV) Program (Figure 1). The ETV Program was created, according to the EPA, "to substantially accelerate the entrance of new environmental technologies into the domestic and international marketplace. It supplies technology buyers and developers, consulting engineers, states and U.S. EPA regions with high quality data on the performance of new technologies. This encourages more rapid protection of the environment with better and less expensive approaches."

For those technologies selected for evaluation, the California Environmental Protection Agency (Cal/EPA), under the auspices of the U.S. EPA, established multi-disciplinary teams that, in consultation with the applicants, identify the specific performance claims and established criteria for evaluating those claims. The technology evaluation teams review and approve test plans, and review the results of the field tests in conjunction with other technical information submitted with the application. Proposed verification and certification decisions are published for public review (Figure 2).

The ETV not only verifies a technology for environmental safety, it also confirms user safety, verifies all claims made by the manufacturer and tests the product's performance against industry standards.

The first alternative cleaning technology selected to help launch the ETV Program was the Smart Sonic Stencil Cleaning Process. Department of Toxic Substance Control (DTSC) engineers, with help from the National Risk Management Research Laboratory (NRMRL) and the U.S. EPA, developed the criteria by which the company's aqueous cleaning process was evaluated.

"We don't just verify technologies, we certify technologies here in California, and that makes the ETV program unique," said Pat Bennett, project manager. "We are geared to test and evaluate technology to help with the commercialization. If the specific technology passes, it will receive

certification from California's Secretary of Environmental Protection Agency and verification by the U.S. EPA. What makes California's certification so important is that the State's environmental standards are, in many instances, more strict than many national and international standards."

DTSC assistant manager Tony Luan said, "The plan to verify this company's stencil cleaning process consisted of analyzing their aqueous chemistry, doing surveys with users, on-site observations of their system, and verifying cleanliness by magnified inspection of the surface and inside apertures of the stencil after cleaning. We also brought an industrial hygienist to observe the system and those using it to make sure there were no health or safety hazards." Many companies such as HP, IBM, Intel, Motorola, Alcatel and Sony, have recognized the advantages of the process early on and have been using it for several years, which helped facilitate user feedback and field data collection.

The fact that the process has already been lab tested by California's South Coast Air Quality Management District (SCAQMD) helped speed the process. The cleaner has been certified as a "Clean Air Chemistry" by SCAQMD. The company's chemistry passed the AQMD certification with the best possible laboratory results. It was found to have no detected VOCs, ozone depleting compounds, global warming compounds or volatile organic hazardous air pollutants.

Smart Sonic has developed a unique chemistry and cleaning system that addresses the environmental and user safety issues associated with cleaning SMT screens and stencils. While the process consists of three components (chemistry, cleaning machine and wastewater management), it is the chemistry that is unique. The detergent (**440-R® SMT Detergent**) cleans better than the CFCs it was designed to replace, yet offers the necessary environmental protections required in the electronics industry.

Systems using alcohol or terpenes only clean a few types of solder paste and present a multitude of health and safety hazards to the workspace and environmental VOC concerns. 440-R SMT Detergent cleans all types of solder paste, yet it is the first such chemistry to have absolutely no environmental impact and remains the only of solder paste, yet it is the first such chemistry to have absolutely no environmental impact and remains the only chemistry to carry both the CAS and Cal/EPA certifications and the U.S. EPA verification (ETV).

The Cal/EPA program has been so successful (27 certifications approved since 1994) that the program itself is serving as a model for the EPA's national technology verification plan. California officials are working with other states and Canada to establish reciprocity. The Canadian program is being modeled after the California program.

WASTE MANAGEMENT

This new stencil cleaning process has also solved the problem of liquid hazardous waste disposal. The wash solution is changed only once per week, independent of the number of stencils cleaned. This limits the amount of waste water generated. While the detergent can be filtered by conventional means and prepared for drain disposal like other aqueous waste systems, most assemblers prefer not to drain any waste, removing themselves from the associated liabilities. Because the detergent contains no hazardous ingredients and no VOCs and the process has been verified not to emit any lead, the resulting liquid waste can be safely evaporated into the atmosphere in standard wastewater evaporation equipment. The nonhazardous liquid is sent into atmosphere, reducing everything down to solids for recycling or disposal. The solid solder paste is recycled as dross or can be melted onsite in a wavesolder pot. There is absolutely no liquid hazardous waste for disposal and no effluent sent to drain -- a "zero discharge" process.

SAFETY AND EFFECTIVENESS -- NO MORE TRADEOFFS

This stencil cleaning process is the first cleaning process to receive EPA and AQMD certification, which will help set the standard for stencil cleaning and elevate the goals for industrial cleaning in general. PCB manufacturers no longer have to "reinvent the wheel." No more evaluating stencil cleaners for efficacy, safety and health concerns, while balancing environmental restrictions with cost and overall processing speed.

Suppliers will have hard data to support their performance and environmental claims. In addition to stencil cleaning, approved, certified, safe and effective replacements will be available for other cleaning applications. CAS-certified chemistries have minimal impact on air quality. Cal/EPA certified and U.S. EPA-verified (ETV) processes are environmentally friendly, user safe and tested for a specific application. All claims made by the manufacturer will be verified.

Companies looking at ISO 14001, "The Environmental Management System," will benefit from the certifications by gaining better control of health and safety issues, reducing energy consumption, waste generation, air emissions and water discharges, and achieving regulatory compliance. SMT

REFERENCE

1 Sam Atwood, "Products of Eight Companies Certified as Clean Air Solvents,"
South Coast Air Quality Management District (SCAQMD) Press Release, July 17, 1997.