

Stencil Cleaner Meets Stringent EPA Rules

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The acronym "EPA" has cast almost as much fear in the hearts of industry as the letters "IRS." The Environmental Protection Agency has a plan to improve its image and actually help manufacturers attain their goals and ISO 14001 requirements.

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 U.S. Environmental Protection Agency (EPA) has begun its Environmental Technology Verification Program (ETV). ETV was created, according to 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."

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For those technologies selected for evaluation, Cal/EPA, under the auspices of the U.S. EPA, establishes multidisciplinary teams which, in consultation with the applicants, identify the specific performance claims and establish 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. Smart Sonic became the first company in the electronics industry, and the only aqueous cleaning system of any type to be selected for the ETV certification program.

The verification process consisted of:

1. A hygienist observing the system and those using it to make sure there were no health hazards.
2. Analyzing the 440-R SMT detergent.
3. Doing surveys with users and on-site observations of their systems.
4. Verifying cleanliness by magnified inspection of the surface and inside apertures of the stencil after cleaning. Many companies such as HP, IBM, Intel, Motorola, Alcatel, and Sony have recognized the advantages of the Smart Sonic process early on and have been using the process for several years, which helped facilitate user and field data access.

Certification Granted

What helped speed the process is the fact that 440-R SMT detergent has already been lab-tested by California's South Coast Air Quality Management District (SCAQMD). The cleaner has been certified (October 16, 1997) as a "Clean Air Chemistry" by SCAQMD and remains the only stencil-cleaning chemistry to attain this certification. Smart Sonic'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.

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Industries large and small -- from auto repair garages and printers to high-tech PC board assemblers and aerospace manufacturers -- must begin using water-based cleaning chemistries like 440-R SMT detergent by the year 1999 under recently-adopted AQMD rules. Companies using clean-air chemistries will be exempt from record-keeping requirements and emissions fees under AQMD regulations: Rule 1171 covering solvent cleaning operations and Rule 1122 covering solvent degreasers. Savings in emissions fees and record-keeping will help offset the cost associated with a new clean air process.

Detergent Formulation

The 440-R SMT detergent is formulated specifically to safely clean all types of solder paste used in SMT assembly. It eliminates the hazards of alcohol, terpenes and hot/corrosive saponifiers used in other screen/stencil cleaning systems, and replaces them with an environmentally safe, non-hazardous, mild alkaline detergent that cleans effectively without heat. It will not only clean any type of solder paste, it will also clean SMD adhesives and post-solder flux residue buildup from pallets, radiators and other tooling just by raising the wash temperature from ambient to 120°F (49°C).

Unlike saponifiers that are consumed during the cleaning process and require continuous replenishment, 440-R is a surfactant (wetting agent) that is not consumed or "loaded" when cleaning solder paste. The initial 10 percent solution will last an entire week, no matter if 50 stencils or 500 stencils are cleaned. The cost reduction in chemistry alone can often justify the purchase of a Smart Sonic cleaning system.

If stencils are washed in hot water or dried with hot air, the metal will expand and contract causing distortion.

Because stencils are heat-sensitive, stencil manufacturers recommend that stencils be cleaned at temperatures less than 110°F (43°C). Stencils are constructed of different metals: an aluminum frame; stainless steel or polyester screen; and a stainless steel, brass or nickel-etched foil. If these metals are washed in hot water or dried with hot air, the metal will expand and contract causing distortion to the etched image and screen tension problems. Hot wash solutions and hot drying air can also cause detachment of the "heat cured" adhesives used to bond the screen to the frame and metal etched foil. Smart Sonic's 440-R SMT Detergent cleans at ambient temperature to assure the integrity of the stencil, prolong stencil life, conserve energy and protect users from hot solutions.

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As with any cleaning process, the most important feature is the chemistry. The 440-R detergent is activated by using one of the Smart Sonic ultrasonic stencil cleaners. All of the company's cleaners use side-mounted "sweep frequency" ultrasonic transducers to provide the ultimate in cleaning efficiency by directing the non-destructive ultrasonic energy toward the surface to be cleaned. Ultrasonics can penetrate fine-pitch and ultra fine-pitch areas that spray systems cannot reach. Each Smart Sonic cleaner has been engineered and ultrasonically powered to meet the task of removing even dry RMA solder paste and post-solder flux buildup safely and completely in just seconds.

At the touch of a button, the Series 5000 Stencil Cleaner is a fully automatic ultrasonic system that utilizes 440-R SMT Detergent solution. The wash time is completed in approximately one minute, rinsing in less than 10 seconds. An optional low-temperature dry cycle can be incorporated or, hand-held low-pressure dry compressed air can be applied to dry a stencil in about 2 minutes.

More Traditional

The 2000 Series Stencil Cleaner is a more traditional ultrasonic system. The operator manually moves the stencil from the wash tank to the adjacent rinse tank where the stencil is rinsed using hand-held water spray or with foot-pedal-operated spray jets. Because hot drying air can damage a stencil, it is recommended that the stencil be allowed to "drip dry." Alternatively, low-pressure, dry compressed air can be applied to expedite the drying process. If hand-held dry compressed air is used, the total cycle for a washed, rinsed and dry stencil is only 3-4 minutes!

Because of EPA and AQMD certification, the liquid waste can be simply and safely evaporated to atmosphere in an optional wastewater evaporator system.

Smart Sonic 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, in itself, limits the amount of wastewater generated. While 440-R SMT detergent can be filtered by conventional means and prepared for drain disposal like other aqueous waste streams, it also provides the flexibility of routine evaporation.

Because it has been certified by the EPA and AQMD, the resulting liquid waste can be simply and safely evaporated to atmosphere in one of the optional wastewater evaporator systems. The non-hazardous liquid is sent to atmosphere reducing everything down to solids for recycling or disposal. The solid solder paste is recycled as a dross or can be melted onsite in a wave solder pot. There is absolutely no liquid hazardous waste for disposal and no effluent sent to drain -- a "zero discharge" process!

The Smart Sonic process cleans faster and more effectively than any solvent and is completely environmentally safe. While other stencil cleaning systems are struggling to stay one step ahead of the ever-changing environmental and user safety regulations, the Smart Sonic stencil cleaning process has been officially certified environmental and user safe by the EPA and the AQMD. In addition, use of the water-based 440-R SMT detergent minimizes hazardous waste and reduces worker exposure to toxic vapors, hazardous solvents and potential explosions. Companies looking at ISO 14001 -- "The Environmental Management System" -- will benefit from this process by gaining better control of health & safety issues; reducing energy consumption, waste generation, air emissions and water discharges; and achieving regulatory compliance.