Back to Index of Technical Papers

Archive of Technical Articles

MAGNAVOX MOVES TO OZONE-SAFE DEFLUXING WITH JETCLEAN® SYSTEMS

by J. R. Ridlen, Magnavox

First Published: April 1996

Magnavox Electronics Systems Company (Fort Wayne, IN) is a leading supplier of electronics equipment to both defense and commercial markets. Magnavox builds circuit card assemblies (CCAs) for military communication systems, antisubmarine warfare, ordnance, command and control systems, tactical information systems, electronic combat systems, commercial avionics and commercial communication systems.

We have defluxed these assemblies for many years using vapor degreasers and 1,1,1-TCA. At one point, we had thirty six vapor degreaser systems in daily operation. They were fast, 100% effective, had no limits on product size and would generally be considered the "perfect defluxer." However, maintenance was a problem with frequent downtime for maintenance, scheduled and non scheduled. They required weekly analysis for acid acceptance and total dissolved solids. Periodic waste disposal of spent or contaminated 1,1,1-TCA was another issue. Another negative was the use of ozone-depleting solvents such as 1,1,1-TCA as well as the worker exposure issue, however minimal that might have been.

In 1994 a cross-functional team was formed to evaluate the types of equipment and chemistries available which would enable us to be free of ozone-depleting substances by 31DEC95. Since we clean CCAs up to four times per shift, we need to clean quickly and return them to flow for further assembly. Batch aqueous cleaning was fully tested and rejected due to its long cycle time and post bake. After visiting and testing at other companies and the Electronics Manufacturing Productivity Facility, benchtop solvent defluxing became our target method.

Four Candidates for Real-World Cleaning Tests

Four candidate machines were brought in-house, on trial basis, for a side-by-side comparison over a six week period. During this time, CCAs were cleaned with a variety of chemistries. They were tested for ionic and visual cleanliness per MIL-C-28809. Air sampling also was performed to determine the concentration of solvent vapor and ensure the systems were not exceeding Threshold Limit Values for each chemistry. These samples were also used to ensure the flammability concentrations were within limits.

The two most expensive machines, with prices ranging up to $40K, did not clean

sufficiently well. Conversely, the least costly system cleaned well but violated worker exposure levels for breathing solvent vapors in air. The JetClean® 1500 emerged as the safest and best cleaner and at a reasonable cost.

We tested one of the first JetClean® 1500 units off the production line and found its capabilities to meet nearly all our needs. We selected Axarel® 2200 as the cleaning solvent and for rinsing. The air dry is augmented by compressed air applied by hand to reach under large components and to remove solvent entrapped in connectors. By purchasing extra cleaning baskets with each Model 1500 we are able to clean, rinse, and dry a continuous flow of CCAs through the unit.

We have been successful in replacing all of the vapor degreasers with only twelve JetClean® 1500s. On a per machine basis, we clean from 100 to 350 CCAs per shift. These boards range in size from 2" x 2" to 10" x 12" with 4"x 4" and 2" x 10" the most typical sizes. We also clean assemblies comprised of multiple rigid CCAs mated to flex circuits while they are attached to painted cast aluminum housings. Very small chassis assemblies also are cleaned. The soil or contamination being removed is RMA flux residue from hand soldering at 600°-700°F.

At 700°F, charred flux seldom comes off entirely even in a vapor degreaser. Therefore, we found that hand brushing the char with Genesolv® 2004 via Micro Care's Solvent Miser Trigger Grip is the best method, followed by the JetClean® system.

We have had to make some adjustments as we installed the machines. Due to IPA's 55° F flash point, safety codes dictated that we maintain a 16X16 foot electricity-free zone around each JetClean® unless the system was installed against a wall, at which point 8X16 is acceptable. In eight locations we are using the units without venting; however, in one product area we clean in excess of 1000 CCAs per week through a single JetClean® so we are placing another Model 1500 back-to-back with it and venting them both through the roof.

One of the big unknowns in scaling-up to full production was the frequency with which we would have to change the Axarel. Based upon the most heavily utilized system, we tracked the contamination level in the Axarel® over four months. Due to drag out losses and daily additions, the contamination level barely exceeds 1%. We have cleaned 18,000 CCAs and never changed the Axarel, but we do filter it every fourteen days during preventive maintenance.

The IPA, however, is changed every two and a half shifts. With this regimen we have been able to meet our cleanliness requirements without doing any chemical analyses, the monitoring having been suspended as unnecessary. On an average unit, cleaning 100 CCAs or less per shift, we can achieve 4 to 5 meg ohm-cm of resistance. If we add a rinse of deionized water, we achieve 8 to 10 meg, both levels far in excess of the 2 meg or greater requirement of MIL-C-28809.

Prepared by:

J.R.Ridlen
Staff Chemical Engineer, MAGNAVOX

17NOV95

Tel: 219-429-7661
Fax: 219-429-7141

EDITOR'S NOTE: After many years of successful sales and marketing, the JetClean® product line was declared obsolete and shut down by Lockheed-Martin in 2001. Systems are no longer available. For customers seeking fast and cost-effective batch cleaning, Micro Care recommends Vertrel® solvents in vapor degreasers. Contact Micro Care for more details.

Related Information:

- For additional information about flammability and how it is measured, see this Technical Note.
- This web site features a list of nonflammable solvents from Micro Care.
- For additional information about the ozone-safe DuPont HFC solvents, check out the Vertrel® solvents web site.
- For other information about the Bromothane™ brand of nPB solvents, check out the Bromothane™ web site.
- For additional help, use the *Solvent Selection Guide* in this Site to help determine the optimal recommendation.
- A simplified PDF version of the same Selection Guide also is available.

Back to Technical Articles index

Solvent Guide | Hotlinks | Cleaning Costs | Contact Us | Search This Site

---