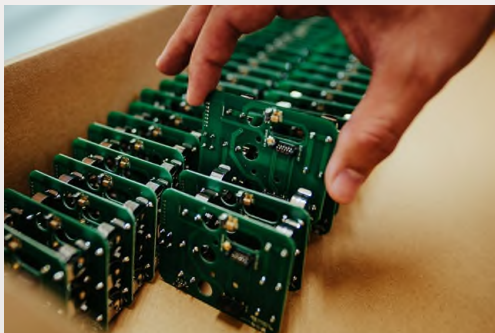
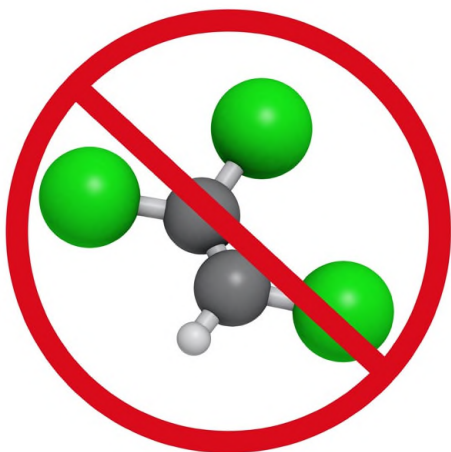


■ **Top Ten Reasons** ■ **to Switch to** ■ **a Better PCB** ■ **Cleaner**

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- **Industry:** Electronics
- **Published:** EPP Europe



Complex PCBs make cleaning a challenge



TCE has a carcinogen classification and is under stringent control in Europe



The electronics manufacturing industry has seen incredible changes over the years. The evolution to smaller, high density circuit boards with low standoff or zero-clearance components is ongoing. With the pervasive deployment of BGAs and microBGAs, MCM devices and even denser semiconductor packages, today's PCBs run hotter, and are more complex than ever before. In addition, the pressure to produce PCBs faster and more economically amid ever-changing environmental regulations and requirements makes it an exciting but challenging time to be in the industry. So, it is imperative that PCB fabricators adapt to these changes to stay current, competitive and profitable.

Phaseouts of Favorites

Each of these changes, especially those regarding environmental regulations, impacts the way printed circuit boards and other electronics parts are cleaned and prepped for further processing like conformal coating or packaging. Historically, brominated and chlorinated solvents like nPB (n-propyl bromide) and TCE (trichloroethylene) were used inside a vapor degreaser to reliably and economically clean PCBs.

Once the chief cleaning solvents within industry, these legacy solvents are now under scrutiny. In Europe, TCE has a carcinogen classification and has not been available for vapor degreaser cleaning in without special authorization and stringent controls on factory emissions, since 2016. And under EU REACH Registration, Evaluation, Authorisation and Restriction of Chemicals) regulations, nPB requires special permission for use in Europe as of July 2020.

In the United States, both TCE and nPB are under review by the EPA (Environmental Protection Agency) and OSHA (Occupational Safety and Health Administration). They recognize both nPB and TCE as hazardous air pollutants and risks to worker safety. It's unclear when a complete nPB or TCE ban will happen in the US, but many experts agree a phaseout is definite.

Aqueous Uncertainties

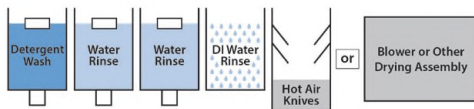
Even water-based or aqueous cleaning is proving to be problematic. Aqueous systems use water to clean. In some areas water is a precious non-renewable resource giving aqueous cleaning systems a low score for environmental sustainability. They produce a waste stream that requires treatment before discharge. Wastewater must be filtered, distilled, deionized, and osmosis prepped ready for disposal. The cleaning agent added to the water can be toxic and poorly biodegradable making disposal problematic.

In addition, the energy required to operate an aqueous system can be high.

Aqueous systems require high temperatures to be effective. This means more power is needed. Also, aqueous machines are generally bigger and more complicated than solvent-based systems. They have larger pumps, sprayers, blowers and filters, as well as longer cycle times that consume more energy. This in turn means more electricity is consumed, adding to the global warming impact.



nPB is under EPA scrutiny as a worker hazard



Aqueous systems have pumps, sprayers, blowers and filters that use energy



So, what options are there for company owners, facility managers and environmental safety and health officers looking for better choices that are more efficient, easier to maintain and less hazardous for workers and the environment? Faced with the challenge of changing to alternative solvents, they are concerned about the impact the change will have on their bottom-line.

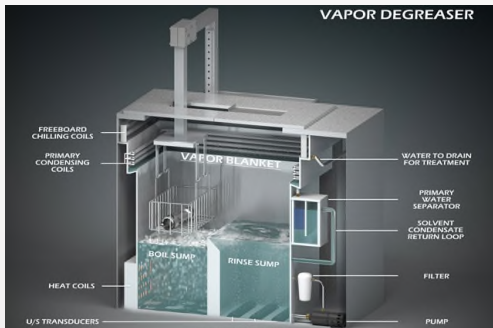
The biggest concerns are that switching out their cleaning solvents and processes will cause production down-time, require a big capital investment in new equipment or result in time lost training employees on new processes. Not to mention the worry that the new cleaning fluids will not deliver the same cleaning results as the old ones.

Fortunately, there are a number of solvent alternatives on the market that clean just as well, if not better than the old solvents. In many instances, the changeover to these modern fluorinated fluids is simple and does not require any investment in new equipment. Benefits can include consistent cleaning quality, improved throughput and decreased energy usage. Plus, these next generation cleaning fluids have an excellent toxicity profile, making them safer for people and the planet.

So, here are the top 10 reasons to switch to a better cleaning fluid today:

- 1. Same or better cleaning:** The modern fluorinated cleaning fluids have been lab-tested and analyzed to ensure the cleaning results are reliable, consistent and just as good as the legacy solvents. Cleaning efficiencies were maintained or improved, even on hard to remove lead-free and no-clean flux residue. Although the aggressive cleaning fluids have high solvency to dissolve contaminants, they are formulated to not damage delicate PCB substrates or components.
- 2. Low cost of conversion:** In many cases, most of the modern cleaning fluids can be used in existing equipment, using the same methods. After emptying and cleaning the vapor degreaser many of the replacement cleaning fluids can be “dropped in” into the machinery without an appreciable change to the cleaning process.
- 3. Energy savings:** Many of the modern cleaning fluids have a lower boiling point and heat of vaporization than the older solvents. This requires less energy consumption, resulting in an overall energy cost savings.
- 4. Improved efficiency:** Since modern cleaning fluids boil at a lower rate than the legacy solvents, PCBs come out of the vapor degreaser cool enough to handle. No extra time is required for them to cool down. This allows technicians to move on to the next production process sooner, boosting overall throughput and productivity.
- 5. Enhanced safety:** Many of the new cleaning fluids are nonflammable for improved safety in the workplace. Their azeotropic properties ensure the compositions are thermally stable and safe to use throughout their service life.
- 6. Healthier for workers:** Many of the substitutes for nPB, PERC or TCE have better toxicity profiles and higher TLVs (Threshold Limit Values) than the legacy solvents making them safer for workers to be around.

Tech Article



Vapor degreasing reliably and economically cleans PCBs

- 7. Better environmental impact:** Since the modern cleaning fluids do not carry a heavy regulatory burden like some of the legacy solvents, switching to a modern cleaning fluid helps you improve your environmental footprint. Modern cleaning fluids boast ODP (Ozone Depleting Potential) ratings of zero and have a very low GWP (Global Warming Potential). This allows them to follow the air quality emissions regulations of the European Union, including REACH requirements.
- 8. Improved maintenance procedures:** Except under the most extreme conditions, such as if exposed to a strong base or acid, or exposed to extreme heat, the modern cleaning fluids will not “turn acid”. They do not require chemical stabilizers or scavengers or the weekly testing required of the legacy solvents.
- 9. Better working conditions:** Most modern cleaning fluids do not have the same pungent, sweet smell associated with TCE or the other legacy solvents. Less fumes means a more pleasant work area and happier, more productive workers. In addition, since many of the next generation fluids are safer to use, PPE requirements may be less stringent, making the working environment more convenient and comfortable for employees.
- 10. Easier handling, transport and disposal:** Modern cleaning fluids are more easily recycled on-site because they do not contain any stabilizers or additives required when using legacy solvents. Employees do not need the same type of intensive training to manage the new fluids safely, saving time and money.

The change to a new cleaning fluid can be full of uncertainty. For many PCB fabricators looking to make the switch to a better solvent it is imperative that they maintain their cleaning performance with minimal impact to throughput and productivity. The best course of action is to partner with an electronics cleaning expert that you can trust. MicroCare has experienced field engineers that audit your current solvents and processes and make recommendations on the best fluids and process to make your switch to a better solvent easier.

About the Author:

Emily Peck is a Senior Chemist at MicroCare which offers benchtop and vapor degreasing critical cleaning solutions. She has been in the industry more than 6 years and holds a MS in Chemistry from Tufts University. Peck researches, develops and tests cleaning-related products that are used on a daily basis in electronics, medical, fiber optic and precision cleaning applications. For more information, visit www.microcare.com.



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