



August 5, 2011

Mr. Alex Ryan-Bond
Environmental Associate
Ozone Transport Commission
444 N. Capitol Street, NW
Suite 638
Washington, DC 20001

Re: OTC Model Rule for Solvent Degreasing 2011

Dear Mr. Ryan-Bond,

I would like to thank you for taking the time to discuss the pending changes to the OTC Model Rule for Solvent Degreasing during our many recent phone conversations and providing ZESTRON America with an opportunity to respond and offer comment.

I would like to begin by stating that Zestron only recently became aware of this pending rule change. And upon polling our customers and other industry suppliers, we found that all were unaware of this critical issue being reviewed by OTC members.

This is certainly disconcerting to us for not only will this rule affect our industry, but, most importantly, it will have a devastating affect on the ability of our customers within the electronics manufacturing business sector to clean PCB's (Printed Circuit Boards) and components to the cleanliness standards the industry expects and demands. We respectfully request that you allow sufficient time to effectively evaluate this issue within our industry and provide OTC with critical feedback prior to rule confirmation.

As currently written, this rule will restrict VOC emissions from Batch-Loaded and Conveyorized (In-Line) Cold Cleaners to 25g/l or less. With regard to this market segment (high precision electronics manufacturing businesses, it is important to understand why cleaning is imperative to the industry, the types of cleaning agents that are available to the industry, why they are used and how this proposed new standard will negatively affect this business sector.

To begin, electronics manufacturers have always cleaned post solder residues from PCB's. When electronic components are manufactured, contamination can result from metallization baths, rinse water, de-flashing chemicals, mold release agents and flux residues. During assembly leftover solder paste, reflow condensates, outgassing, manual welding and handling residues can create problems. In particular, solder pastes occasionally produce small solder balls which can cause serious circuit reliability problems.

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Circuit assemblies are cleaned to remove those contaminants that could be corrosive to joints and components and ultimately result in circuit failure. These failures can have several root causes:

- Electrochemical migration and dendritic growth
- Electrical leakage currents

None of these phenomena are good for the reliability of the assembly as they will eventually cause it to fail as documented by numerous papers and studies. Within industries demanding high reliability components such as military, medical, aerospace, automotive and telecommunications, board failure can cause catastrophic product failure and potentially cause harm the user and public at large.

Zestron is in the business of engineering, manufacturing and distributing cleaning agents for the electronics manufacturing industry and has been doing so for nearly fifteen years in the United States and over twenty years in Europe. As an industry supplier, Zestron has been keenly aware of the environmental impact of our industry's process consumables and end products.

Prior to Montreal Protocol, halogenated solvents were widely used as cleaning agents, and subsequently banned due to their negative impact on ozone. This led to the development of new cleaning agents and although many are not harmful to ozone, they are organic in nature and vary in their VOC content. This new class of cleaning agents can be classified as solvent based, water based and alkaline-surfactant based.

Initially, industry cleaning products were solvent based, with VOC levels ranging from 800 to 900 g/l. Zestron developments led to aqueous based agents, yet VOC levels remained in this same range. Recognizing the need to reduce VOC content in products, Zestron continued product development introducing aqueous based product families with significantly reduced VOC levels ranging to 225 g/l in its ready to use form.

There is a wide variety of flux types on the market and these are generally classified as water soluble or rosin based. Typically, water soluble fluxes can be cleaned with DI-water. However, depending upon the quantity of activators, many rosin based fluxes require an engineered cleaning agent combined with the mechanical energy of a batch or inline cleaner (Cold Cleaner) to remove post reflow residues. It is important to note that fluxes are typically organic in nature. Thus a cleaning agent requires organics for solvency as well as alkalinity in order to loosen and remove residues; 'Like dissolves like'. Therefore, engineered cleaning agents will include VOC's.

During this same period, it is critical to understand that PCB manufacturers were trying to reduce negative environmental impact of other process components such as eutectic solder material. This caused a shift from eutectic to lead free solder material and this change, although environmentally beneficial by eliminating lead, has made it significantly more difficult to remove post reflow residues.



Lead free solder requires higher reflow temperatures. This results in additional oxidation and polymerization reactions of the flux causing flux residues to become 'baked on' and therefore making them more difficult to remove. This phenomenon led to new flux

formulas with higher boiling points, increased rosin content and more aggressive activators to inhibit solder oxidation at the higher temperatures. In turn, this led to increased flux residues. Coupled with changes in PCB design, including increased board density, and ever reducing component standoff heights, demands on the cleaning process and engineered cleaning agents has dramatically increased and continues to do so.

Developing cleaning agents with reduced VOC content remains a key goal for Zestron and other industry suppliers. However, a target of 25g/l by 2014 is unrealistic. The OTC region specified within the north eastern corridor has more than 450 electronic manufactures. Many of these companies are producing electronic components for military and other industries requiring high reliability and using fluxes that require chemically assisted cleaning. If the VOC limit within the current draft rule remains unchanged, these companies will have no cleaning alternative other than suspending or relocating their manufacturing process.

It is true that SCAQMD implemented a similar rule over ten years ago. Plants that could not meet the VOC requirements of SCAQMD nor change their cleaning process due to qualification specifications, relocated to geographic areas without restrictive rules. However, the electronics manufacturers that remain in southern California are those that primarily use OA fluxes that can be cleaned with DI water. Even so, given the trends in component and board design, many OA users are now migrating toward chemically assisted cleaning out of need.

Zestron certainly understands the OTC goal to reduce ground level smog and we applaud our governmental effort. You explained that the majority of VOC emissions results from the numerous auto repair metal cleaning applications. This market segment is the primary focus of this model rule and one whereby the 25g/l VOC emission limit remains an achievable target.

Regarding the electronics manufacturing business sector, we request the OTC consider an exemption allowing a VOC emission rate up to 150 g/l. Even though many current cleaning agent product offerings have a VOC content above 200 g/l for aqueous agents and 800 to 900 for solvent based, a goal of 150g/l is a reasonable industry target within the timeframe suggested by the OTC.

We are available to work with you, industry partners and your team on drafting language for this model rule that will lead to the VOC reductions sought by the OTC and within reach of industry R&D.



We appreciate the opportunity to offer comments to the OTC regarding this model rule and remain available to assist in this effort as required.

Very Truly Yours,

A handwritten signature in black ink that reads "Sal Sparacino". The signature is written in a cursive style and is positioned above a light gray rectangular box.

Sal Sparacino, P.E.
Technical Marketing Manager
ZESTRON America

Cc: Mr. Gene Pettingill: DNREC