

## Cleaning a No-Clean Assembly Contaminated with Water Soluble Rework Flux

Mixing water soluble rework flux with a no-clean processed board  
creates a cleaning challenge that can be alleviated with the right process  
**Foresite Inc.**

### Case Study

A client experienced a situation where product was failing in the field. The client's failure analysis investigation identified a rework residue that appeared in various locations on the circuit boards (see picture 1). After further investigation, they concluded that an operator had used a water-soluble flux to do rework on the boards. Water-soluble flux contains bromine and chlorine, which are known to be corrosive, unless removed. The problem was a no-clean manufacturing process had been used prior to the rework, and since the boards were populated with water intolerant components, the product could not be cleaned using standard cleaning processes such as in-line aqueous or batch cleaning systems. Current spot cleaning standard practices, such as canned solvents and brushes, tend to spread out the residues instead of removing them from the boards. Therefore, the client needed a non-fluid invasive method that effectively removed the residues.



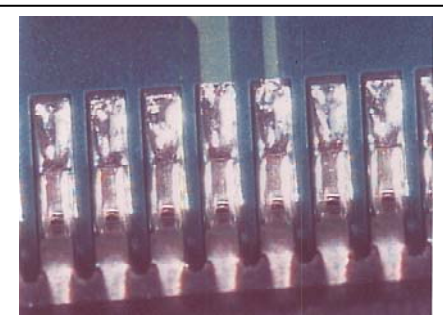
Picture 1: Hand solder flux residues  
(Not all white residues are corrosive residues.)

### Corrective Action

In cases like this, we use a special cleaning process that involves spot steam wash using a saponifier (soap), and a steam-only rinse. However, before cleaning their product, the client wanted confirmation that the cleaning removed the corrosive residues on their samples.

### Confirmation Analysis – Proof of Cleaning: Ion Chromatography Testing

A comparative analysis was conducted of reworked boards before and after cleaning. Analytical evaluation was performed using Ion Chromatography per IPC-TM-650, method 2.3.28 to characterize process residues. The reworked boards showed high levels of chloride; whereas, after cleaning, the boards showed acceptable levels. A second lab performed a set of independent tests and confirmed the cleanliness.



Picture 2: After spot steam cleaning

### Confirmation Testing: Accelerated Life Testing

To confirm the effectiveness of the cleaning, the client performed 500 hours of accelerated life testing (ALT) on over a dozen reworked and cleaned boards. The boards

that were steam cleaned passed full functional testing; whereas, six boards that were not steam cleaned failed the ALT testing within 168 hours.

### Ion Chromatography Results

Sample Description (Average of boards tested)	Board location	Chloride Levels ( $\mu\text{g}/\text{in}^2$ )	Bromide Levels ( $\mu\text{g}/\text{in}^2$ )	Sulfate Levels ( $\mu\text{g}/\text{in}^2$ )	WOA Levels ( $\mu\text{g}/\text{in}^2$ )
Failed board	U10	10.31	2.45	0.0	75.7
Cleaned board	U10	3.65	2.09	0.0	26.6
Failed board	U05	16.24	2.11	0.0	113.6
Cleaned board	U05	1.47	2.91	0.0	22.1

### Conclusion

Using water-soluble hand solder flux on a no-clean process is a no-no. However, if it is inappropriately applied, then spot steam cleaning is one corrective action approach that has worked effectively.