



June 7, 2008

## A New Methodology for Defluxing using a Batch Chemistry Process



Recently the AAT lab did some testing of cleaning chemistries at elevated temperatures approaching 200°F using the new AquaTherm™ batch cleaner. The primary purpose of the testing was to determine if wash temperatures above the traditional 130°F - 160°F range improved the cleaning characteristics of the batch process.

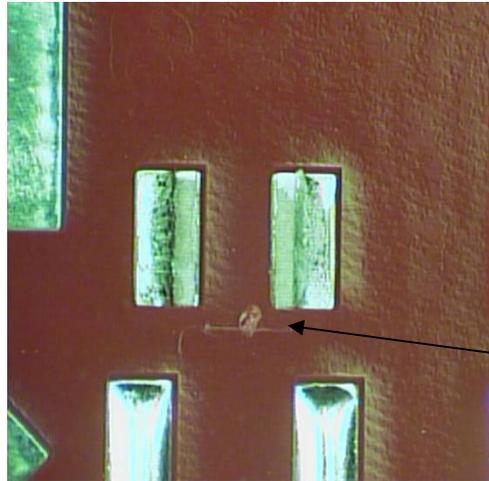
The second area under evaluation was the use of elevated wash temperatures combined with fresh cleaning chemistry every wash cycle in an open loop wash mode. The AquaTherm™ is the only defluxing system available today that is designed to wash and rinse at temperatures up to 200° F. In an open loop configuration, the AquaTherm™ utilizes a precision chemical metering pump to mix the chemistry, with ambient or preheated water, while filling the process chamber.

The third consideration was the use of lower chemistry concentrations at 200°F in an open loop wash.

### Testing

Sample boards were reflowed using a variety of popular leaded and lead-free solder pastes including some that are known to be hard to clean. Using a standard 20 minute wash cycle, the results showed that wash solution temperatures of 200°F completely cleaned flux residues beneath many of the components under test. As shown in Photo 1 below, flux residues were completely cleaned from underneath this 12mil x 10mil component which was standing off the board at 1-2 mils. The tests indicate that this same component **could not have been cleaned completely at 160F** in a typical batch process.

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Mark left behind from prying the component off the board.

Photo 1

### Process Variables

Traditional Closed Loop Chemistry Wash	AquaTherm™ Open/Closed Loop Chemistry Wash
Typical 20 minute wash cycles	Typical 20 minute wash cycles
10-30% Typical Chemistry concentration	Completely variable (1%-100%)
130-160F wash & rinse temperatures	Up to 200F

### Feasibility

The general conclusion of the testing indicates that today's batch systems do not adequately deflux at 160°F with a 20 minute wash cycle. Therefore, the quality of defluxing becomes the driving factor for change in the batch cleaning process.

### Cost, Maintenance, & Quality Considerations

Closed Loop Chemistry Wash	Open Loop Chemistry Wash
Capital equipment cost high	Capital equipment cost significantly less
2-3 gallons of cleaning chemistry per fresh bath plus ongoing replenishment	0.03 gallons or more per wash
Drag out requires ongoing chemistry concentration monitoring and replenishment	No drag out and chemistry concentration is precise per wash
Cleaning capability deteriorates each wash due to bath loading	Cleaning capability fresh every wash
Bath is purged every 50-100 batches due to loading	No bath to maintain
Holding tank maintenance & disposal cost	No Holding tank to maintain
Solder accumulation in the holding tank	Solder is collected in a drain filter cartridge



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### **Conclusions**

Clearly, wash temperatures of 200°F, combined with fresh cleaning chemistry, provides the best opportunity to completely remove flux residues from underneath difficult to clean components. In addition, the cost considerations of an open loop wash may be about equal depending upon how the cost of consumables, facilities, maintenance, quality, and reliability are scored and understood.

Today, the AquaTherm™ batch cleaner is the only system available, from any manufacturer, which offers the process flexibility and cleaning capability as described above. Please contact us for more information about chemistry defluxing at 200F in an open/closed loop process.

Note: Please consult with your local municipality or county agent regarding local EPA requirements for open and closed loop wash processes. In most cases aqueous defluxing cleaning agents containing reflowed flux residues meet EPA requirements for BOD, COD, pH, and other pertinent contaminants.