Spray fluxing process control for wave soldering is defined as, “the ability to reach and maintain a desired flux deposition.” Measured in micrograms of flux solids per in² (or cm²), flux deposition is the uniform application of flux to a circuit board assembly. For example, a flux manufacturer may recommend a flux deposition range of 1,000–1,500 µg/in². So, spray fluxing process control can be stated as, “the ability to apply flux solids to a circuit board within a desired deposition range, and maintain that range over time.”

“You have to have flux where you want solder to go …”

The job of flux is to remove metal oxides and nonmetallic compounds from interconnect surfaces. To do this job, it needs to be applied to all the metal surfaces to be joined. Therefore, spray fluxing process control also includes, “the ability of the fluxer to penetrate 100% of the plated-through holes.”

Most fluxers offer little or no process control. Foam fluxers are open vats exposed to the atmosphere in which flux evaporates causing its properties to change, resulting in poor soldering, excessive flux residue, and gallons of chemical waste. Nozzle spray fluxers are better, but have their own inherent problems. Most glaringly, nozzles clog disrupting the uniform application of flux. Fluxers with stationary heads make flux penetration of plated-through holes challenging at best. These under performing fluxing systems cost board manufactures thousands of dollars in wasted materials, rework, and production line downtime due to unnecessary maintenance.

This paper details two simple experiments you can conduct to measure just how much control your fluxing system has over the fluxing process.

**Designed Experiments**

Two experiments can be conducted to measure spray fluxing process control:

1. Measure “wet weight” of flux on circuit boards
2. Measure flux penetration of through-holes

**Measuring Flux Wet Weight**

**Tools:**

1. Digital scale
2. Blank circuit boards
Procedure:

1. Place a blank circuit board onto the digital scale and zero the scale
2. Remove board from scale and run through the fluxing system
3. Immediately place board back on the scale
4. Record the flux wet weight
5. Repeat test to prove flux deposition repeatability

Results:

Minimal variation in wet flux weight from board to board demonstrates control of flux flow rate and spray head traverse speed.

Measuring Flux Penetration of Through-Holes

Tools:

1. Blank circuit boards
2. Thermal fax paper (for alcohol-based fluxes), or pH paper (for water-based fluxes)

Procedure:

1. Sandwich a piece of appropriate paper between two blank circuit boards
2. Run the sandwich through fluxing system
3. Inspect the paper for evidence of flux penetration (the paper will change color in response to the acid in the flux)

Results:

Evidence of flux penetration of all plated-through holes demonstrates good atomization of the flux, a well developed and repeatable spray pattern, and uniform distribution of flux across the circuit board.

Conclusion

Spray fluxing process control is defined as, “the ability of a fluxing system to apply flux solids to a circuit board within a desired deposition range, maintain that range over time, and penetrate 100% of the plated-through holes of the circuit board assembly.” Conducting these two simple experiments will allow you to measure your current fluxer process. If flux wet weights vary significantly, or if you are not measuring 100% plated-through hole penetration, upgrading your fluxer will improve quality and yield.