Why Clean No-cleans?

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The Science of Cleaning Green
Was No-clean technology developed by Military Intelligence?

No-clean fluxes and no-clean solder paste are mis-leading.
They are commonly cleaned for good reason.
No-Clean Fluxes Really Are Synthetic Fluxes

- Traditional fluxes are limited
- Rosin fluxes must contain rosin
  - Inherently sticky
  - not as printable for Fine Pitch
- Water solubles must be water soluble
  - Shorter printing life, less tack
  - harder to process - must be cleaned
- Synthetic Fluxes have no formulary restrictions
  - Can be formulated to optimize the process
    - Printability, tack, printing life, cleaning or no clean
A Case For Cleaning No-cleans

- IPC/EIA J-STD-001C require the flux to be removed unless otherwise specified.
- Trends toward further miniaturization favor flux removal (flip chip assembly).
- Trends toward higher temp solder favor flux removal (no-lead solders).
- Trends toward higher clock speeds (>1 gig hertz) favor flux removal.
- Long term marketing strategies for electronic products favor replacement due to consumption or obsolescence vs. product failure.
IPC/EIA J-STD 001/C
Requires Clean Boards

- 8.3.1 No Particulate matter (all classes)
  - No lint, solder splash, dross, wire clippings
  - No loose or dislogable solder balls
- 8.3.2 Unless otherwise specified (all classes), assemblies shall be cleaned and be:
  - Free from flux residue (1X)
  - < 1.56 micrograms/cm² NaCl equivalent ionizables
- Appendix B standardizes a testing protocol to be used when implementing new flux materials or validating a cleaning process change
  - SIR, ROSE, Ion Chromatography
Flip Chip Cleaning Prior to Under-fill Improves Reliability by Preventing Under-fill Voids and Delamination

Delamination of under-fill will cause premature solder failure.

Under-fill Void traps foreign matter and concentrates physical force.
Lead Free Soldering Requires Stronger Fluxes/Cleaning or Nitrogen Oven Inertion

No-lead residues are discolored due to higher temperature profiles
Information vs. Myth

- Contract manufacturers have no marketing pressure to clean for product reliability. **False**
- OEM’s are not always fully informed on cleanings reliability benefits. **True**
Confusion Leads to Poor Choices

- Saving a dollar by not cleaning may cost $100’s of repairs or worst, lost customers
- Exponential rule of repair
  - Cleaning vs Not cleaning = $0.10 to $2
  - Repair @ board level = $1 to $20
  - Repair @ assembly level = $10 to $200
  - Repair @ customer level = $100 to $2000
Required Action of Us

- We need to –
  - Work with OEM’s to provide credible evidence that cleaning is much more reliable, and thus, more profitable vs not cleaning.
  - Work with CM’s to redefine the advantages of circuit cleaning.
  - Partner with customers to provide cleaning solutions to their current & future problems as knowledgeable cleaning professionals.
  - Define equipment/chemistry cleaning solutions to new technology problems with papers on
    - Flip chip, no-lead soldering, improving reliability
  - Work collectively to fully participate in industry committees or workshops related to cleaning
    - IPC, JEDEC, SMTA, IMAPS, SMEMA
  - Educate new industry professionals on cleaning basics
    - Cleaning book, conference courses, traveling cleaning road show