

**Developing a contact cleaning
system for the SMT industry**

A Case Study

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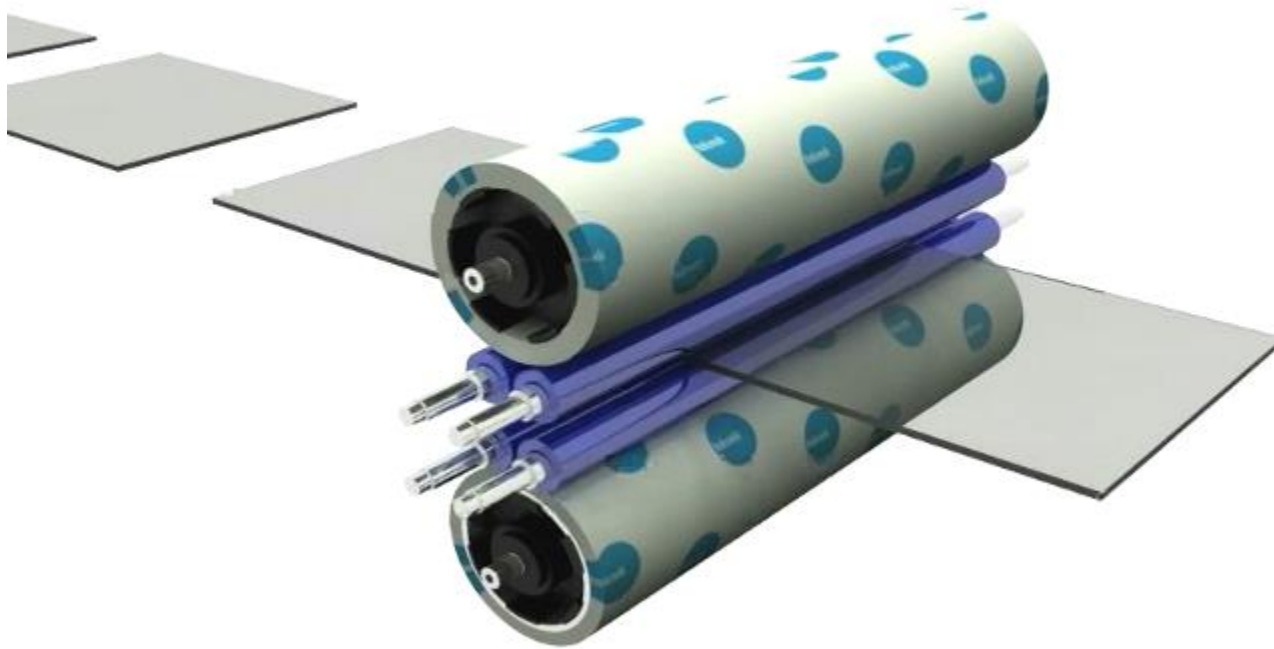
Objectives

- The key objectives of this development work are to
 - Have a contact cleaner which meets the requirements of ANSI ESD S20.20
 - Does not compromise of the cleaning effectiveness of the equipment

Outline

- The existing technology
- Applying the ANSI ESD Philosophy
- Results
- Conclusions

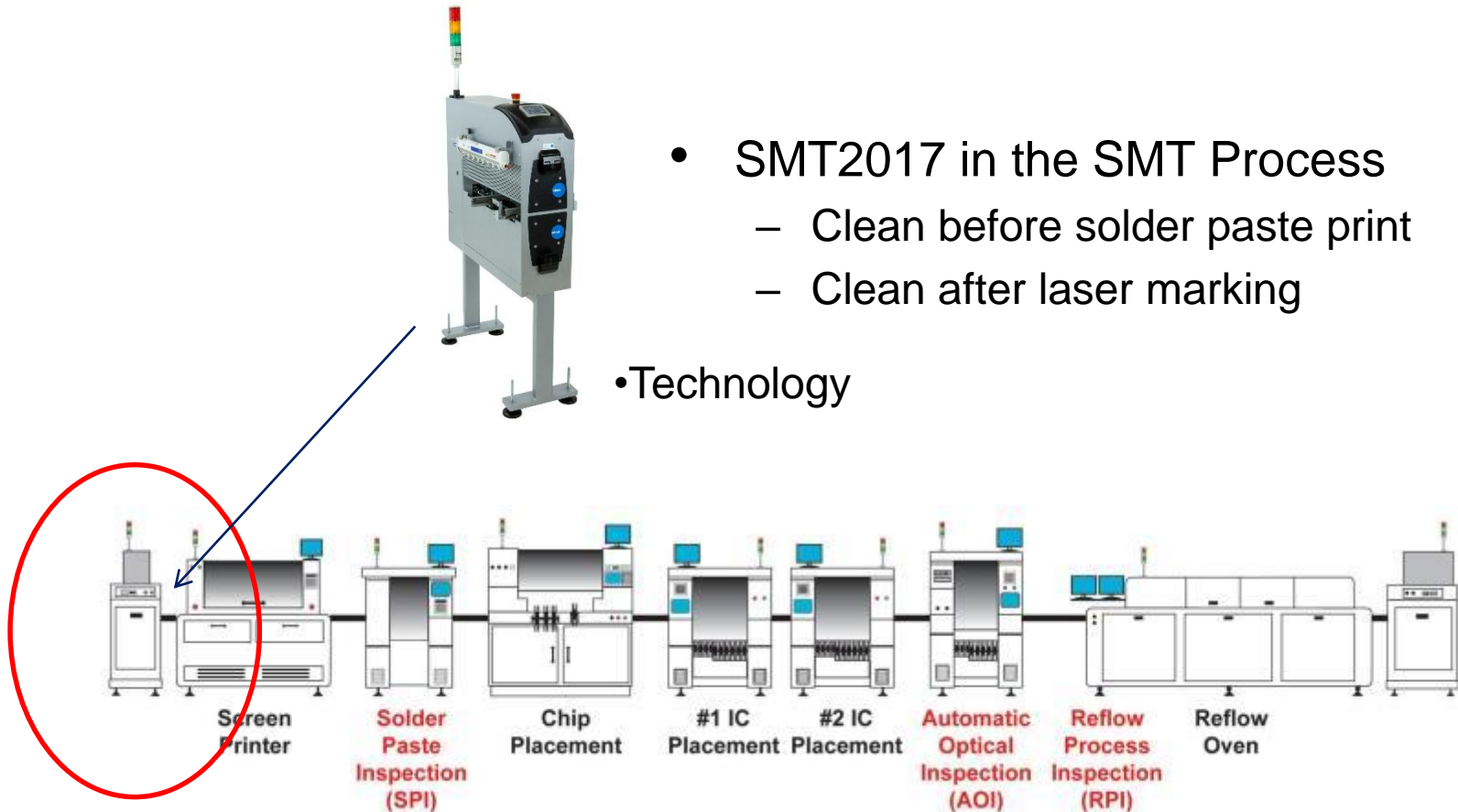
Existing Technology



SMT Application

- SMT2017 in the SMT Process
 - Clean before solder paste print
 - Clean after laser marking

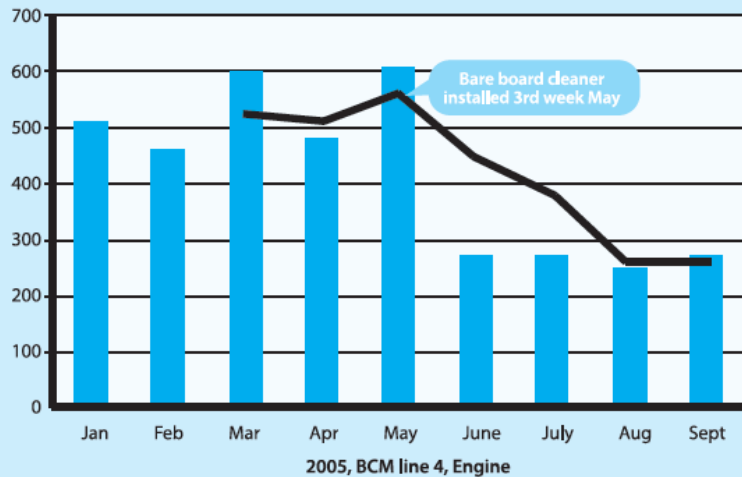
•Technology



Cleaning Performance

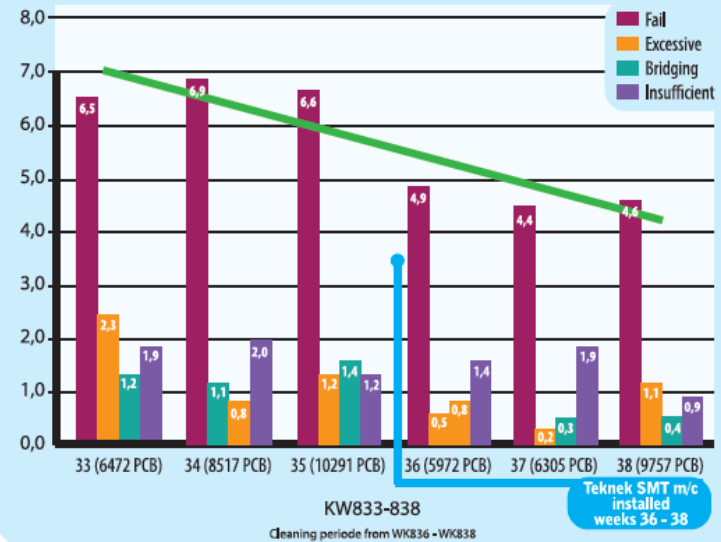
SMT DATA

BOARDS FAILED

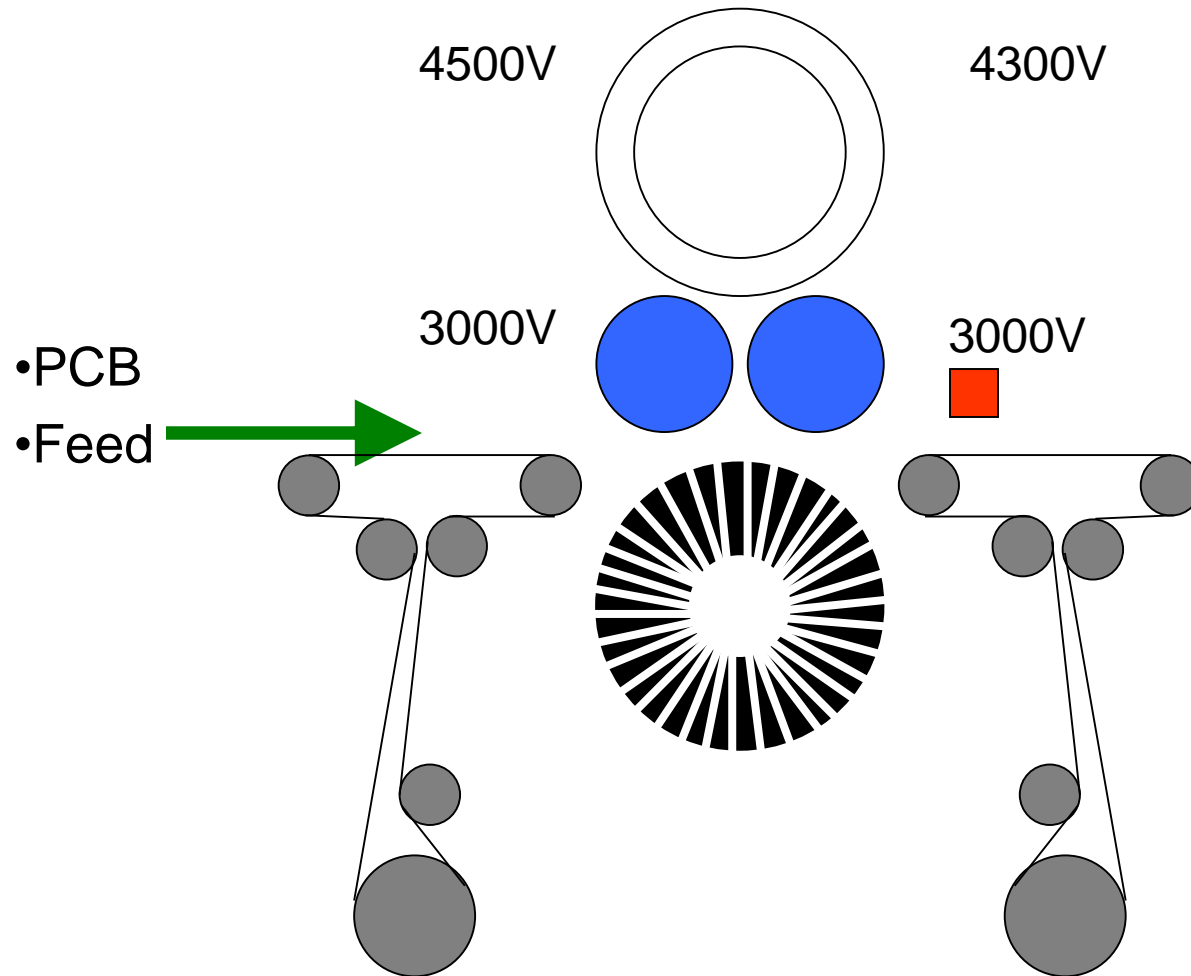


Source: US automotive electronics manufacturer

Results KohYoung Line Florenz (all in)



Existing static environment



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Grounding

- The rubber rollers which touch the PCB require to be grounded. This is challenging both because they are rotating but also because they have to be able to be pulled out from the machine frame as shown below



New Grounding Mechanism



Rubber cleaning rollers

- **ANSI ESD S20.20 requires all components which touch the board to have a surface resistance $< 10^9$ Ohms**
- Current conductive rollers do not meet this requirement at 10^{10} Ohms.
- Rubber has been reformulated to increase its conductivity .
- Nanoclean™ 20.20 now has surface resistance 10^8 Ohms verified by SGS
 - There are no conductive particles, the polymer is inherently conductive

Adhesive Roll

- Adhesive roll does not touch the PCB but is sited within 30mm of it.
- Allowable charge for HBM is 125V/25mm on an insulator giving a maximum of 150V for the adhesive roll
- Current charge levels are 4500V
- Adhesive roll has been made more conductive – allowing more dissipation of charge
- Adhesive roll has been formulated to have 45% lower tack reducing charge generation

Triboelectric Properties

- Silicone rollers: -120nC/J
- Nanoclean Rollers: $+40\text{nC/J}$
- Pressure sensitive adhesive: -10nC/J
- Epoxy Printed Circuit board: -32nC

- Silicone/ Adhesive Triboelectric gap: 110nC/J
- Silicone/ PCB Triboelectric gap: 88nC/J
- Nanoclean/ Adhesive Triboelectric gap: 50nC/J
- Nanoclean/PCB Triboelectric gap: 72nC/J

Measurement Ref: www.alphalabinc.com/triboelectric-series/

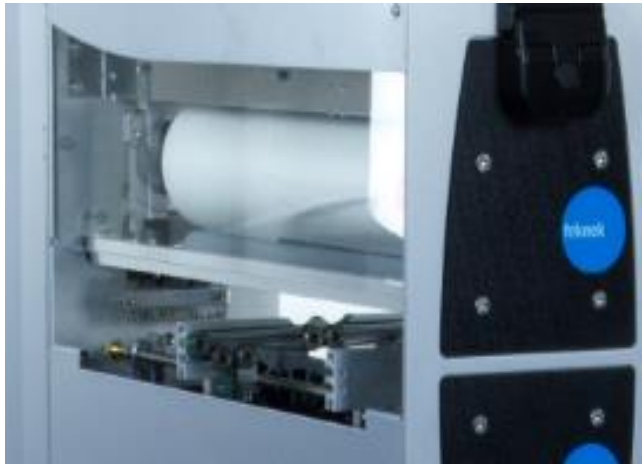
Reducing Tribocharging

- Second reformulation of rubber including additives to reduce the triboelectric gap between the rubber rollers and the board and also the rubber rollers and the PCB
- This formula also reduces the adhesion between the rollers and the adhesive – reducing charge generation
- New lighter weight roller with pressure control to reduce nip pressure
- New adhesive formulation with 45% reduction in tack to the rubber roller

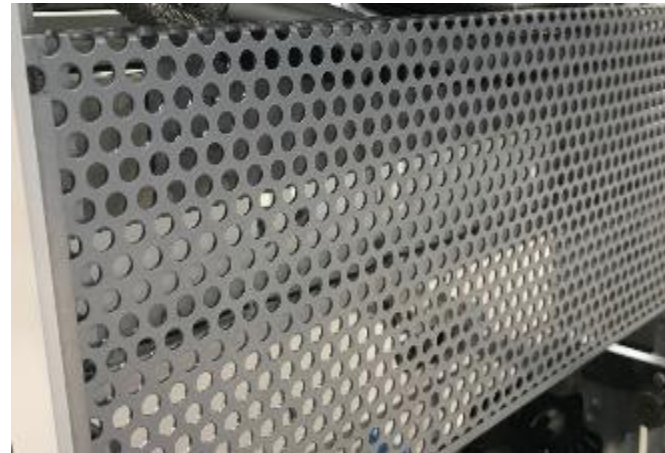
Insulator Removal

- ANSI/ESD recommends the removal of non-essential insulators

Existing Perspex Window



New Metal Window



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Static Results

TEST POSITION	TRADITIONAL (V)	New SMT 2017 (V)
Elastomer roller at machine entry	3000	10
Elastomer roller at machine exit	3000	10
Adhesive roll at machine entry	4500	90
Adhesive roll at machine exit	4300	80

Verification



Conclusions

- ANSI/ESD 20.20 provides excellent guidance for designers of Automated Handling Equipment seeking to minimize the static environment within their equipment.