
Schneider
Electric

Schneider Electric is a European multinational corporation that specializes in electricity distribution, automation management and produces installation components for energy management.

Brief Overview of Schneider Electric

Industry -*Electrical Equipment*

Founded- *1836, incorporated 1981*

Headquarters-*Rueil-Malmaison, France*

Key people-*Jean Pascal Tricoire (Chairman and CEO)*
-Henri Lachmann (Vice-Chairman and Lead Director)

Products -*Include programmable logic controllers, sensors, drives, uninterruptible, breakers, switchgear, switchboards, motor*

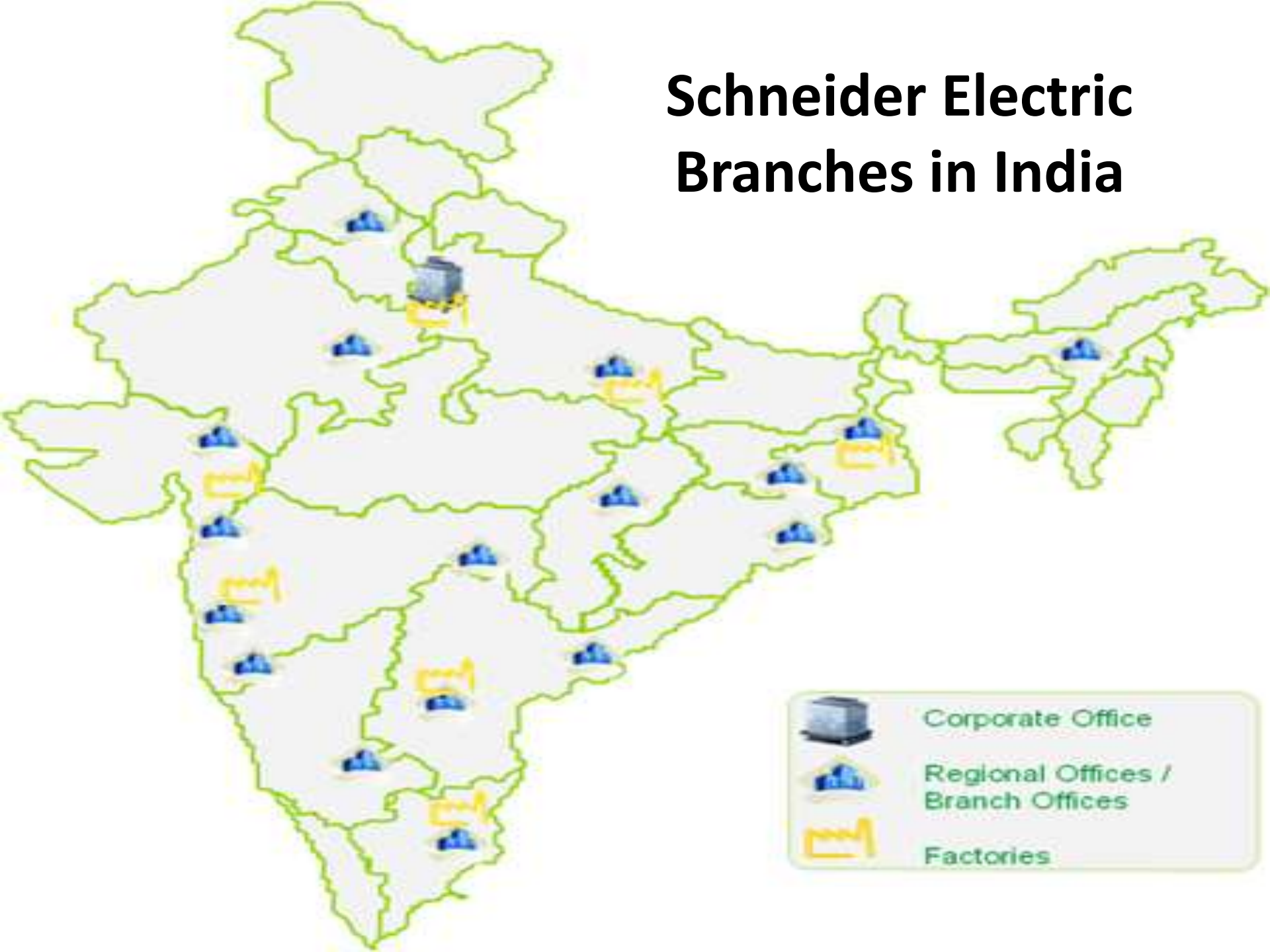
Owner-*Capital Group Companies(9.4%)*

Number of employees-*152,384 (2012)*

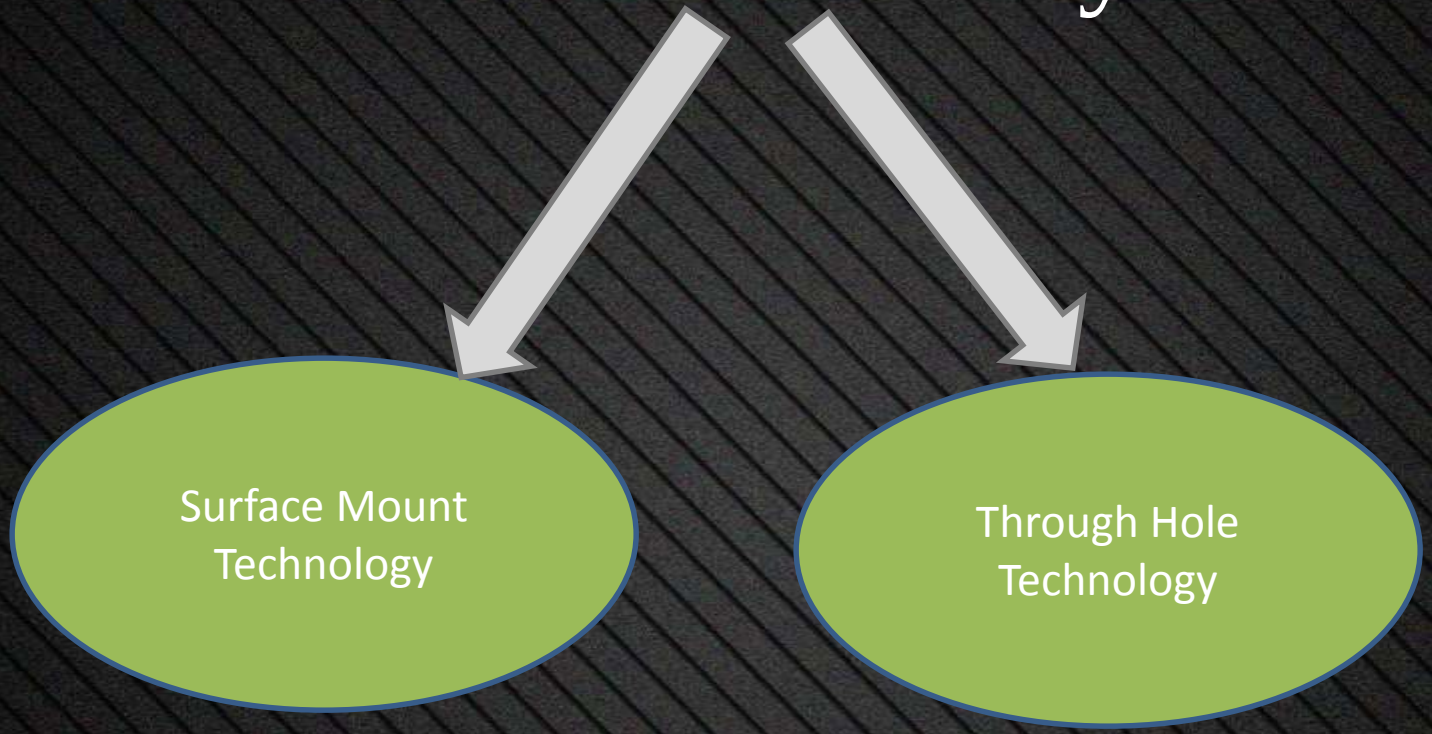
Schneider Electric

Miles & Milestones

Schneider Electric Branches in India



PCB Assembly

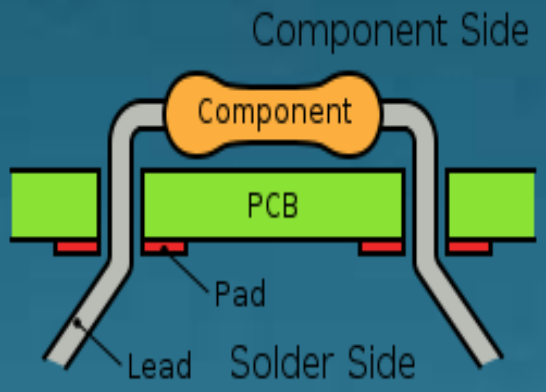


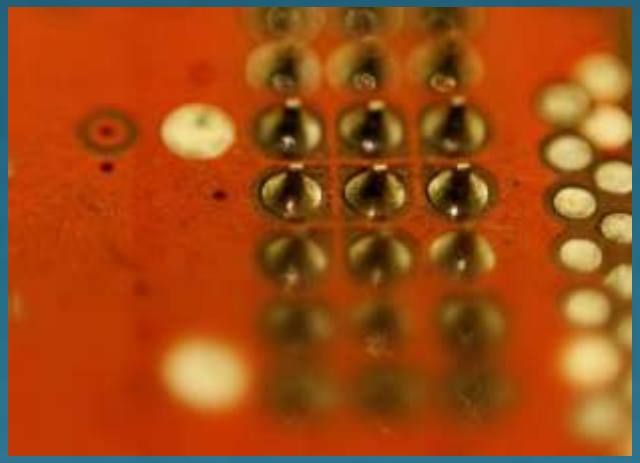
Surface Mounting Technology(SMT)

It’s a method for producing electronic circuits in which the components are mounted or placed directly onto the surface of printed circuit boards. An electronic device so made is called a surface-mount device .

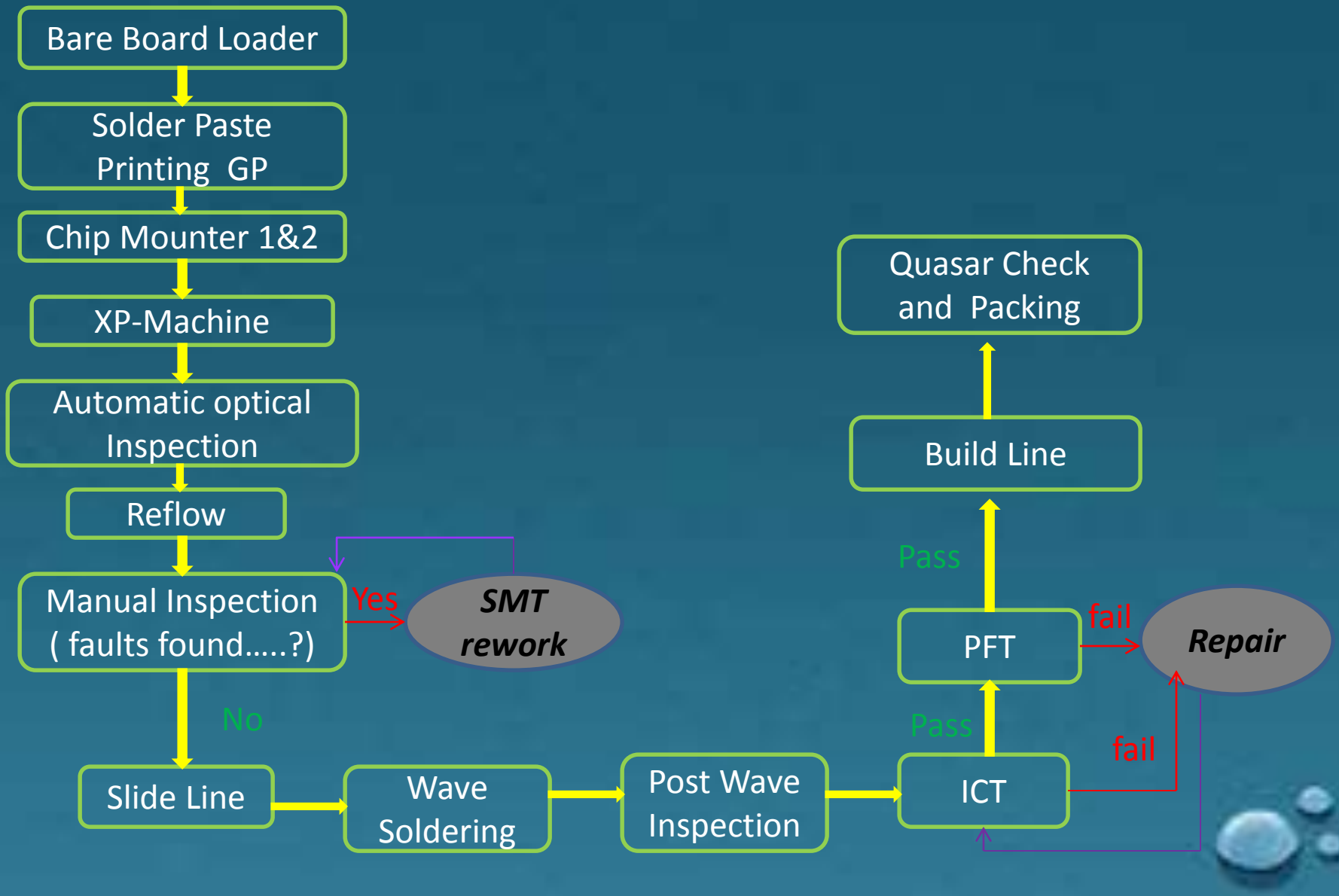
Through Hole Technology

This refers for mounting electronic components that involves the use of leads on the components that are inserted into holes drilled in printed circuit boards and soldered to pads on the opposite side either by manual assembly or by the use of automated insertion mount machines.





Process Flow of SMT



Bare PCB Loader

- A bare PCB from the manufacturer is loaded into this machine.
- It is conveyed to the solder paste printing machine by the conveyor .

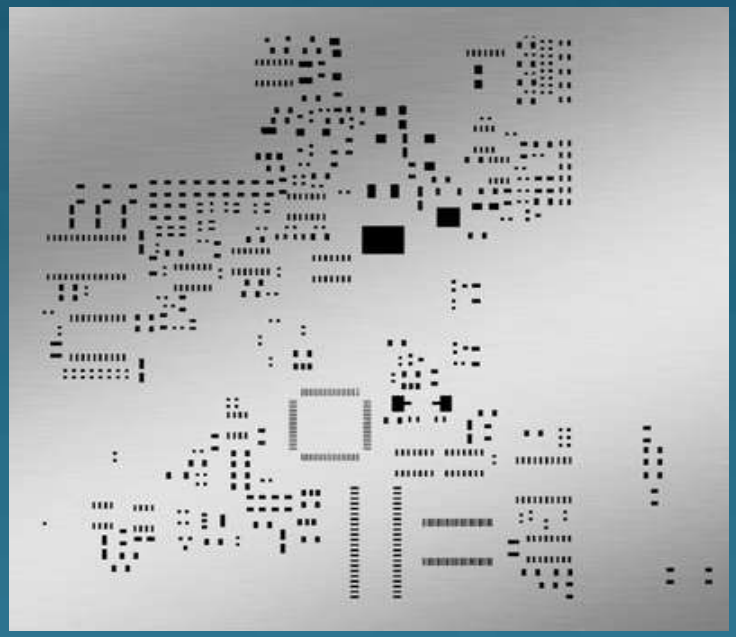
Continued :-

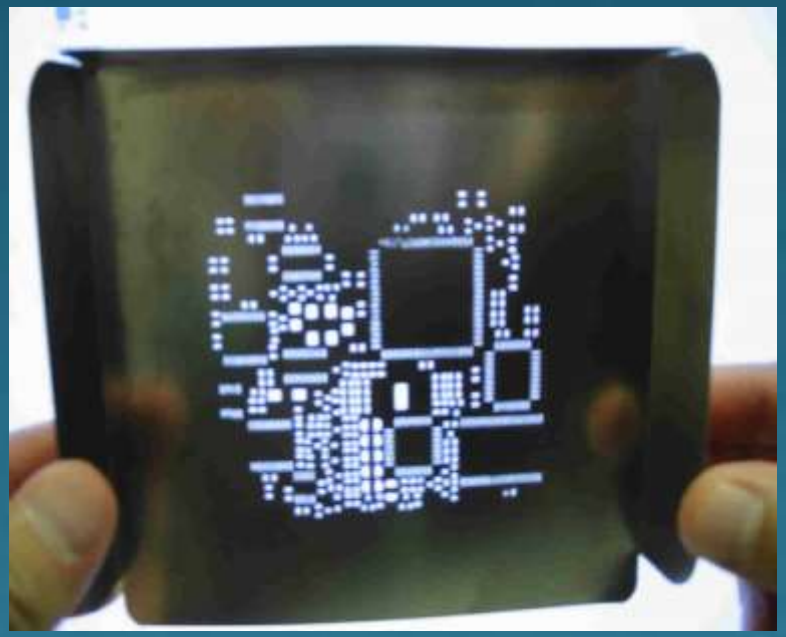
- A conveyor system is a common piece of mechanical handling equipment that moves materials from one location to another.
- Along this, blank PCBs travel, and a PCB clamp in the centre of the machine.

Stencil Printing

Stencil Printing is the process of depositing solder paste on the PCBs to establish electrical connections.

- This printing function is achieved through a single material namely **solder paste** which consists of solder metal and flux.





Stencil

Continued :-

- Paste also acts as an adhesive during component placement and reflow.
- The solder paste is smeared on the stencil by the **squeegee** based on the type of requirement by **selecting the program**.

Solder paste printing machine

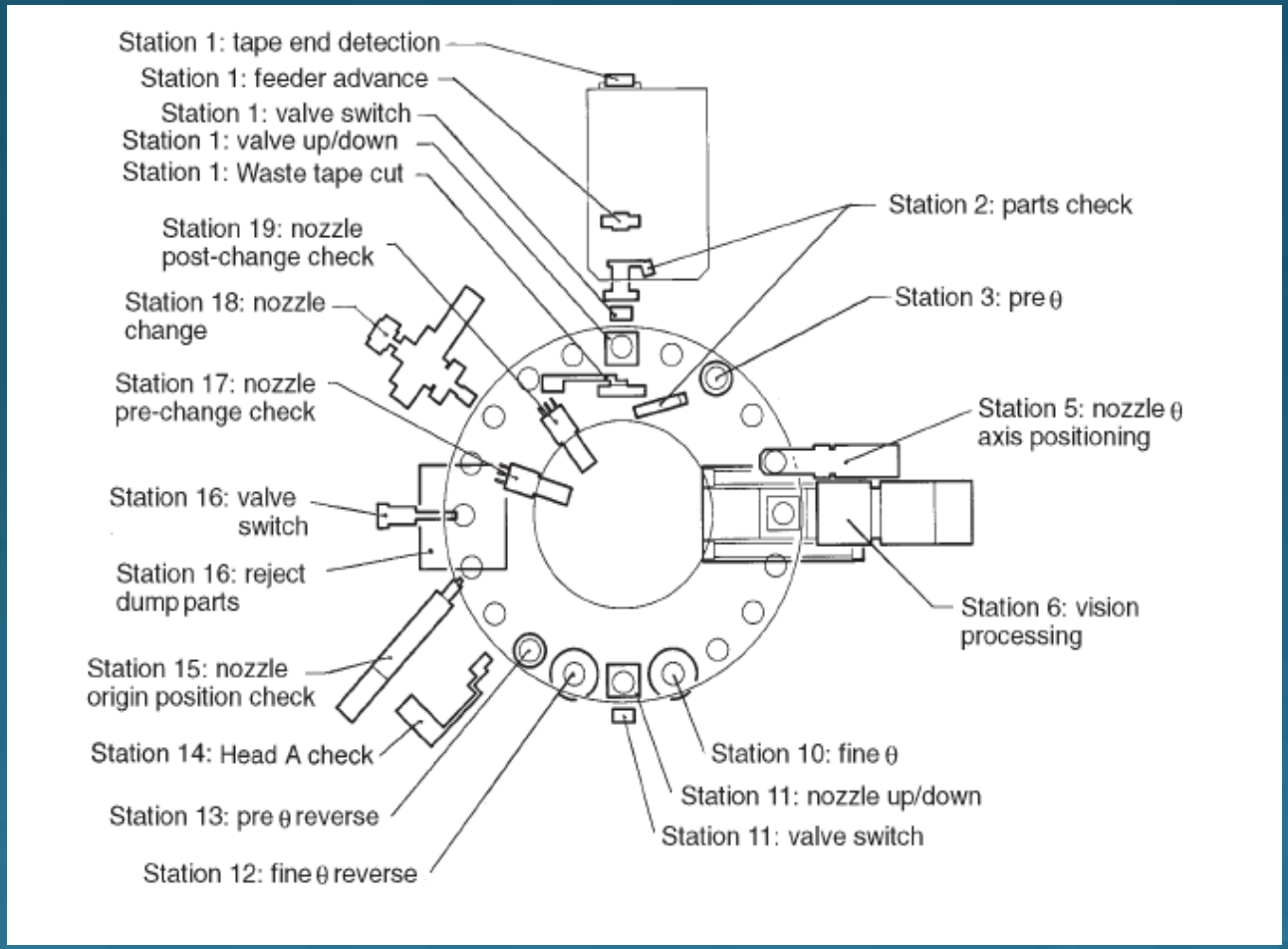
Chip Placing Machines 1&2

- These machines are used for mounting of SMT components
- The components mounted by nozzles are controlled by the **high speed low precision servomotor.**
- The mounting of the components in their specific order is **programmed** according to the PCB before the start of the process.

Turret Head

The **turret head** is a form of nozzle head lath that is used for repetitive production of duplicate parts, which by the nature of their placing process are usually interchangeable.

Turret Head with Different Stations



Function of each Station

Station	Function
1	Pick up part from the device table
2	Part detection (large parts only)
3	Pθ: Parts prerotation to either 0°, +90° or -90°
4	Idle
5	Placing head clutch alignment
6	Vision processing
7	Idle
8	Idle
9	Idle
10	Fθ: Fine placement angle rotation (including adjustment)
11	Placement
12	FRθ: Fθ reverse rotation
13	PRθ: Pθ reverse rotation
14	A-head detection
15	Nozzle clutch origin detection
16	Reject parts discarded
17	Detection of nozzle type No. 1 - No. 6
18	Nozzle change
19	Nozzle change check (detect nozzle type No. 1 - 6)
20	Idle

Specifications of Chip Placing Machine

- **Power Requirement**
  - 200 V AC (± 10 %), three-phase, 50/60 Hz
- **Power Consumption**
  - 9.5 KVA
- **Weight**
  - 5,950 kg
- **Part size**
  - 19 × 19 mm
- **Part height**
  - up to 6mm
- **Placing rate** (at 100 % Cam speed)
  - .o68 sec/part or 52841 cph

Fine Pitch(XP) Machine

- **Fine pitch** is used when referring to surface-mount components with a lead pitch of 25 mils or less.
- Here the components **mounted by nozzles** are controlled by low speed, high precision **servomotor**.

Specifications of XP Machine

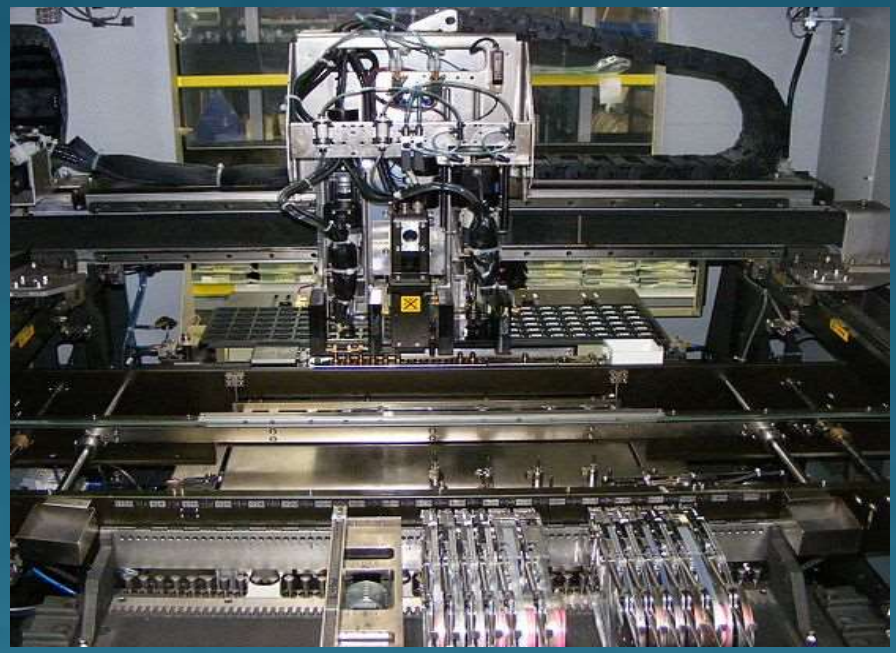
- XP-243eE can mount on PCB with weight up to 1kg.
- Max 17 nozzles can be stored at the nozzle storage unit.

Applicable components

- Size: 45 x 150 mm
- Height: Up to 25.4 mm

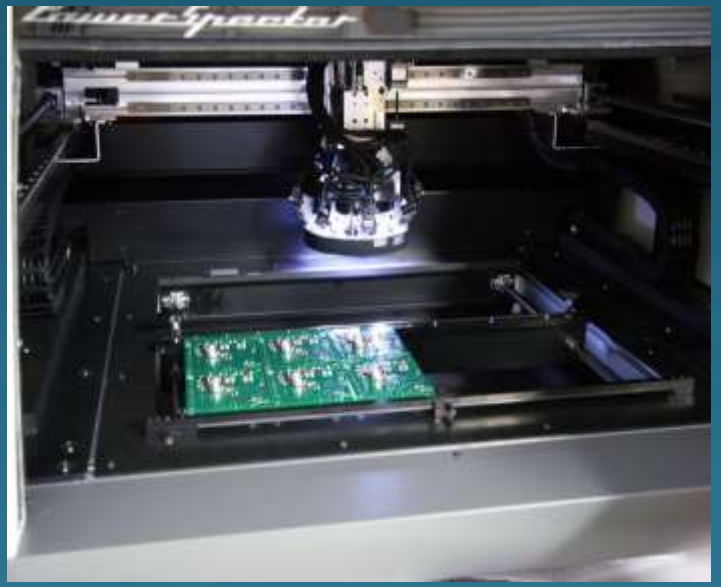
Placing Rate

- 0.43 sec./component or 8,370 cph.



Automated Optical Inspection

- It is an automated visual inspection of a wide range of products, such as **PCBs, LCDs, transistors, automotive parts** etc.
- Here **in PCB-inspection**, a camera autonomously scans the device under test for variety of surface feature defects such as **scratches** and **stains**, **open circuits, short circuits, thinning of the solder** as well as **missing components, incorrect components**, and **incorrectly placed components.**



Reflow Soldering

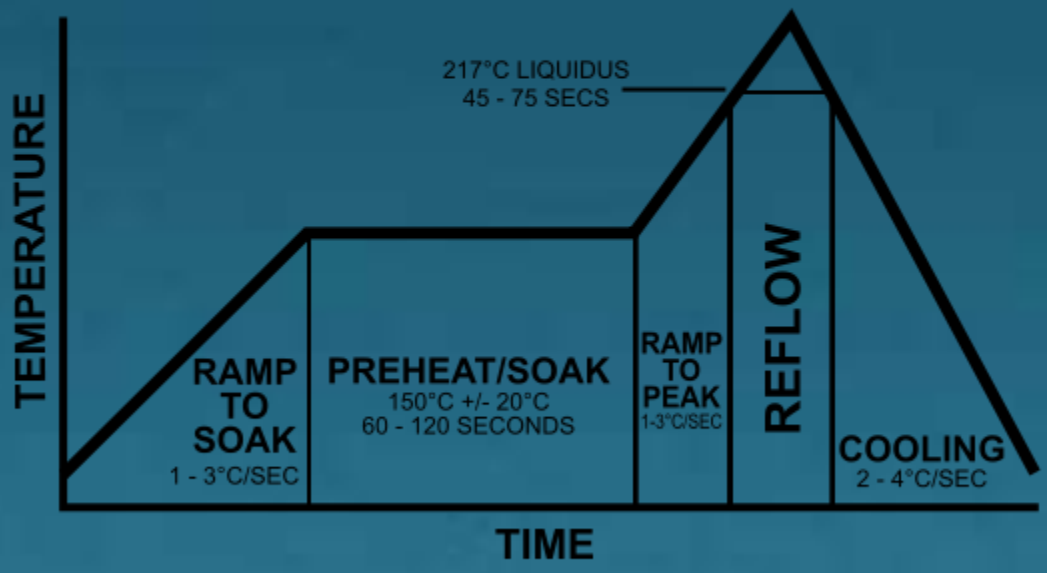
- Its a process in which a solder paste is used to temporarily attach one or several electrical components to their contact pads.
- After this the entire assembly is subjected to **controlled heat**, which melts the solder**, permanently connecting the joint.**

Soldering oven

Zones in Reflow Soldering

In the conventional reflow soldering process, there are usually four stages, called **"zones"**, each having a distinct thermal profile:

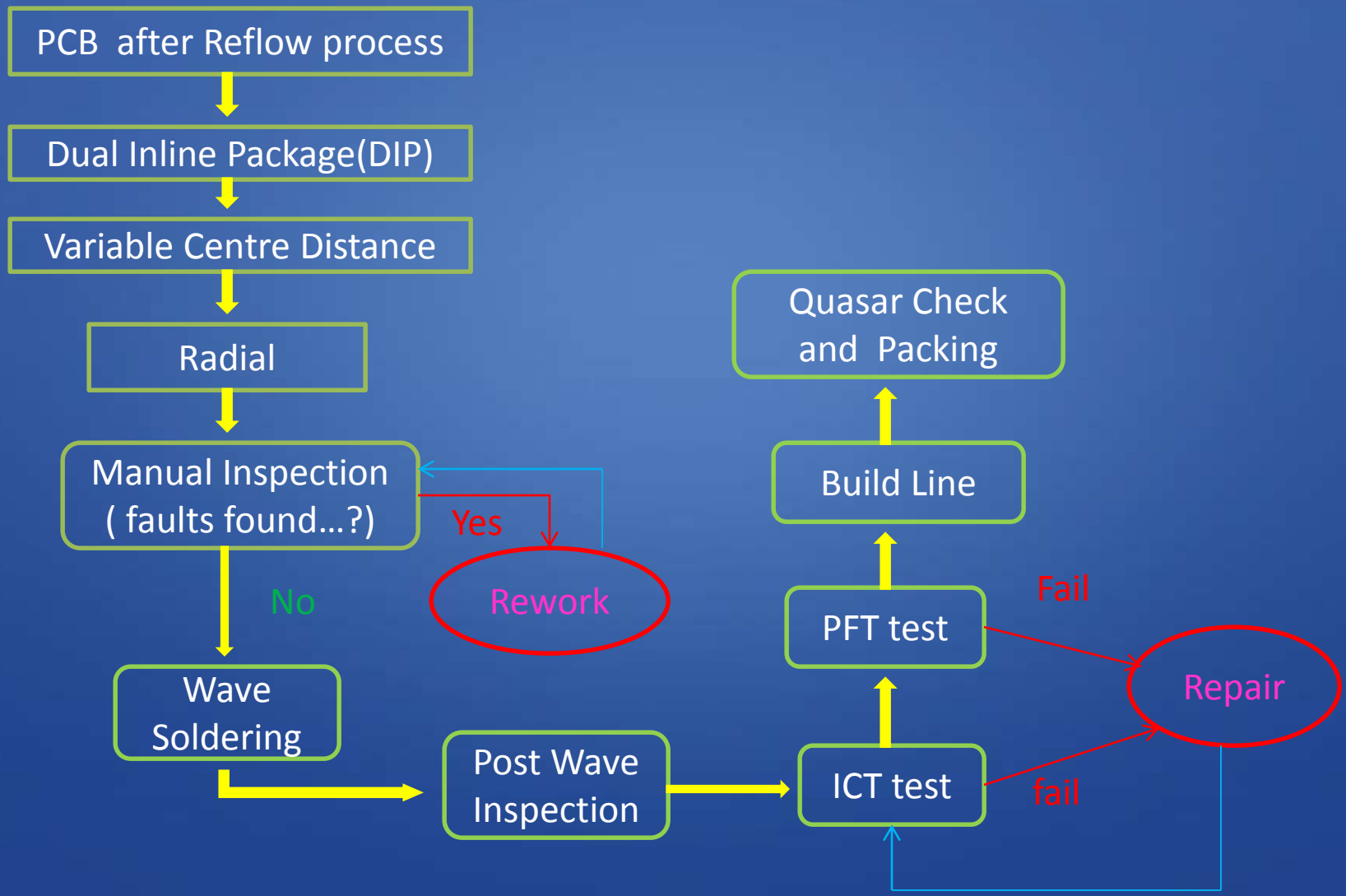
- ✓ Preheat,
- ✓ Thermal soak ,
- ✓ Reflow and
- ✓ cooling.



Specifications of Reflow Machine

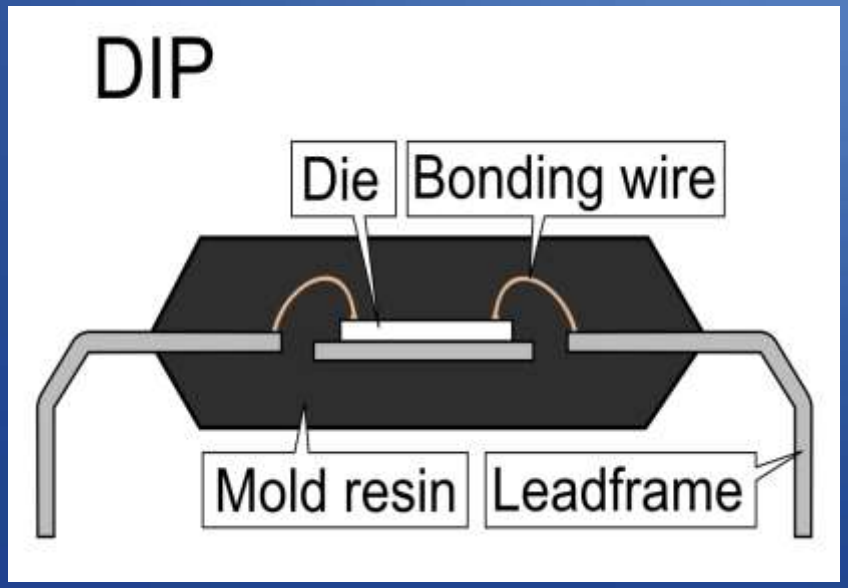
- ✓ Conveyor speed 0.98 ~ 5.26 ft/min.
- ✓ Board size 2cm ~ 10.23 cm (W 12.2" 16.14").
- ✓ Weight 1200kg.
- ✓ Conveyor direction L to R or R to L (changeable).
- ✓ Power input 200/208V ,3-ph ,50/60Hz ,42A.

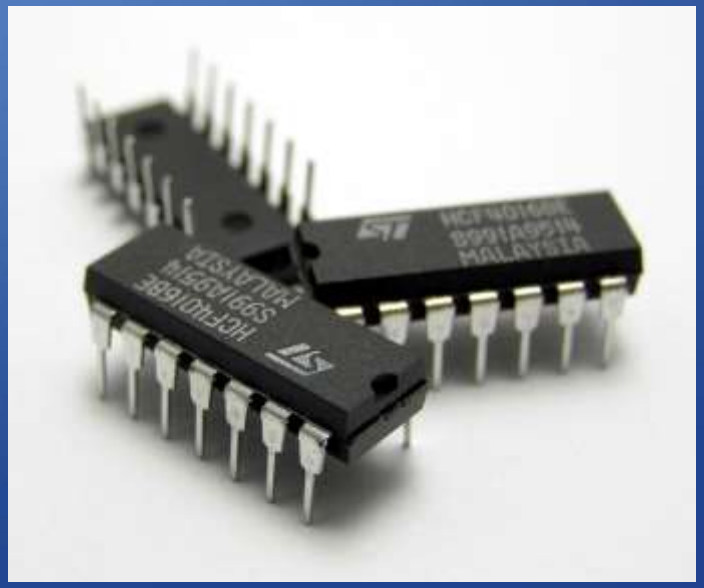
Process Flow of THT



Dual In-Line Package (DIP)

DIP is an electronic device package with a rectangular housing and two parallel rows of electrical connecting pins.





DIP Inserter

- A DIP inserter takes **ICs** from **tubes** which are loaded into **magazines**.
- A **shuttle mechanism** picks the needed component needed from the magazines and drops it into a transfer assembly.
- The **insertion head picks** the component from the transfer assembly and **inserts the IC into the board**
- And a **clinch assembly** underneath **cuts and bends** the leads either inward for sockets or outward for ICs.

Variable Centre Distance Inserter

- A VCD inserter takes axial leaded through-hole components from reels which are fed into dispensing heads that cut the parts onto a chain in the order of insertion.
- Then transferred from the sequence chain to the insertion chain, which brings the component underneath the insertion head.

Continued :-

- Then it cuts the leads of the component to the correct length for lead length and insertion span, bends the leads 90°.
- And then it inserts the component leads into the board while a clinch assembly underneath cuts and bends the leads towards each other.

Specifications of VCD Inserter

- **Power Requirement**
- 120 volts, 60Hz, single phase, 15 A.
- **Insertion Rate**
- Up to 15,000 ins/hour.
- **Weight**
- 975 kg
- **Machine Dimensions**
- **Width:** 70.38 inches (1788mm)
- **Depth:** 137.25 inches (3486mm)
- **Height**: 76.00 inches (1930mm)

Radial Insertion

- A radial inserter takes radial leaded THT components from reels.
- Then they are fed into dispensing heads that cut the component from the reel .
- Then place it onto the chain in sequence of the order of insertion.

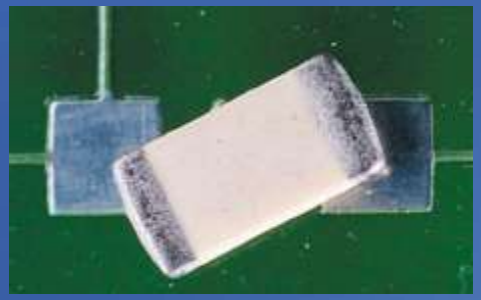
Continued :-

- Then component is brought to a component transfer assembly behind the insertion head;
- And is transferred to the insertion head.
- Then inserted into the board while a clinch assembly underneath cuts and bends the leads opposite to each other.

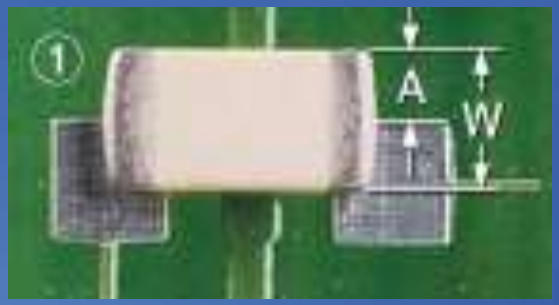
Manual Inspection

- It’s the inspection done manually for any defects found in the previous process.
- In this process any defects/errors in placing of components are manually detected and replaced.

Some Sample Defects



Skewing



Side Overhang

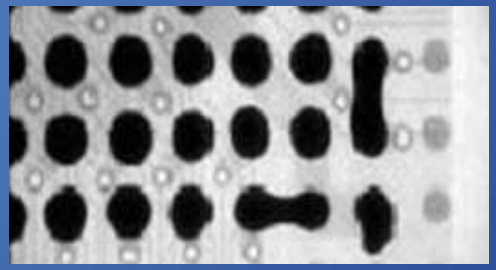
Mounting on Side

Components crack and damage

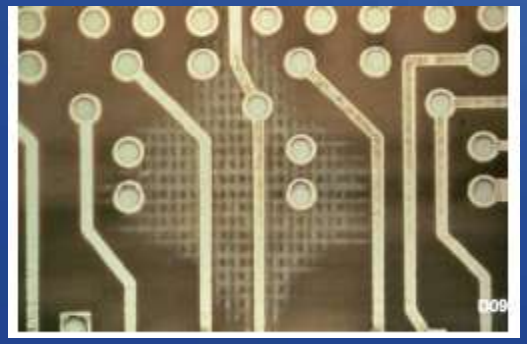
Continued :-

Burns

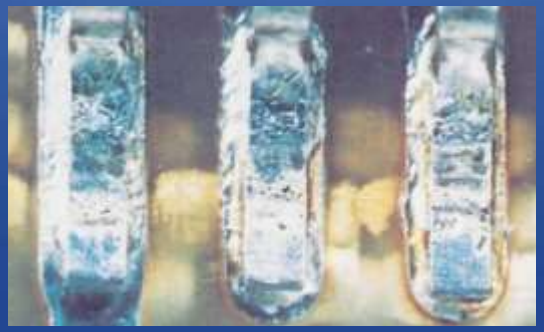
Blistering & Delamination



Solder Bridging



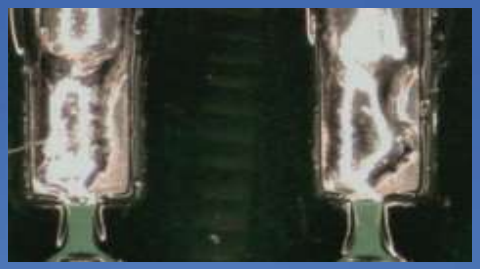
Crazing



Measling

Non wetting

Continued :-

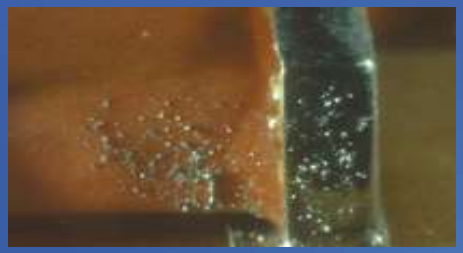


Dewetting

Incomplete Reflow of Solder Paste

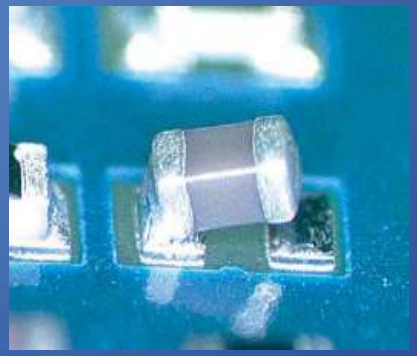
Solder Bridging

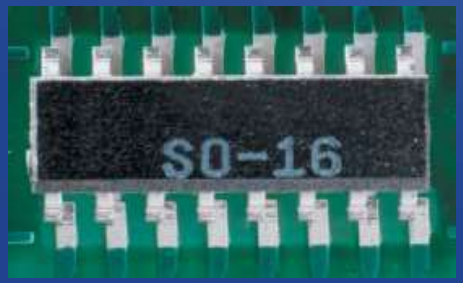
Continued :-



Formation of Solder Balls

Tombstoning





Side
Overhanging

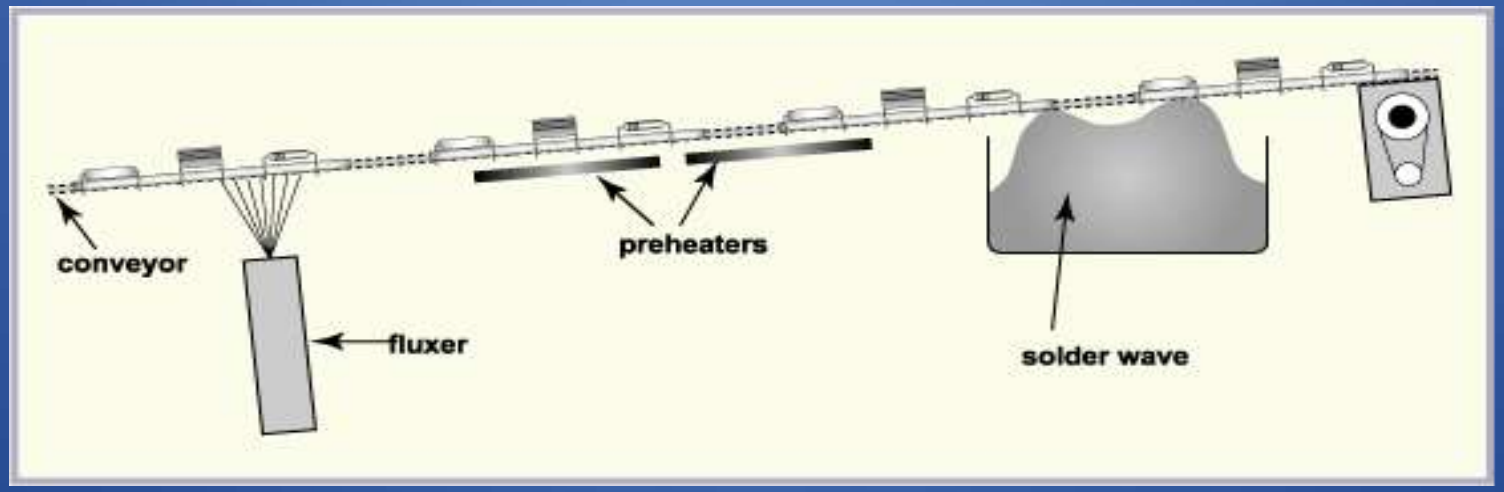
Slide Line

❖ Here the components which cannot be placed by machine is placed manually by hand.

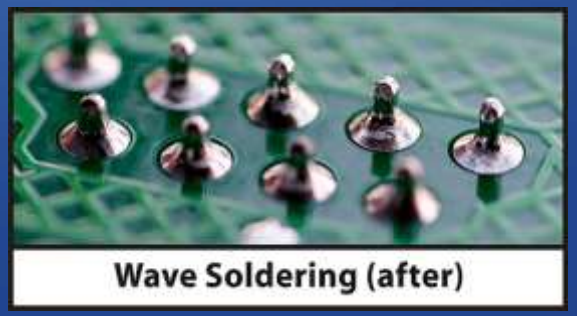
- Relay
- Transformer
- Capacitor
- Connectors
- Coil
- Inductor
- Fuse holder
- Inductor
- Display unit
- FET etc

Wave Soldering

- The name is derived from the use of waves of molten solder to attach metal components to the PCB.
- **Wave soldering** is used for both through-hole &SMT PCBs.




Wave Soldering (before)


Wave Soldering (after)

Continued:-

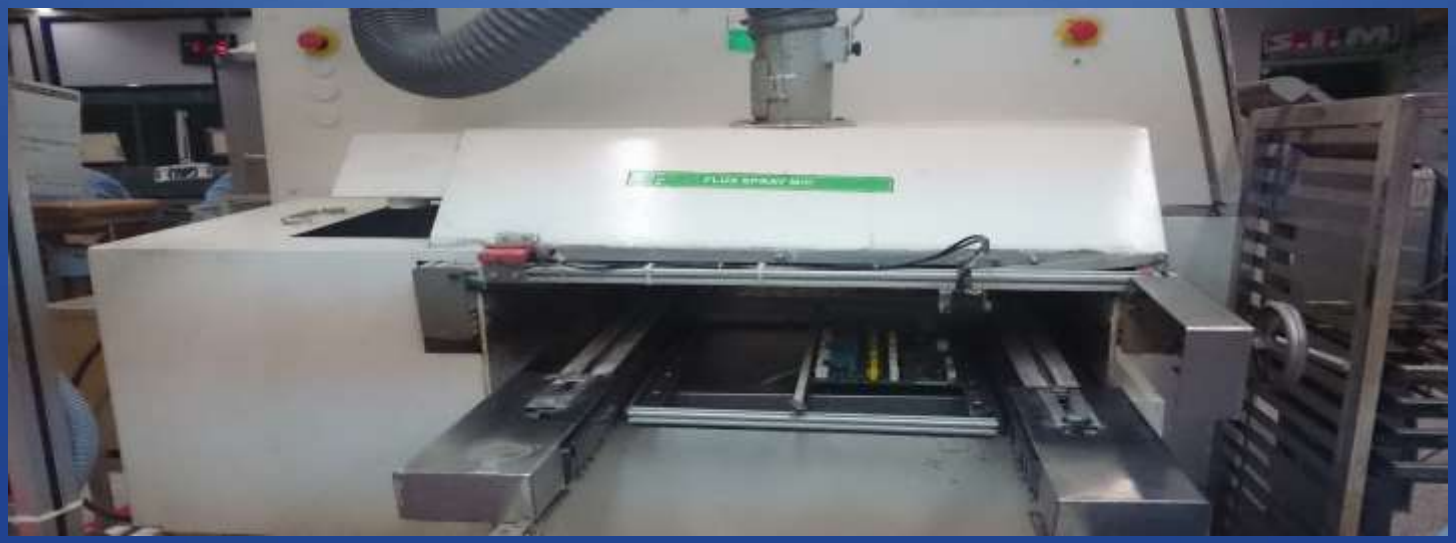
- For THT components, they are glued by the placement equipment onto the printed circuit board surface before being run through the molten solder wave.

Solder Wave

Wave Solder Process

Fluxing:-

- The primary objective is to clean the components that are to be soldered(oxide layers).
- There are two types of flux, corrosive and noncorrosive.
- Corrosive flux is quick and requires little precleaning, but has a higher acidity, The latter requires precleaning and is used when low acidity is required.



Continued :-

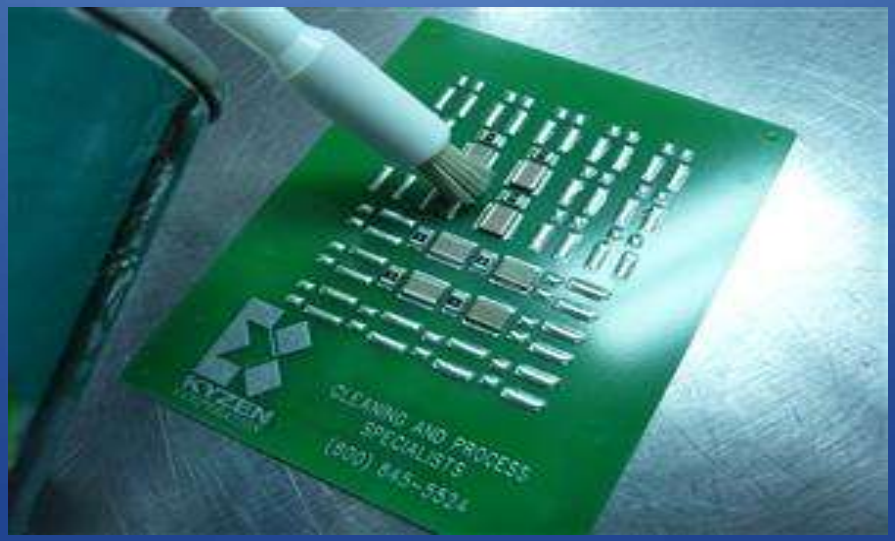
Preheating

- The preheating zone consists of convection heaters which blow hot air onto the PCB to increase its temperature.
- The upper preheater is usually an infrared heater.
- Preheating is necessary to activate the flux, and to remove any flux carrier solvents.
- Preheating is also necessary to prevent thermal shock.

Continued:-

Cleaning

- Some types of flux, called "no-clean" fluxes, do not require cleaning ; their residues are benign after the soldering process.
- Others, however, require a cleaning stage, in which the PCB is washed with solvents and de-ionized water to remove flux residue.



Visual Inspection & Rework

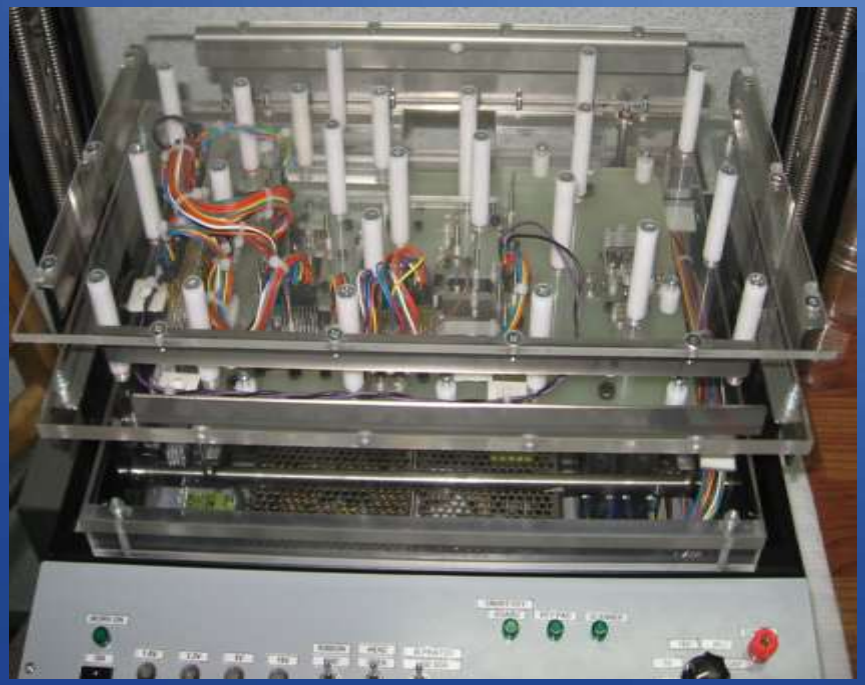
- The PCB is checked for any errors and there on passed to rework.
- In **Rework** defects are corrected and then sent to the next stages.

In Circuit Test

- **ICT** is a test where an electrical probe tests a (PCB), checking for shorts, opens, resistance, capacitance, and other basic quantities which will show whether the assembly was correctly fabricated.
- It may be performed with a bed of nails type test fixture and specialist test equipment, or with a fixtureless in-circuit test setup.

PCB Function Test

- The functional test is typically performed in the last phase of the production line of a product, as a final quality control.
- It provides a pass/fail determination on finished PCBs before they are shipped.



Continued:-

- An PFT's purpose in manufacturing is to validate that product hardware is free of defects that could, otherwise, adversely affect the product's correct functioning in a system application.

Quasar Check and Packaging

- Quasar is a software which stores information about the PCBs which pass through PFT .
- In case of any defect in future, info about the specific device can be obtained from the data banks, which is managed by quasar.

Schneider Electric

Products

Data Centers

Smart UPS

Prefabricated data center

Power distribution units

Products

Security &Environmental monitoring

Surge Protection

Mobile Accessories

Cooling Units

Audio Video Power Solutions


Thank You

Our Sincere Gratitude to

Santosh P.N

H.R Manager

K. Anand

Platform Team Leader

Sharvan

MFG. Tech

Process Engineer

Presented by:-

Sujith.J.S
Project Trainee
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