

SMT Preventative Maintenance: Nozzles

No SMT equipment can place accurately and run efficiently without quality nozzles and feeders. These two factors are the core of the pick and place process. If the machine is either unable to pick parts consistently or hold on to the components during the transport from feeder to PCB, defects will result.

Proper feeder and nozzle maintenance is critical, especially with the current market growth and technological advancements in SMT equipment.

At first sight the principle of using vacuum pressure and precision nozzles to enable component placement are basic and straightforward. There are five distinct stages to the pick and place process:

1. Picking
2. Holding
3. Transport
4. Placement
5. Release



Nozzles are the first and last thing to touch all components placed. Not to mention they move tens of thousands of these parts every hour. They have to hold the part during transport to the board while the machine is moving and/or rotating. The lack of proper nozzle maintenance and/or poor quality nozzles will lead to part issues, machine issues, and other process problems.

Each stage of the placement process must be executed repeatedly *without* failure. Careful review of these processes has determined the following five major issues associated with improper nozzle maintenance and/or the use of poor quality nozzles:

1. Loss of vacuum may be responsible for some issues as it may cause the nozzle to not be able to pick up a component from the feeder. It could also cause components to shift on the nozzle during transport. One of the main reasons for less suction and the loss of vacuum is that the quality of the nozzles isn't maintained during the manufacturing process. The quality and structure of the nozzle must match the component(s) it is designed to place. Another issue related to loss of vacuum is poor pickup location on the component. Poor quality nozzles can cause extra fatigue on the pick and place equipment as it must consistently acclimatize to maintain efficiency.

2. Short or worn nozzles result in poor pickup and can cause the part not to be embedded correctly into the paste. When the part is not placed into the paste correctly there is not enough surface tension to hold the part while the PCB is moving. Parts will shift. One benefit of

monitoring nozzle tip length is that it can allow you to schedule preventive maintenance in order to prevent your nozzle tips from causing quality issues.

On the other hand, nozzle tip wear can also cause less vacuum to be generated and cause parts to drop or shift during transport. New advancements in ceramics, ESD material, and special coatings allow nozzle manufacturers to design nozzles with amazing durability and toughness, especially under the extreme conditions in which they work.



3. Sticking nozzles may be responsible for many issues as it drastically changes the height at which the nozzle is presented. There are a few things that may cause this to happen. One of the most prominent is the quality of the material used to manufacture the nozzle. Over time, certain plastics and metals can deform, causing the nozzle to not fit correctly in its holder. This results in the nozzle sticking during the Picking, Transport, or Placement stages.

4. Higher than normal rejection rate at inspection caused by:

- Components not being presented to the nozzle in a consistent position
- Nozzle lighting being poor
 - Degradation of reflective disks over time
 - Dirty reflective disks
 - Poor quality of reflective disks
- Nozzle height incorrect
- Stuck nozzles from part height incorrectly set in program
 - Nozzles worn beyond their tolerances
 - Incorrect length tolerances on nozzles



5. Component and circuit board damage. (ESD) With the constant movement of nozzles and components, it is possible to build electrostatic charges on the nozzle tips. This charge, once released can damage vital components being placed. Electrostatic discharge is one of the major causes of device failures in the electronics and semiconductor industry. Manufacturers and users of integrated circuits must take precautions to avoid electrostatic discharge during the pick and place process. Nozzle manufacturers must also take precautions by researching and developing nozzles that utilize ESD (Electrostatic Dissipating) materials.



In summary, nozzles touch tens of thousands of components every hour. They are highly critical to the pick and place process. The need for proper preventative nozzle maintenance along with the use of high quality nozzles is essential to your process. By properly maintaining your pick and place equipment, nozzles, and feeders, you can save your company time and money.

There are many problems associated with not maintaining your equipment in regards to nozzles. Some of these issues include: mispicking of components, misplacement of components, tombstoning of components, or even flipped components. Other issues included sticking nozzles, component and circuit board damage from ESD, and higher rejection rates.

With so many nozzle manufacturers out there, sometimes it is hard to choose the right one. The best process is to factor the price to performance ratio. Pick a nozzle manufacture who offers high quality products at the most affordable pricing. Ask them about receiving sample nozzles for testing purposes to guarantee that the products perform as well as or better than OEM.

Your pick and place process is critical to your business. Remember, a down machine that can't place components and can't make you money. With appropriate preventative maintenance combined with high quality nozzles, **you can achieve better results!**



Count On Tools, Inc. is a US manufacturer of SMT placement nozzles, replacement parts, and consumables with over 20 years experience in the electronics industry.

COT offers a wide selection of aftermarket nozzles for Fuji, Juki, Panasonic, Siemens, Assembleon, Mirae, Mydata, Universal equipment as well as other consumables such as cutter blades, filters, springs, feeder parts, vacuum pump parts, belts, lamps, and more. COT also offers custom nozzle solutions for odd shaped components.

COT has the experience and manufacturing flexibility to be able to develop engineered solutions to satisfy your individual Process Requirements. Their industry knowledge and manufacturing expertise allows them to design and manufacture aftermarket nozzles and feeder

components for SMT equipment that save users time and money with their electronics manufacturing processes.

Choose a company you can COUNT ON!

