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PCA (Printed Circuit Assembly) and Electronic Devices Cleaning Station

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PCA (Printed Circuit Assembly) and Electronic Devices Cleaning Station

Abstract:

As part of the field/customer repair operation, PCA's (Printed Circuit Assembly) are received as defective material in many cases having large amount of dust and/or contamination particles incrustrated in them. This is due mainly to the years of operation where they receive little or no maintenance inside their products. When they are received as defective parts, the process is to thoroughly clean them in order for them to be able to be repaired and sold as spares parts.

Problem Statement:

Dust particles have been directly associated to different PCA's failures during their test and troubleshooting. During their repair processes the following failures are observed; low processing performance, latent failures, Electrostatic Discharges (ESD) failures and shorted circuits.

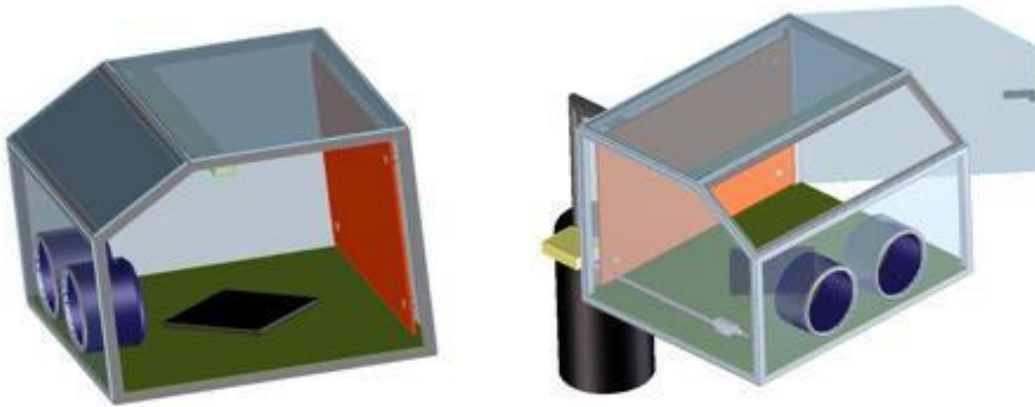
Since they are received with significant amount of dust and contamination, their handling during the repair process have been extremely challenging. They cause poor indoor air quality environment which is directly affecting the operator's health due to their exposure to the pollutant. Some of the symptoms associated to this have been irritation of the eyes, nose, and throat, headaches, dizziness, nausea, shortness of breath and fatigue that depending on the amount time exposed could incur in a potential OSHA (Occupational Safety Health Administration) Risk.

In order minimize issues related to the operators' health and increase product quality, a new process is required in order to define and implement a solution to clean the excess of particulates incrustrated on the assemblies and/ or any other electronic device surface, in a safe environment that could protect the operator's health during their handling process.

The solution must comply with the ESD Standard.

Our Solution:

The developed solution was designed considering ESD requirements as one of the key parameters to guarantee high quality and reliability during the PCA's cleaning operation. This station could be used to complete Preventive Maintenance services to any sensitive electronic devices such as servers, PCs, Network racks, etc.



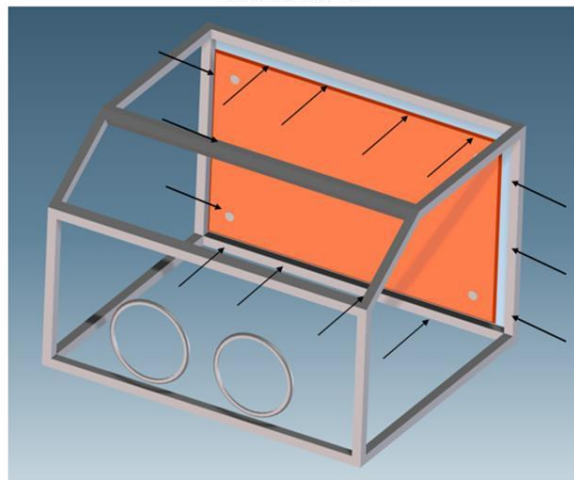
The enclosed cleaning system was developed in which the operators use a pressurized and ionized air gun equipment to blow out the dust contaminants incrustated on the assemblies. In this system, the dust residues are kept inside the enclosure due to a negative pressure environment which is provided by the external vacuum system.

In order to improve the negative air pressure inside the enclosure station, a suction double back wall was designed with the following specs:

- Suction double back wall dimensions: 32" x 20" x 0.250"
- Back wall side cover dimensions: 34" x 22 x 0.250"
- Gap between both walls: 1.250"

This improvement reduces the internal suction volume dramatically resulting in a 4 times faster dust recovery from the enclosure through the vacuum when the station is fully operated (if compared with the same mechanism without the suction double back wall installed).

Internal Air Flow using a double back wall



Dust particles are also collected internally inside the vacuum system (HEPA filtered), which uses a disposal bag, to avoid any dust leaks around the unit under the operation. In addition, an internally rotary table was added to improve the electronic device handling during the cleaning process. To guarantee the operator's visibility, the station has been equipped with an LED light assembly.

The external dimensions of the cleaning station are: 36" w x 30" d x 24" h.

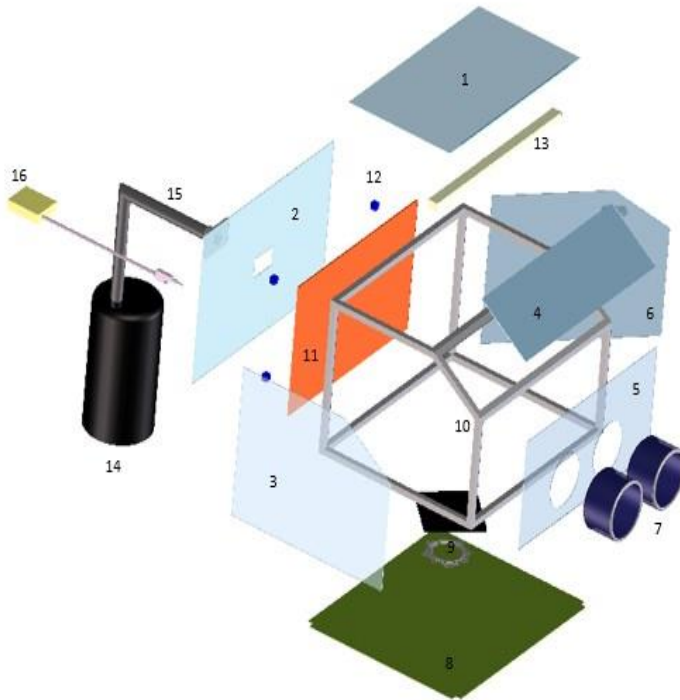
The custom cleaning solution meets all requirements and needs that include the following components:

- Enclosure mechanism to avoid air pollution around the area
- Clear static dissipative polycarbonate sheets to improve visibility (ESD Safe)
- Aluminum frame to reduce weight (1" x 1" Aluminum tube)
- Vacuum cleaner (Nilfisk Attix 50), a pressure air gun ionizer (Simco Top Gun3) and a LED powered lighting fixture integrated inside the mechanism
- Pressure air gun ionizer to eliminate any ESD risk during the blowing cleaning process
- Vacuum cleaner is used to recover all dust particles inside the enclosure
- Vacuum equipped with HEPA filtered cartridge to avoid dust leakage to the environment
- The station could be assembled on a custom cart for an easy transportation and/or any adjustable workbench to reach the operator's height requirements

Similar technologies are found for cleaning medical devices parts but mostly focuses on a stationary booth. These systems uses AC motors and independent filter to produce negative pressure and captured contaminants respectively.

PCA (Printed Circuit Assembly) and Electronic Devices Cleaning Station

Exploded View



Item No.	Description	Material	Qty
1	Top side cover	ESD Polycarbonated Sheet	1
2	Back wall side cover	ESD Polycarbonated Sheet	1
3	Left side cover	ESD Polycarbonated Sheet	1
4	Front side viewer	ESD Polycarbonated Sheet	1
5	Front side cover	ESD Polycarbonated Sheet	1
6	Access Door	ESD Polycarbonated Sheet	1
7	Cabinet gloves	Polyethylene	2
8	Bottom floor	EMHW Sheet 0.500" thick	1
9	Rotary table	EMHW Sheet 0.500" thick	1
10	Cabinet frame	Aluminum 6061 1" x 1"	1
11	Suction double back wall	Aluminum 6061 sheet	1
12	Spacers	Aluminum 6061 1" rounded x 1" L	4
13	LED Lightning fixture	Aluminum frame	1
14	HEPA Vacuum Cleaner	ESD Safe	1
15	Vacuum hose	ESD Safe	1
16	Ionized air gun	ESD Safe	1

Before & after pictures using the cleaning station to remove dust particles from a Network Switch Assembly:

