

Desmear (DSM)

Cleaning of laser drilled holes and roughening of ABF surface

Tool Overview:

Process Name : Desmear



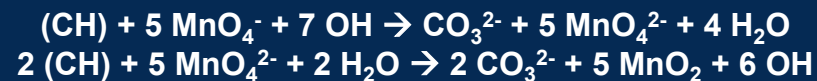
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Desmear mainly include 3 steps:

Swelling : Resin preparation for an optimum attack of the permanganate etch solution – guarantees a micro roughness on the epoxy surface.

Micro etching : Chemical treatment to clean Laser via holes and roughen surface for copper adhesion
The permanganate etching removes epoxy resin swollen in the sweller.
The alkaline permanganate solution (MnO_4^-) is reduced in the reaction process via the intermediate product Manganese (MnO_4^{2-}) to non-soluble manganese dioxide (MnO_2 = brown stone).
To keep the process capable of reaction, the emerging manganese (MnO_4^{2-}) will be re-oxidized by means of regenerator electrolytic ally to Permanganate (MnO_4^-).
The brown stone deposited in the module must be removed from the module by means of cleaning.



Reduction : Reduction and removal of manganese dioxide residues.



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Process Sequence

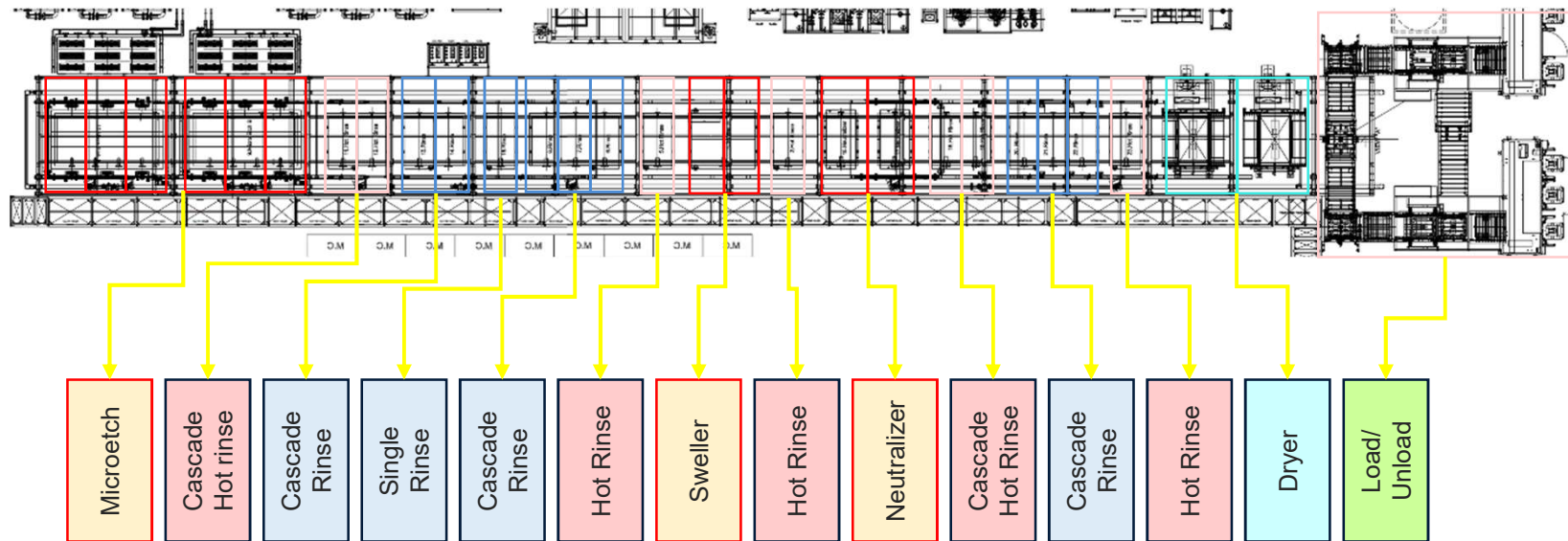
Module Name	Function
Loader/Unloader	Panel is loaded from a magazine onto a conveyor, gets centered and transported and loaded into basket
Hot rinse	Remove the FM on panel surface and wetting panel before dip into Sweller
Sweller	Swell the ABF film and serve purpose of removing the residue due to drilling
Hot rinse	The rinse serves the purpose of optimal cleaning of the drilled holes and the panel surface
3 cascaded rinse	Refresh with DI water all the time for better cleaning.
Micro-etch	Serves the purpose of removing of epoxy resin swollen in the Sweller
2 cascaded hot rinse	Equipped with ultrasonic and heater for better panel surface cleaning.
3 cascaded rinse	Refresh with DI water all the time for better cleaning.
Neutralizer	Reduces the acidic potassium permanganate and totally removes residues from the manganese dioxide
2 cascaded hot rinse	Equipped with ultrasonic and heater for better panel surface and via cleaning.
3 cascaded rinse	Equipped with ultrasonic and heater for better panel surface and via cleaning.
Hot rinse	Last hot rinse, to ensure no chemical and FM residue on Panel surface.
Dryer	80°C temperature can ensure the basket and panel can get dried before go to next step.



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Loader/Unloader	Sweller Module	Rinse Module post Sweller	Micro-etch Module
			
<ul style="list-style-type: none">• Panel is loaded from a magazine onto a conveyor, gets centered, transported and loaded into basket• The basket wait at loader and unloader part, transported into or out the main line	<ul style="list-style-type: none">• Resin preparation for an optimum attack of the permanganate etch solution.• For TKC tool, Sweller Module include DI/Chemical dosing system, 4 groups heater, cooling, circulation system.• The circulation filter use 1 um type material	<ul style="list-style-type: none">• 3 cascaded rinse, the 1st cascaded module DI keeps on to refresh with DI water all the time for better cleaning.• Rinse module equipped with air agitation to ensure the DI well cleaned the panel surface, the conductivity meter to monitor the module cleanliness.	<ul style="list-style-type: none">• The permanganate etch solution removes resin smear from the inner layers and cleans the hole wall surface and roughens the epoxy resin surfaces• The micro-etch module equipped with DI/chemical dosing system, include 35 groups heater, cooling system, and 3 groups of circulation system, filter use 20 um type SUS material



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Rinse Module Post Micro-etch	Neutralizer Module	Rinse Module Post Neutralizer	Dryer
			
<ul style="list-style-type: none">• Hot rinse post micro-etch, the 1st cascaded rinse dosing with Neutralizer in order to pre-clean the panel and basket• The 2 cascaded module equipped with heater (4 group for each module),and circulation system, DI/chemical dosing system, ultrasonic system(1 group for each module)	<ul style="list-style-type: none">• Reduction and removal of manganese dioxide residues, The reduction cleaner reduces the acidic potassium permanganate and totally removes residues from the manganese dioxide• The module equipped 4 groups heater, cooling system, circulation system, DI/Chemical dosing system. The circulation filter use PP material	<ul style="list-style-type: none">• Hot rinse post Neutralizer, 2 cascaded hot rinse with DI to clean the panel post chemical, ultrasonic power to remove the filler in the via• The module equipped 4 groups heater, circulation system, DI dosing system, ultrasonic system(2 groups for each module)	<ul style="list-style-type: none">• 80°C temperature can ensure the basket and panel can get dried before go to next step.• The module equipped the heater, the blower blow out to dry the panel surface, via and basket



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Inline Control

Process	Potential failure Mode	Control plan
Build-Up Desmear	Top defect: (Low risk) <ul style="list-style-type: none">• GE22 GE22 SUS mode, the ultrasonic equipment surface damage seriously cause FM spread into the copper line and surface, decrease the power of ultrasonic to decrease the damage, change the new equipment every 3 month• CU54 Excursion case: (Low risk) <ul style="list-style-type: none">• Panel drop• PET Film remain Potential Failure: (low risk) <ul style="list-style-type: none">• Panel damage• Scratch• ABF Bleed Out• Via Bottom residue• Dark via• ED16	<u>Chemistry monitor:</u> <ul style="list-style-type: none">• Sample size: all chemical tank• Tool/Method: C-lab CVS• Frequency: 2 times per day• Bath life: Rinse tank(10days) / Neutralizer tank(14 days or 49100 panels whichever comes first) / Micro-etch tank(SG beyond 1.16 or 6 weeks whichever comes first) / Sweller(21 days or 98200 panels whichever comes first)
		<u>Product monitor:</u> <ul style="list-style-type: none">• 2 Ra test panel post each PM (Ra within baseline)• 1 Via test panel post each PM(no via residue)• 1 weight loss panel post each PM(0.3g-0.9g)• 1 QVP/PS data every week(QVP: No fail mode1/PS:T31>0.5kgf/cm2)• 1 Ra uniformity panel every week (Ra within baseline)
		<u>Inline yield monitor:</u> <ol style="list-style-type: none">1. M/C auto stop by OPC function(Chemical concentration/rectifier output/recipe download/pump status/flowrate/tank temperature).2. Daily checklist by shift

