

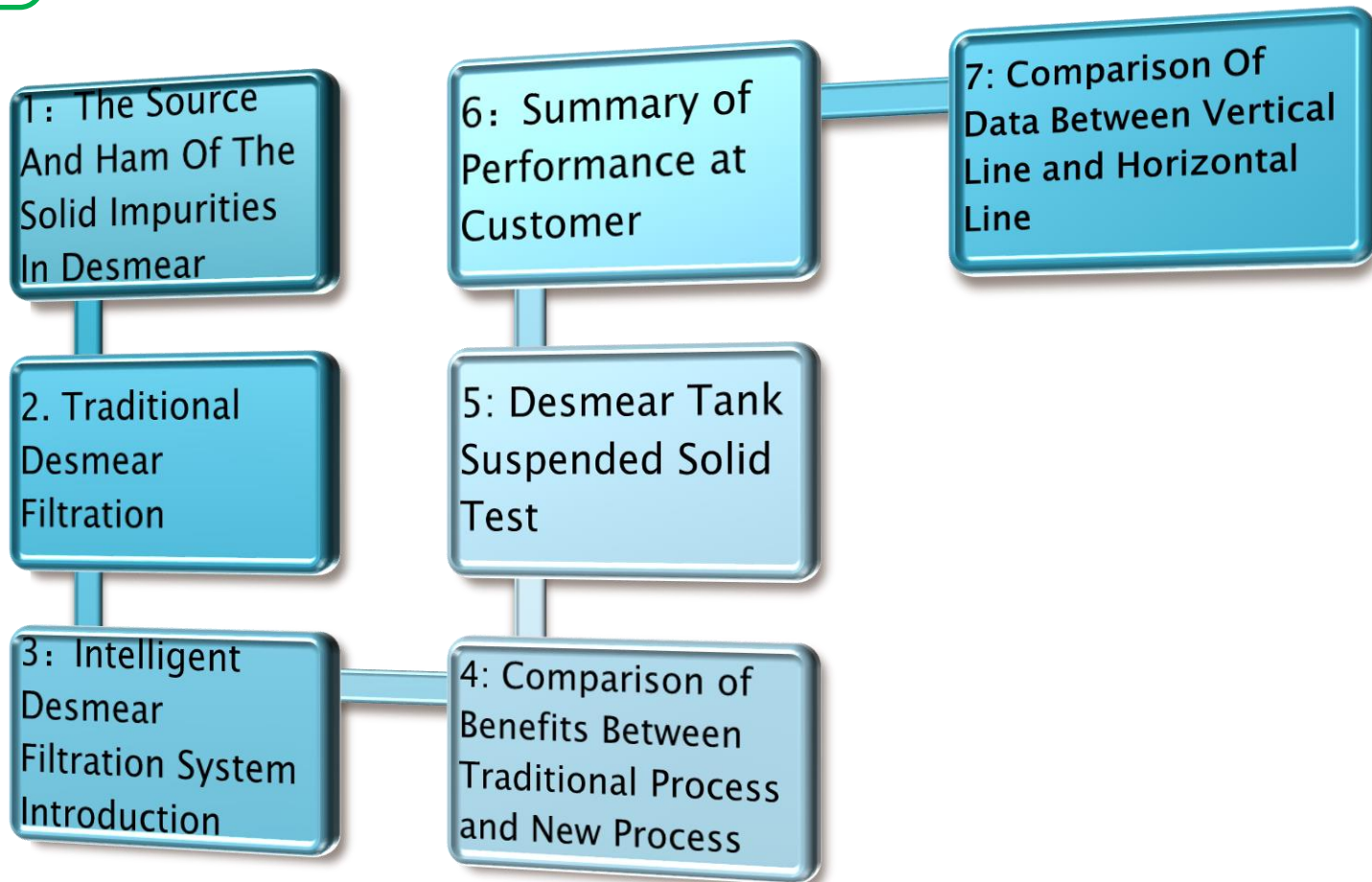


Sun Pride Semi-conductor Technology Co Ltd

Intelligent Desmear Filtration Equipment

Enter A New Era of Automatic Intelligent
Environmental Protection

Content

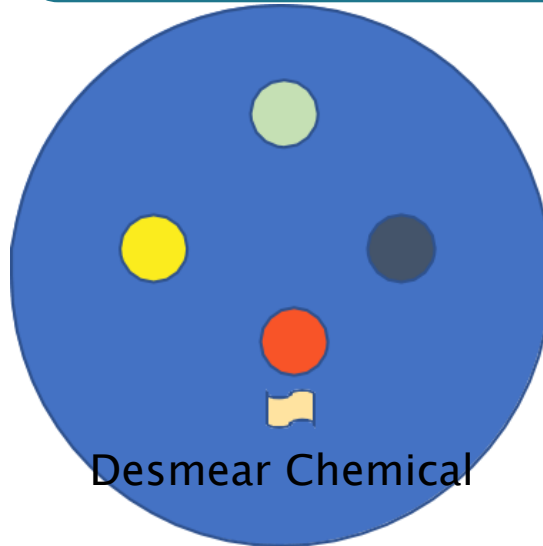


1. The source of the solid impurities in desmear

Solid matters fall off by friction during system running for long time such as bushing wire etc.

Permanganate crystal grains, Adding of solid Permanganate not completely dissolved

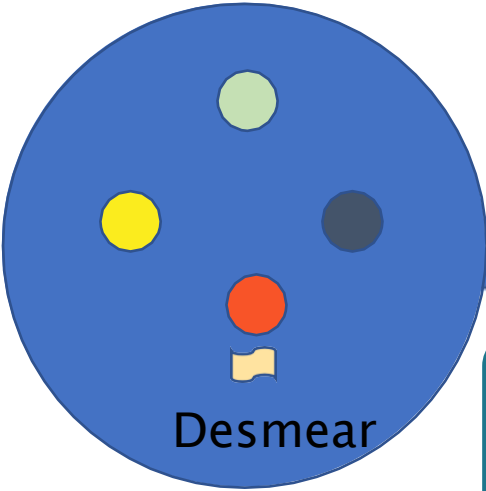
By-Product produced during regeneration of the Desmear chemical



Desmear Chemical

Copper & PP chips: drill residue or entrainment and rough edge treatment

1.1 Problems caused by the solid impurities in Desmear process



Desmear

Debris block the holes causing bad blind hole

Via Open Circuit

Hole Blocked Blind hole Short Circuit

Hole Blocked by Cu , PP chips

Bad Blacklight

The diagram illustrates the desmear process on a PCB. A central blue circle labeled 'Desmear' contains four colored circles (green, yellow, red, grey) representing different types of solid impurities. An arrow points from this circle to a grid of six images showing the results of the desmear process. The top-left image shows a hole blocked by debris, labeled 'Debris block the holes causing bad blind hole'. The top-right image shows a via that is open, labeled 'Via Open Circuit'. The middle-left image shows a hole that is blocked, causing a blind hole and a short circuit, labeled 'Hole Blocked Blind hole Short Circuit'. The middle-right image shows a hole blocked by copper and prepreg chips, labeled 'Hole Blocked by Cu , PP chips'. The bottom-left image shows a hole that is blocked, causing a bad blacklight, labeled 'Bad Blacklight'. The bottom-right image shows a hole that is blocked, causing a bad blacklight, labeled 'Bad Blacklight'.

2 Traditional Desmear Filtration System in Desmear Process

2.1 Some traditional Desmear process does not have filtration equipment

2.2 Use ordinary filter cartridge for filtration (Manual disassembly and cleaning for maintenance,, very inconvenient. There is also a risk of liquid leakage if handled carelessly)

2.3 Use SS filter cartridge or filter mesh (Normally 200um or 300um), filtration efficiency is poor, easily caused blockage of holes (Especially for blind holes and small via holes)



2.4 Traditional filter, SS filter cartridge (Bag) physical filtration, easy to block, need to clean frequently and need to remove the filter element from time to time for cleaning and maintenance, increase maintenance workload

Disassembly



Soaking



Cleaning



2.5 Cleaning high risk chemical filter cartridges brings safety hazard

Safe Operation Protection

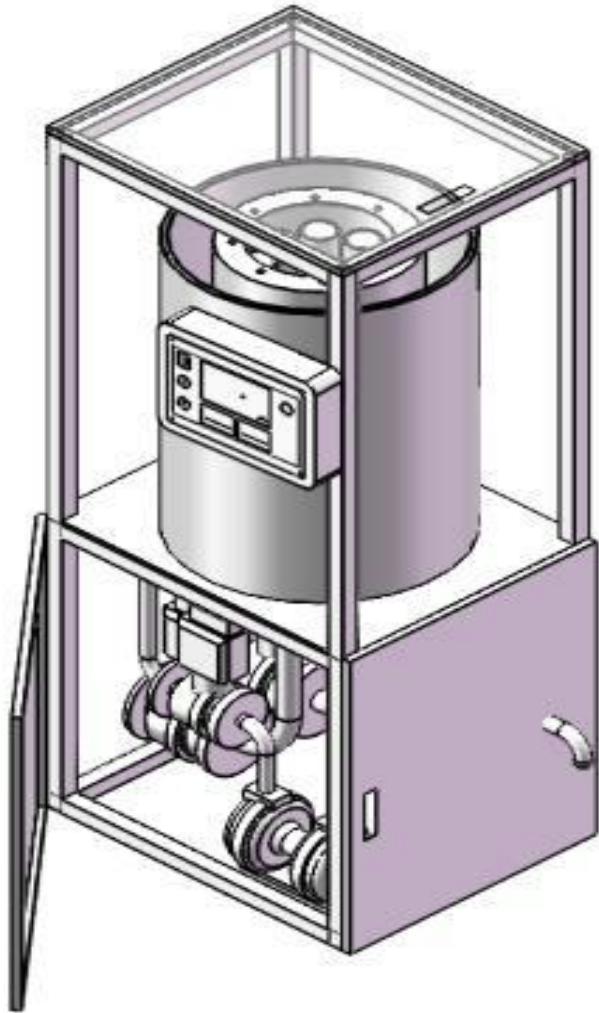


No protective mask

Not wearing protective apron

Danger Operation

3 PCB Intelligent Desmear Filtration System Introduction



Smart Filtering
Auto Back Wash

Clean
Production
Reduce Water
and Power

High Precision
Filtration
No Need to
Replace Filter
Element

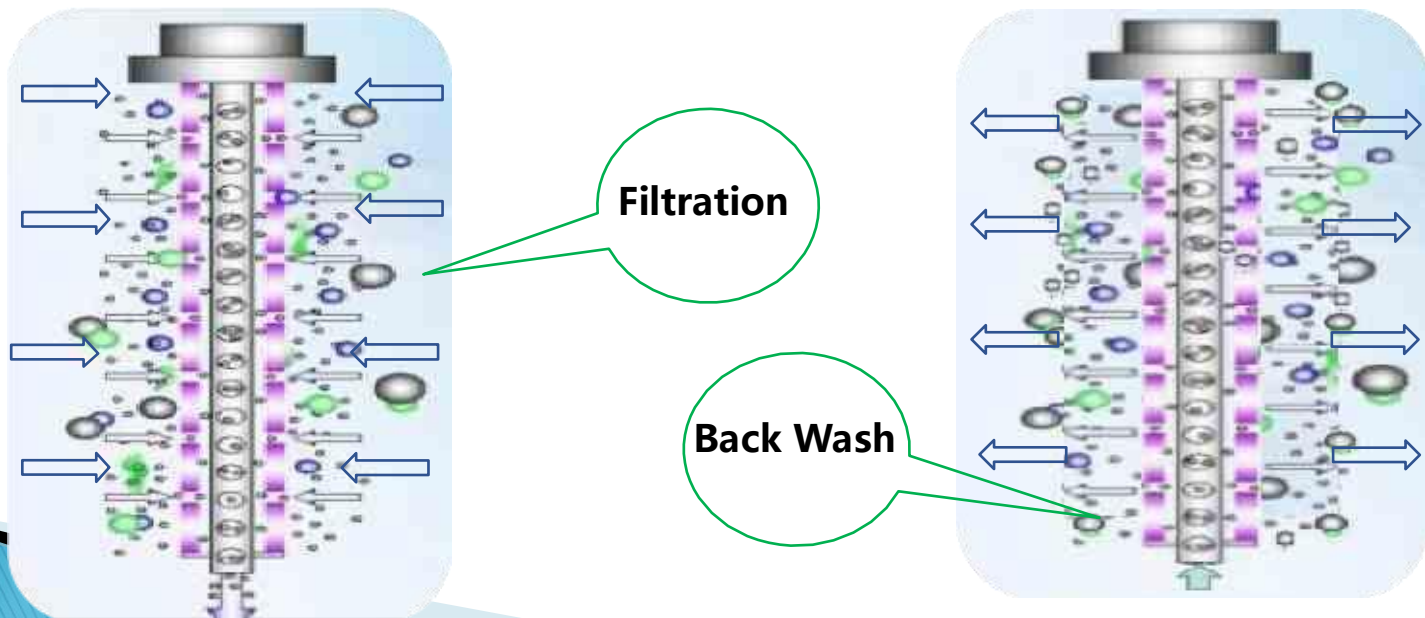
Stable
Performance
High
Temperature
and Oxidation
Resistance

3.1 Operation Theory

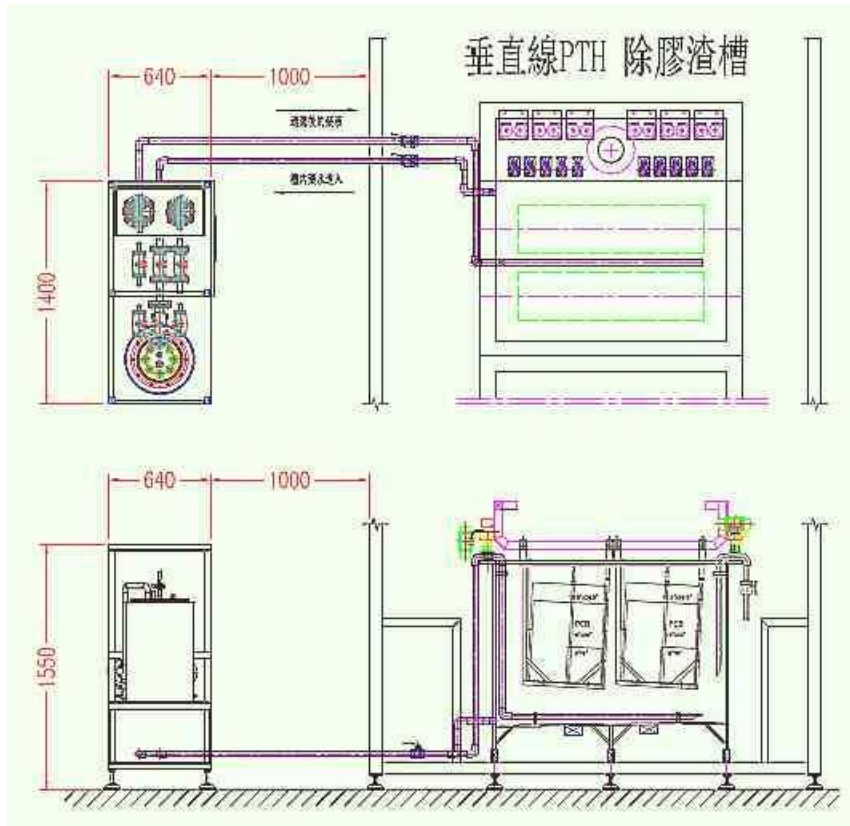
Filter Capacity (10umSpecial Metal Cartridge) + Auto Back Wash Function

① **Filtration** : The Desmear chemical is pumped to the filter system. Under the pressure difference, the Desmear chemical infiltrated from the outside of the filter element, flows away through the middle hollow part and return to the Desmear tank. The smear residues can not pass through the filter element and block inside the filter system.

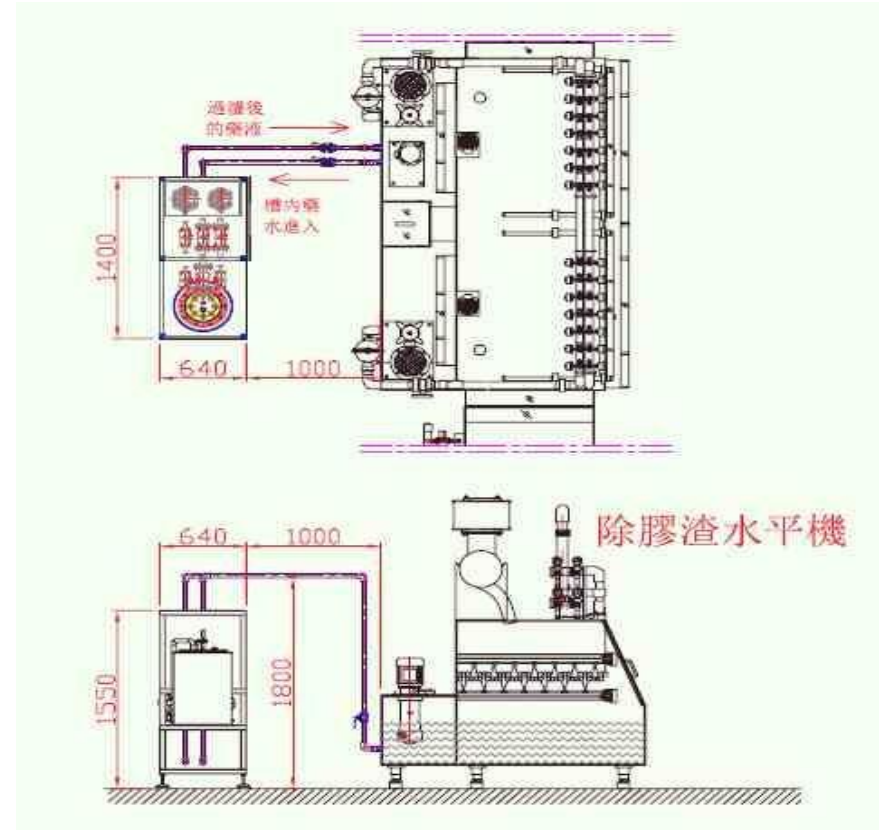
② **Back Wash** : Water (Or Air–water mixture) is pumped into the filter system from the bottom of the filter element and enter the hollow part of the filter element, the smear residues that blocked in the filter element is flushed out under pressure difference and discharge it through the drain pipe to the sewage tank



3.2 Installation Schematic



Vertical PTH Line



Horizontal PTH Line

3.3 System Model

Model	SPRRS004	SPRRS008	SPRRS004-AI	SPRRS008-AI
Size(mm)	500×680×1500	500×680×1500	500×780×1500	500×780×1500
Power(kw)	0.5	0.5	1.0	1.0
Air Pressure (Mpa)	0.4	0.4	0.4	0.4
Temp Range (°C)	120	120	120	120
Capacity (L)	1000-1500	2000-2500	1000-1500	2000-2500
Installation Area(m ²)	1.0	1.0	1.0	1.0

4 Comparison of Benefits Between Traditional Process and New Process :

Item	Traditional Filtration System	Intelligent Filtration System
Hole Blocking Rate & Fine Line Short Circuit	Failure to effectively filter debris and impurities, can easily lead to problems such as hole blocking, no copper in the holes, copper nodules, narrow holes, open blind holes and fine line short circuit. The scrap rate gradually increases.	High-efficiency filtration solves the problems of hole blocking, no copper in the holes, copper nodules, narrow holes, open blind holes and short circuits caused by impurities, improving product quality and reducing scrap rate.
Environmental Benefits	High dragout due to high viscosity of the Desmear chemical and waste liquid is generated during disassembly and cleaning of the filter element, which is easy to cause second contamination.	Reduce the viscosity of the Desmear chemical so that it can reduce dragout. No need to disassemble the filter element. Clean production is made.
Maintenance Dumping Tank Frequency	Need to maintain and dump the tank once a week. It is troublesome and time consuming (Need to cool down the tank from 75-85 C to 60 C before maintenance and need to heat up again to 75-85 C after maintenance. Chemical will be lost for each maintenance)	It can prolong the maintenance and chemical dumping frequency. It can save maintenance time, cost and improve production efficiency.
Operation Safety	Disassemble and clean the filter element every week. Workers often do not wear safety protection equipment, which is prone to safety accidents.	Intelligent back wash, no need to disassemble and clean or replace the filter element. No operation safety accident
Production Management (6s)	In the process of disassembling and cleaning the filter element, it is easy to spill waste liquid or improper operation, resulting in quality problems, resulting in a dirty, chaotic and poor production environment.	There is no need to disassemble and clean the filter element, which meets the requirements of the 6s production management system

5 Desmear Tank Suspended Particle Detection

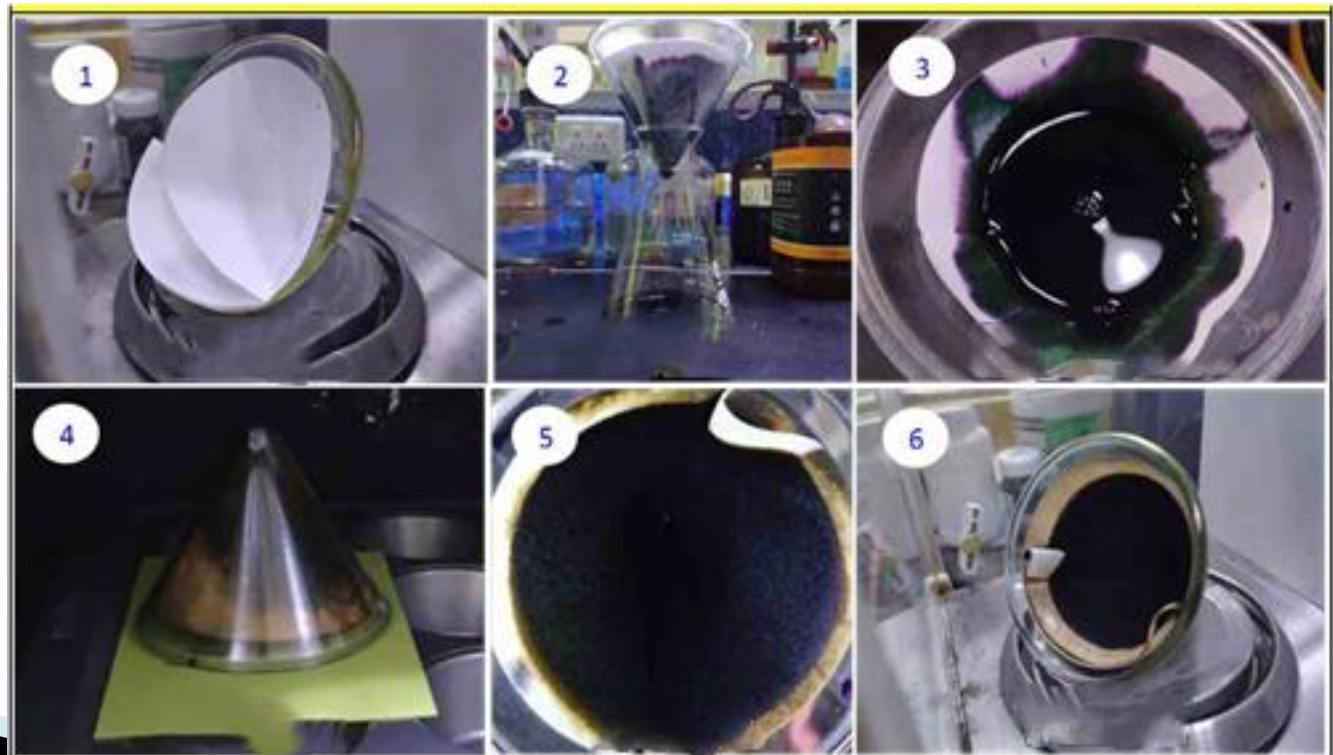
1. Put the filter paper into the funnel, bake for 120°C*3min, Weight after cooling(A)g

2. Get some Desmear chemical 100ml(V), cool down to room temperature, then pour the chemical through the filter paper

3. Use DI water to clean the residual chemical after filtering

4. Put the filter paper to the oven together with the funnel and bake for 120°C*15min, Weight after cooling(B)g

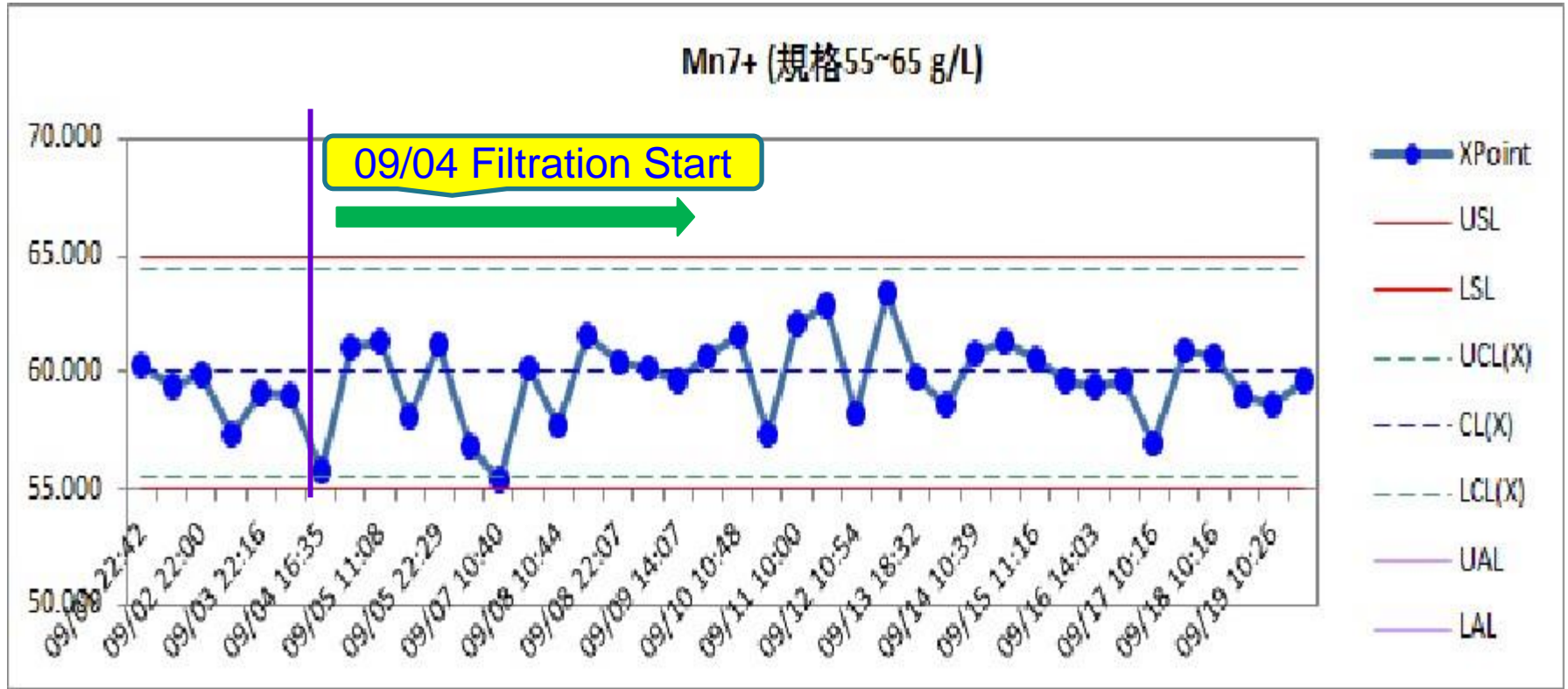
Suspended
Particle Content
(g/L)
 $= (B-A)/(V/1000)$



6 Summary of Performance at Customer– Horizontal PTH line

No	Acceptance Items	Acceptance Specifications	Acceptance Result
1	Filtration Effect	Physical Filtration. Filtration process does not affect the electrolysis of the tank and Desmear chemical regeneration effect	PASS
2	Desmear Rate	Monitor the change in the Desmear rate over a week > 10%	PASS
3	Suspended Particle Monitoring	Suspended particles are monitored for more than a week and their content is < after tank make up*1.2	PASS
4	Back Wash System	1. Automatic back wash to sludge discharge. No need to disassemble and clean 2. Do not block the filter element and the pressure gauge do not exceed the standard setting	PASS
5	Effect	The solid matter hole broken scrap rate is reduced by more than 20%	PASS

6.1 Desmear Chemical Concentration

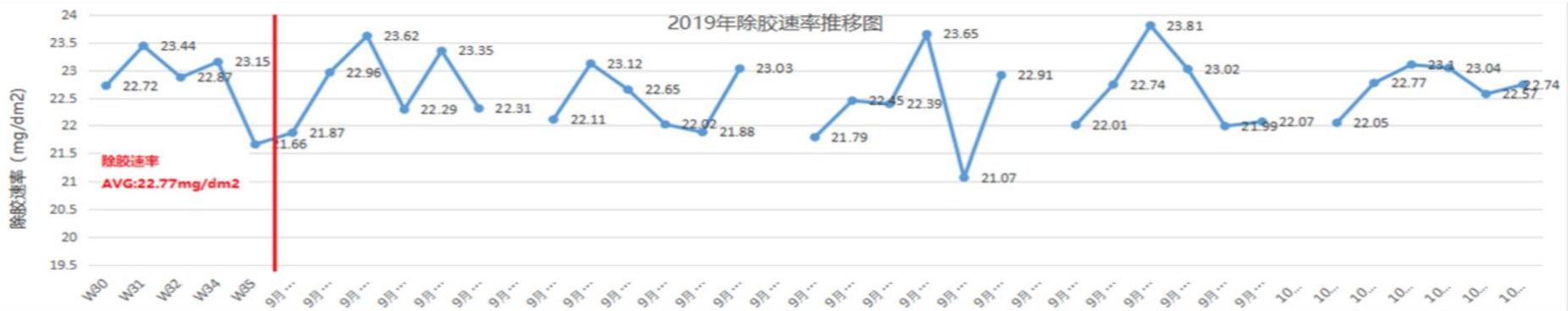


The Intelligent Filter is used for two weeks and the Desmear chemical concentration is within the specification range

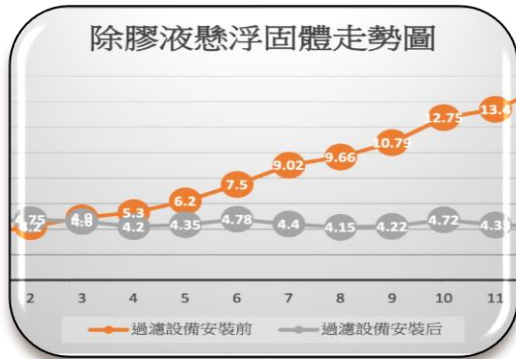
6.2 Desmear Rate Monitoring

Test Date	W30	W31	W32	W34	W35	9 / 4	9 / 5	9 / 6	9 / 7	9 / 8	9 / 9	9 / 10	9 / 11	9 / 12	9 / 13	9 / 14	9 / 15	9 / 16	9 / 17
Desmear Rate (Spec20-60mg/d m2)	22.72	23.44	22.87	23.15	21.66	21.87	22.96	23.62	22.29	23.35	22.31		22.11	23.12	22.65	22.02	21.88	23.03	

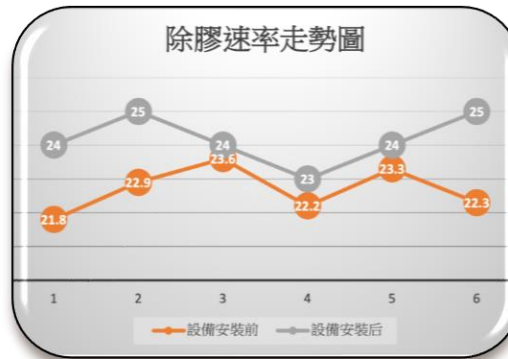
Test Date	9 / 18	9 / 19	9 / 20	9 / 21	9 / 22	9 / 23	9 / 24	9 / 25	9 / 26	9 / 27	9 / 28	9 / 29	9 / 30	10 / 1	10 / 2	10 / 3	10 / 4	10 / 5	10 / 6	10 / 7
Desmear Rate (Spec20-60mg/d m2)	21.79	22.45	22.39	23.65	21.07	22.91		22.01	22.74	23.81	23.02	21.99	22.07		22.05	22.77	23.1	23.04	22.57	22.74



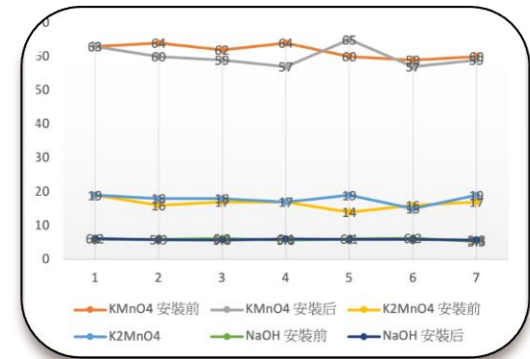
6.3 Desmear Filtration Main Parameters



Desmear Suspended Solid Particle



Desmear Rate



Chemical Concentration Stability

Desmear Hole Blocking Tracking						
Case	Part No	Level	Batch No	Inspection No	Via Fill 2 Broken Hole No	Foreign Matters Hole Blocking Defective Rate
Before Installation Equipment	xxxxx	Via Fill 2	25	52265	50	0.01%
After Installation Intelligent Filter	As Above	As Above	34	69367	45	0.01%
	As Above	As Above	27	58069	37	0.01%

Foreign matters hole blocking reduce by 35% after installation of the Intelligent Filter

7 Comparison Of Data Between Vertical Line and Horizontal Line

Item	Installation	Vertical PTH Line	Horizontal PTH Line
Desmear Rate	Before	20 mg/dm ²	22 mg/dm ²
	After	25 mg/dm ²	22 mg/dm ²
Chemical			
KMnO ₄	Before	65 g/L	62 g/L
	After	63 g/L	61 g/L
K ₂ MnO ₄	Before	20 g/L	17 g/L
	After	19 g/L	18 g/L
NaOH	Before	6.50%	6.25%
	After	6.50%	6.50%
Chemical Dragout	Before	200 ml/m ²	50 ml/m ²
	After	140ml/m ²	45ml/m ²
Suspended Solid Particle	Before	20 g/L	15.2 g/L
	After	5 g/L	4.5 g/L
Hole Block Ratio	Before	0.05%	0.01%
	After	0.03%	0.007%
Via Fill Broken Hole	Before	0.15%	0.10%
	After	0.10%	0.07%
PTH Scrap Rate	Before	0.003%	0.004%
	After	0.002%	0.0035%

7.1 Advantages of PTH Vertical Line And Horizontal Line Operation

item	Vertical PTH Line	Horizontal PTH Line
Split Installation	Installation on the side of the tank, safe space on walkway	Fit the space for the compact design of the horizontal line
	Shorten the liquid transfer distance and energy loss	Will not affect the operation of the auto feeder
Maintenance	Reduce the frequency of the Desmear tank cleaning and replace of chemical	Reduce the frequency of disassembling, assembling and cleaning of nozzles
	Normally need to replace the chemical every 2~3 months	Normally the nozzles need to be disassembled and cleaned once a day
	After the equipment is installed, the tank can be cleaned once a year or longer	After the equipment is installed, the nozzles can be cleaned once a month
	Reduce the cost and time of tank dumping and treatment of the waste chemical	Reduced capacity loss from downtime for cleaning equipment
Stable Quality	Continuous filtration to remove residues in the tank	Continuously remove residues and maintain viscosity of chemical
	Reduce the generation of $KMnO_4$ crystals	Optimizing the fluid dynamics and distribution of the chemical
	Prevents scrap due to foreign matter blocking the holes	Improve blind hole BVH for better Smear removal

7.1 Advantages of PTH Vertical Line And Horizontal Line Operation

item	Vertical PTH Line	Horizontal PTH Line
Intelligent Operation	Fully automatic PLC monitoring operation with on-site alarm alert	
	1. Online pressure monitoring to prevent blocking of overpressure operation and ensure safe production operations.	
	2. On-line flow monitoring, adjust the chemical circulation flow rate of the filtration system according to production requirements.	
	3. Real-time specific gravity monitors the Back Wash frequency of the equipment, which is more accurate than regular Backwashing	
Labour Saving & Safety	Fully automatic and reduce workload of labour	
	Automatic back wash control, automatic sludge discharge and collection, reduce the risk of liquid contact.	
Clean Operation	Reduce the amount of Desmear removal solution and cleaning water consumption	
	Reduce wastewater treatment fees and overall production costs	

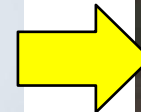
Equipped with 4 or 8 special metal filter elements in the barrel



Auto Collection of Discharged Waste Residue



SS Pipe with Thermal Insulation Material



Thank You



Sun Pride Semi-Conductor Technology Co Ltd.