HyperSWASH

PERFECT MATCH IN ONE CHAMBER

PRECISE PCBAs CLEANING
INLINE PERFORMANCE AND CAPACITY
SMALL FOOTPRINT
LOW PROCESS COSTS

Hyper SWASH III cleaning system

HyperSWASH belongs to the top-end product line of **PBT Works** company. It results from over 30 years of tradition and experience running almost 2000 PBT cleaning system installations worldwide. Customer feedback is essential for us. Combining learning from practice with profound theoretical studies resulted in a revolutionary concept of the single-chamber cleaning "processor. "(all subprocesses in the machine run in the same chamber.) Many people used to call similar machines "batch machines. "

Most "batch machine "development originated from other industry branches (kitchenware, laboratory ware, or mechanical component cleaning). However, requirements for cleaning electronic assemblies are dramatically different. Today, the primary requirement is to clean under components because the pole-to-pole distances are closest here. Another - power electronic application requires a spotless surface, often passivated before chip or wire bonding. The Hyper SWASH is built especially for electronic applications. That is why it offers the best match of features for PCB assembly cleaning.

GLOBAL TECHNOLOGY AWARD FOR HYPERSWASH

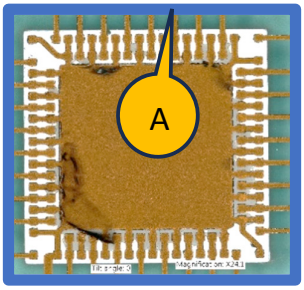
In 2022, PBT Works received the Global Technology Award for HyperSWASH III in two categories: Cleaning Equipment and Best Product – Europe.

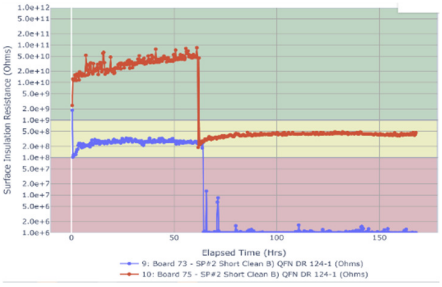
Global Awards for Hyper SWASH

WHAT DIFFERS THE HYPER SWASH FROM OTHER MACHINES

Today, PCB assemblies are complex, using large outline and bottom-terminated components (BGA, QFN, LGA). Also, requirements for robustness against electrochemical migration have grown due to shortening distances between poles and requirements that the assemblies must work in harsh environments.

Our studies and also studies of other institutions have confirmed that cleaning must be comprehensive. Even a tiny amount of not cleaned flux residues can cause ECM, resulting in leakage current or temporary short. See the results of incompletely cleaned QFN DR124 on the glass test boards with subsequent tests for SIR.





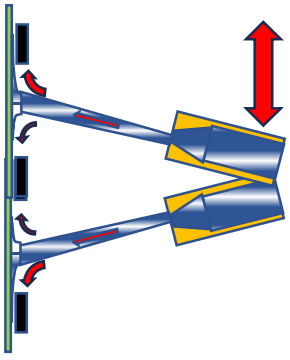
Almost clean QFN *Dendride after SIR test(point A)* *SIR record (blue line)*

The HyperSWASH has a linear driving nozzle system spraying under 90 degrees to the surface for high-performance cleaning. We call such configuration a **Linear Direct Spray System**. It eliminates shadows by components. It is very similar to the nozzle system of inline cleaning machines, with exceptions:

1: HyperSWASH moves with nozzles in both directions.

2: Hyperswash timing can be set independently for wash rinse and drying.

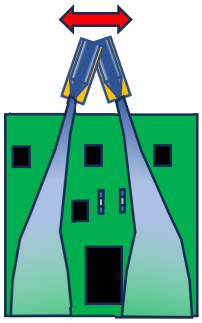
These two features are essential for optimizing parameters without compromises.



Direct spray nozzle configuration *Nozzle arms in the machine* *Clamping frame for direct spray*

Linear Direct Spray nozzle configuration can clean most complex assemblies from all types of flux residues. The maximum size of boards is up to 35 "x34,5 ". The machine processes two frames in batch.

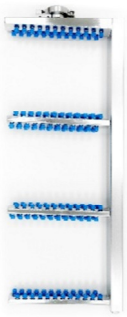
We do not always need such a powerful nozzle configuration. Some assemblies are less complex, or flux residues are easily soluble. In that case, **Hyperswash can work with other nozzle set COMBO.** Depending on the maximal PCB size, there are three different nozzle configurations for COMBO – with three two or one rack for a basket.



COMBO nozzle setup

Nozzle arms in the machine

PCB clamping



Spray nozzle COMBO III

Such a configuration can also be employed for cleaning directly in magazines. Cleaning in magazines with handling automation increases the system's capacity enormously.

Magazines loaded to machine

Magazine for PCBA

Magazine for lead frames

UNIFORMITY OF CLEANING

Both these configurations offer a unique **uniformity of cleaning impingement** across the process chamber. Such uniformity is an essential requirement for any process control. The cleaning machine must produce the same quality of cleanliness in every position in the chamber. Running any control system on cleaning makes only sense if the process parameters are proportional to the result and the random effect is suppressed to a minimum. In such a system, you can easily thoroughly clean under complex packages and not compromise the chemical compatibility of other components, inscriptions, or materials on the board.

TWO MACHINES IN ONE

Without tools, you can swap the nozzle system on the shop floor within three minutes. Such a possibility increases the flexibility of the system substantially. The user has, in fact, two different machines in one.

FLEXIBLE RINSING

HyperSWASH is a flexible system. It can run at small or large facilities, with different deionized water sources and conditions for draining waste. Upon facility conditions, the machine can run as a fully closed, semi-open loop or flow-through cascade rinsing. These configurations can be changed by software only and by some minor modifications of sensors. Hyper SWASH always has two independent rinsing steps, provided by mechanical chemical filters and sump tanks with heating and pumps. Such cascading also increases the quality of rinsing for higher capacities.

Additionally, at the beginning of the first rinsing, a particular sequence of draining and refilling fresh deionized water serves as a chemical insulation. You do not need to use it if you like to run the machine as insulated, without any waste from each cycle. However, for higher capacity, the cost of chemical filters is sometimes higher than that of a small amount of wastewater, classified as dangerous waste.

UNIVERSAL AIR KNIFE

Because all process steps run in the same chamber, limiting all drag-over between steps to a minimum is important. Therefore, the machine has a robust air knife. The air knife is fully programmable. It can be initiated anywhere during the process. Air temperature is programmable from room to 230°F. Water is primarily blown out at drying, and only minor water residues evaporate. This saves time but also suppresses any possible stains.

GLASSDOOR AND LIGHTING IN THE CHAMBER

That feature seems to be luxurious and built only as an eyecatcher. However, seeing all the details during the process-building phase is essential. Delays for dripping, chemical insulation, and drying times can be quickly and efficiently programmed by observation. Some can worry about the glass being applied with temperature changes and the ESD environment. The glass for doors is a safe, sealed, hardened, ESD-compliant glass.

CONTROL SYSTEM – MAINTENANCE AUTOMATION

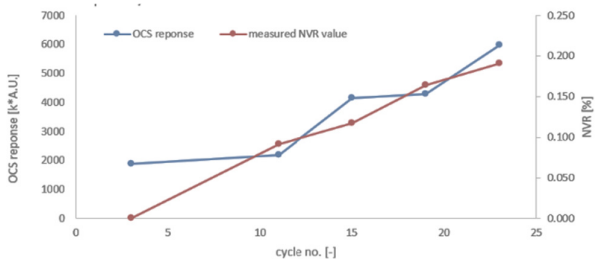
With the high flexibility and capacity, the balance between flux residues coming to the system with PCBAs, fresh cleaner as a refill, water quality, and evaporation can change from

type to type of assembly. It is risky to rely on refilling the pre-mixed cleaner only by level, and it is also risky not knowing the saturation grade of that cleaner.

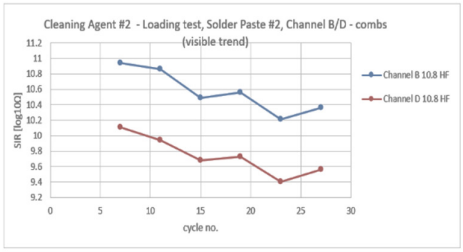
Laboratory analyses are precise but too slow to catch any dramatic development in your wash sump tank. Similarly, the re-circulating and reclaiming of deionized water cannot be only monitored by conductivity but also by the content of non-ionic compounds from cleaner and non-polar residues.

Hyper SWASH can have necessary sensors for measuring saturation and organic compounds in the rinse water integrated into its control system. We have confirmed by experiments that the non-ionic impurities in rinse water ("invisible. "for conductometric sensors) have a negative influence not only on the surface tension but also on surface insulation resistance after standard moisture tests 40°/ 90% acc to IPC.9202

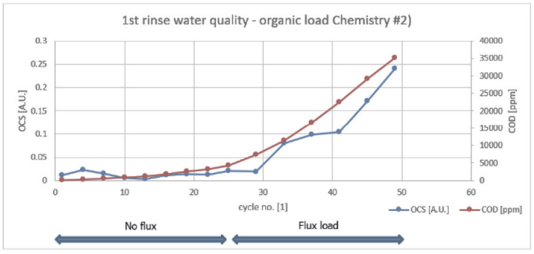
Organic carbon sensor



Comparison of cleaner saturation measuring by OCS and NVR (non-volatile residues test



A drop of SIR on samples after 20 cycles with exhausted active carbon filter in rinse. Conductivity unchanged.



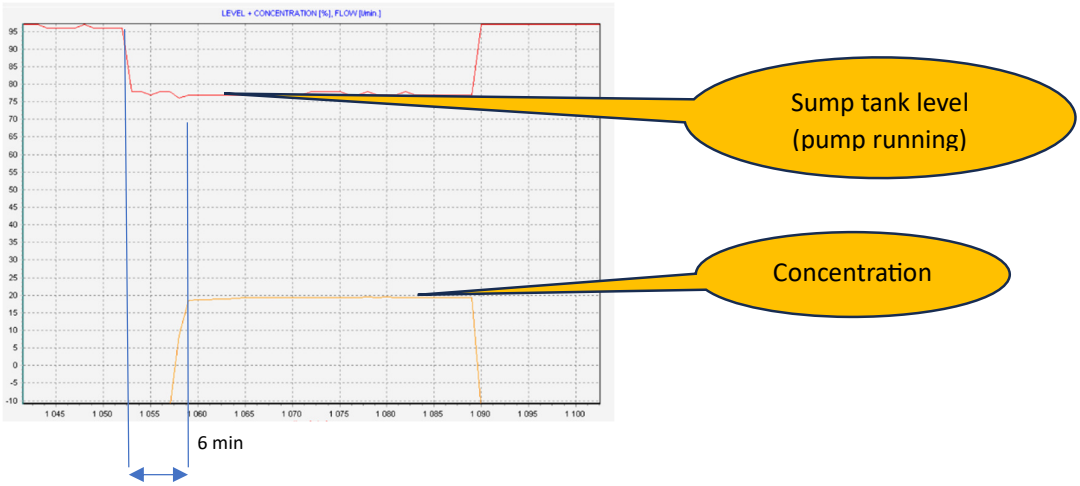
Increase of organic compounds in rinse step (comparison of OCS and TOC data)

Such precise rinsing monitoring is helpful in several branches of electronics, from industrial electronics to telecommunication, avionics, medical, special, and deep drill up to semiconductor packaging and manufacturing of interfaces for heterogeneous integration.

DATA MANAGEMENT PROCESS SUPPORT THROUGH DATA

Hyper SWASH has powerful data management. All process data are registered and can be graphically compared. A process engineer can not only overview stability but also get essential answers from the system. "how long does it take to mix the cleaner emulsion? When do I need to make a preheating idling cycle to keep the temperature of processes

within allowance? Such a question may not be crucial for a system continuously running with always the same product and parameters. For such a flexible system, working "on demand, "these and similar information are essential.



Record of parameters in a machine display – parameter analysis

HANDLING AUTOMATION

Hyper SWASH can be delivered with automatic loading/unloading of workpieces from the machine. Doors are automatically operated, and a palette with frames or baskets drives to the cart locked to the machine. The cart can be easily moved to other workplaces using an AGV (automatic guided vehicle). No more operator needed

Hyper SWASH with automatic handling (safety protection with 3D space sensor)

WORLDWIDE PRESENCE – LOCAL SUPPORT

Today, we offer our systems worldwide. We have more than fifty representatives and supporting centers in all industrial countries. We help our customers achieve uncompromised quality.