Introduction To Aqueous Cleaning Equipment

Equipment

In-line equipment is designed to continuously clean large numbers of circuit boards in a short period of time. As the name implies, the washer receives boards by conveyor from preceding process units (e.g., reflow ovens), cleans, and dries them in one operation. Spray-in-air indicates that a mechanical spraying process is carried out in air as opposed to spray-in-immersion, where the board is submerged in water.

In-line equipment consists of a series of chambers, each responsible for a different duty in the assembly process. The basic design concept is outlined in figure 1, taking into consideration the specific configurations that vary with vendor and model.

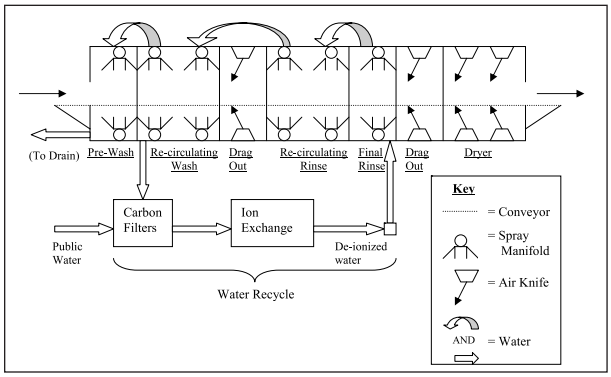

Figure 1.

To begin, un-cleaned units are fed into the pre-wash zone on a conveyor where they undergo a gross, low pressure wash. Next, the units move into the re-circulating wash zone for the dissolution of flux residue. The effectiveness of the wash zone depends upon the washer's ability to deliver an effective combination of water pressure and water volume to the board surface.

A drag-out zone is implemented to prevent contaminated water from moving ahead in the cleaning process on the conveyor. It consists of air knives blowing a stream of air over the units and conveyor. From here, the units enter the re-circulating rinse zone to remove most of the contaminated wash water still remaining on the assembly. The final rinse immerses the board in the purest DI water, ensuring all ionic contamination is removed. Another drag-out zone is employed primarily as a pre-drier. The units are dried in the drying zone by jets of air. Blowing air over the units is preferred over heated drying because it's cheaper and it prevents the risk of contamination from residual water being deposited on the board when the water is vaporized. The units now move out for further processing in the plant.

Processed water generally comes from the public water source. It is filtered and de-ionized before entering the washer in the final rinse stage. The water cascades from this stage to the preceding stage continually until it finally reaches the pre-wash stage, at which the contaminated water is sent to drain. Some of the water is drawn out of the re-circulating wash stage and sent to carbon filters to conserve water. This reverse flowing process ensures that the final rinse utilizes the cleanest DI water available.

Key Parameters

- Water temperature
- Water pressure
- Conveyor speed
- Dryer temperature
- Water cleanliness/resistivity

Advantages

- The ability to clean a large volume of units quickly as part of a continuous assembly operation
- High pressure, short spray distances, and directional spraying allow for removal of particularly difficult soils

Disadvantages

- High cost, when compared to batch systems
- Large size

APPLICATION NOTE

OVER→

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"Dishwasher" Type Equipment

This equipment is named for its similarities to a household dishwasher. Wash water is delivered by spraying in air to stationary units by means of counter-rotating delivery arms. Units are positioned vertically in fixed racks and the spray arms move in a circular motion.

Features of "dishwasher" type equipment vary by vendor and model, but include: stainless steel cleaning chambers, side mounted spray nozzles, and wash water reuse, to name a few.

The delivery of water in batch systems is generally classified as low impact and more flooding in nature. Figure 2 shows a general schematic for a "dishwasher" type batch washer. Batch equipment is usually fully programmable. In general, the key parameters can be pre-programmed.

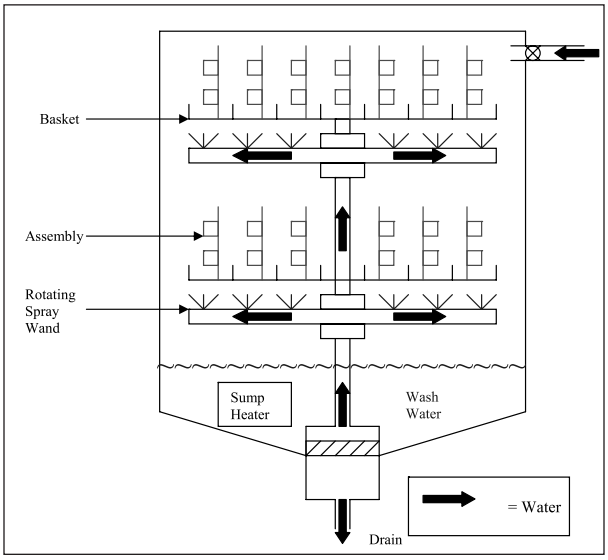

Figure 2.

Key Parameters

- Prewash, wash, and rinse time
- Wash temperature
- Number of rinses
- Resistivity of rinse water
- Drying time

Advantages

- One person process
- No observation necessary during operation
- Highly automated with a higher degree of flexibility

Disadvantages

- Smaller cleaning volume
- Requires hand loading
- Disrupts process flow

APPLICATION NOTE

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