Technical Data Sheet

PC-45S and PC-45R TWO-PART DEVELOPER

A Stabilized, Hard Water Inhibited, Two-Part Developer Concentrate

Product Description

PC-45 DEVELOPER is a carbonate based, two-part liquid developer concentrate for developing fully aqueous dry films. PC-45S "Starter" is a buffered potassium carbonate based solution, incorporating hard water scale inhibitors, rinse aids, and equipment cleaners. PC-45S is formulated to exhibit a pH of 10.8 – 11.0 upon make-up, at a total carbonate concentration of 1.0% by weight (10/gL). A pH upon make-up of 10.8 – 11.0 minimizes the potential for overdeveloping when preparing new developing baths. Additionally, PC-45S incorporates the same additive package as PC-450C, assuring optimum developer performance even when water quality is marginal.

PC-45R "Replenisher" is employed to replenish working developing baths in combination with automated feed/bleed replenishment systems. PC-45R chemically regenerates bicarbonate into usable (available) carbonate, significantly reducing the volume of "fresh" carbonate required to maintain the pH. When used in combination with Seacole's PC-AUTO/Controller, the PC-Series Developer baths may be operated for 4-20 weeks continuously without requiring fresh bath make-up (depending upon throughput). The PC-AUTO/Controller will automatically make accurate, proportional additions of PC-45R and water, maintaining the pH at +/- 0.02 pH units and the carbonate concentration at +/- 0.03% by weight, resulting in predictable developing quality without adjusting the conveyor speed.

Performance Features

- PC-45S and PC-45R are designed to maintain consistent control of developing pH at make-up and during replenishment.
- PC-45S and PC-45R are formulated with a unique hard water scale inhibitors that minimize hard water accumulation in conveyorized spray process equipment (including post rinse chambers) and its potential formation and/or redeposition onto panels.
- PC-45S and PC-45R contain rinse aids to inhibit the coagulation of dissolved photopolymer and antifoam.
- PC-45S and PC-45R are compatible with virtually all type of aqueous dry films and LPI solder masks.
- PC-45R is stabilized, improving process consistency and reducing replenishment volume by as much as 40%.

Physical Specifications

Parameter	PC-45S "Starter"	PC-45R "Replenisher
Physical State	Liquid	Liquid
Appearance	Transparent	Transparent
Odor	None	None
Stability	Stable	Stable
Freeze/Thaw Stability	Maintain above 15°F	Maintain above 15°F
Flammability	None	None
Specific Gravity	1.34	1.39
pH	11	>12.5

Equipment Requirements

Tanks: Constructed Of Polypropylene, Polyethylene, PVC Or CPVC.
Heaters: Quartz, Titanium, Stainless Steel, Or Teflon Encased Steel.
Racks/Baskets: Constructed of Polyethylene, Polypropylene, Stainless Steel Or Plastisol Coated Steel.
Cooling Coils: Polyethylene, Polypropylene, Teflon, Stainless Steel Or Plastisol Coated Steel.
Ventilation: Recommended
Agitation: Spray Processing May Require The Addition Of Anti-Foam. A Nonpetroleum-Based Anti-Foam Such As Seacole's Anti/Foam CR-98S Is Recommended.
Filtration: Continuous Filtration Is Recommended.

Product Make-Up

PC-45 series developer (PC-45S and PC-45R) are designed for use only with automated feed and bleed replenishment systems operating by continuous pH control. The use of either of these products in batch dump systems is not recommended.

Desired % by weight Carbonate	PC-45S "Starter" (% by volume in water at make-up)	PC-45R "Replenisher" (% by volume in water for replenishment)
0.85 (8.5 g/L)	1.88	1.63
0.90 (9.0 g/L)	2.00	1.73
0.95 (9.5 g/L)	2.11	1.83
1.00 (10.0 g/L)	2.22	1.92
1.10 (11.0 g/L)	2.44	2.12
1.20 (12.0 g/L)	2.67	2.31

Always follow manufacturers recommendation regarding the carbonate concentration suitable for developing a specific photopolymer. The above data is offered as a guide only. The following procedure is recommended for mixing the bath.

Procedure

1. Thoroughly rinse the tank and inspect for cleanliness paying special attention to the heaters and heater sheathings, and cooling coils.
   (If necessary, employ EQUIPMENT/Cleaner 60 to thoroughly clean the tank.)
2. Fill the tank half full with deionized water. Add the calculated volume of PC-45S "Starter" concentrate, such that after final dilution the concentration desired is obtained.
   Fill the tank to operating level with deionized water.
3. Measure the potassium carbonate concentration by employing the test method described in this data sheet. Correct if necessary.
4. Calibrate the pH meter and measure the pH. If the pH is below 10.7 or above 11.2, STOP.
   Verify the pH meter and pH probe are working correctly. If the pH reading is accurate, make sure PC-45S "Starter" and not PC45R "Replenisher" was used for make-up. If both the pH meter and chemical are correct, either residual chemical in the tank or the quality of water used to make-up the bath is affecting the pH.
5. Turn on heaters and verify temperature with a thermometer.
6. Turn on the feed/bleed replenishment controller and be sure the dosed PC-45R "Replenisher" concentrate is adjusted to the correct concentration.

Operating Parameters

The PC-45 operating bath should be operated within the carbonate concentration, temperature, and pH specifications of your dry film and/or LPI solder mask supplier. Typically, these specifications are as follows:

Potassium Carbonate Concentration (Total)	0.85 - 1.10% By Weight (8.5 – 11 g/L)
pH	10.7 – 10.9
Temperature	85 - 110°F
Dwell Time	30 - 150 Seconds (To Maintain 50% "Break")

Control and Replenishment

AUTOMATED FEED AND BLEED PROCESSING

Only two variables, the pH and percent by weight (%w/w) total carbonate require control during processing. It is recommended the pH be maintained between 10.70 - 10.75. This is most effectively accomplished by employing an automated feed and bleed pH control system. It is unnecessary to dump the bath except during routine equipment maintenance, eliminating frequent bath make-ups and heat-up time. Additionally, because the pH is held constant (+/- 0.025 pH units), it is unnecessary to continually adjust conveyor speed to control the break point.

Measuring the Percent by Weight Total Carbonate

The percent by weight (% w/w) of potassium carbonate in the working bath or diluted feed line can be calculated using the procedure below.

Equipment Required	Reagents Required
Buret, 50 ml	Methyl Orange Indicator
Erlenmeyer Flask, 250 ml	Hydrochloric Or Sulfuric Acid - Standardized .10N
Pipet, 10 ml	

Procedure

1. Pipet 10 ml of sample into a 250 ml Erlenmeyer flask containing approximately 50 ml of deionized water.
2. Add approximately 10 drops of indicator and titrate with standardized acid from an orange to a red endpoint. Record the mls of titrant required to reach the endpoint.

Calculation

$$\frac{A \times B \times C}{2 \times D} = \text{g/L potassium carbonate}$$

NOTE: The g/L total carbonate divided by 10 equals % w/w total carbonate!

Where
A = volume of titrant required in ml
B = N of the titrant
C = M.W. potassium carbonate (138.2)
D = sample volume in ml

Calculating Additions of PC-45S "Starter"

If the potassium carbonate concentration is low upon make-up, calculate the volume of additional PC-45S "Starter" to add using the calculation below.

Calculation

$$\frac{(A - B) \times C}{450} = \text{liters of PC-45S to add}$$

Where
A = desired concentration of carbonate (g/L)
B = measured concentration of carbonate (g/L)
C = bath volume in liters

Safety and Handling

Read and understand this products MSDS before handling.

Waste Treatment

Individual users should verify the nature of spent solutions to assure compliance with local, state, and federal regulations. Contact Seacole for specific details and/or further waste treatment recommendations.

Ordering Information

PC-45R is available in 55-gallon drums, and 275-gallon totes.

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