2 Using KODAK EKTACOLOR Chemicals in Continuous Processors

This section lists the recommended steps, conditions, and replenishment rates for processing Kodak Color Papers in continuous processors using Process RA-4. KODAK supplies EKTACOLOR Chemicals for use in continuous processors, which are vavailable in sizes specially designed for continuous processors. For a listing of available sizes, see Section 1, KODAK EKTACOLOR Chemicals. Use these chemicals for processing Kodak Color Papers designed for Process RA-4, such as:

• KODAK EKTACOLOR EDGE Paper

• KODAK ROYAL Digital Paper

• KODAK ROYAL Luminous Digital Paper

• KODAK Photo Book Paper

• KODAK PROFESSIONAL SUPRA ENDURA VC Digital Paper

• KODAK PROFESSIONAL ULTRA ENDURA Paper

• KODAK PROFESSIONAL ULTRA ENDURA High Definition Paper

• KODAK PROFESSIONAL ENDURA Metallic VC Paper

Processing options are available for Process RA-4, such as developer regeneration and bleach-fix regeneration. These options are described in Section 5, *Processing Options with KODAK EKTACOLOR Chemicals.*

For information on handling and mixing KODAK EKTACOLOR Chemicals, see Section 1, *KODAK EKTACOLOR Chemicals.* For information on monitoring your process, see Section 6, *Process Monitoring and Troubleshooting with KODAK Control Strips, Process RA-4.*

CONTINUOUS PROCESSORS

Steps and Conditions

To use Process RA-4, your processor must be capable of operating at the processing times required.

Table 2-1 Processing Steps and Conditions for Process RA-4—Continuous Processors

Solution/Step	Time* min:sec	Temperature† °C (°F)	Maximum Weeks per Tank Turnover	Comments
EKTACOLOR RA Developer Replenisher 12 or EKTACOLOR Developer Regenerator 12/55‡ or	0:45	37.8 ± 0.3 (100.0 ± 0.5)	1	Recirculate and filter. Use precise temperature control. Use squeegees at tank exit.
EKTACOLOR RA Developer Replenisher	0:45	35.0 ± 0.3 (95.0 ± 0.5)	4	
EKTACOLOR RA Bleach-Fix and Replenisher or EKTACOLOR RA Bleach-Fix and Replenisher NR	0:45	32 to 38 (90 to 100)	4	Recirculate and filter. Use squeegees at tank exit.
Wash	1:30	30 to 40 (86 to 104)		
Dry	As needed	Not over 96 (205)		

* Immersion time plus crossover time to the next tank. Developer time range is 44 to 48 seconds. Minimum times for the bleach-fix and wash can be one second less than the normal times. Longer times reduce the benefit of a shorter process cycle, but cause no other adverse effect. For best results, use the recommended times with crossover times of 6 seconds or less.
† Check the developer temperature frequently with an accurate thermometer.
‡ KODAK EKTACOLOR RA Developer 12/55 Regenerator significantly reduces the waste volume, and lowers chemical costs. See Section 5, *Processing Options with KODAK EKTACOLOR Chemicals*. If you do not use regenerator, use EKTACOLOR RA 12 Developer Replenisher.

Squeegees

Install squeegees at the exit of the last developer tank and the last bleach-fix tank to reduce solution carryover. Reducing solution carryover by using efficient squeegees permits lower replenishment rates and more efficient silver recovery from the bleach-fix overflow. Typical carryover rates with good squeegees are 43 to 65 mL/m^2 (4 to 6 mL/ft^2); however, if carryover exceeds 54 mL/m^2 (5 mL/ft^2), you may need to compensate for excessive carryover by increasing the bleach-fix replenishment rate and the wash rate.

Agitation

The developer and bleach-fix recirculation rates for high-volume processors should be 0.20 to 0.35 tank volumes/minute. If the processor has multiple tanks, each tank should have this recirculation rate. Higher solution agitation may be needed for low-volume, slow-transport processors to maintain process activity.

The quality of agitation is important during the first few seconds of the bleach-fix step. If agitation is poor during this initial period, development may not be stopped effectively, which can cause magenta streaks and non-uniformity in the prints. This condition may be worse if the paper is inadequately squeegeed as it leaves the developer, permitting too much developer carryover into the bleach-fix.

Filtration

Processing solutions and wash waters may contain some insoluble materials. If you don't filter out these materials, they can stick to the paper, tank walls, rollers, and solution lines, and may damage the paper. Usually, filters with a porosity of 10 to 30 microns are effective for solutions and wash water. For incoming water supplies, use filters with a porosity of 15 microns.

You can use the following filter materials with processes that use EKTACOLOR Chemicals:

- bleached cotton
- cellulose with phenolic-resin binder
- fiberglass with phenolic-resin binder
- polypropylene
- spun polypropylene
- viscose rayon with phenolic-resin binder (**do not** use in the developer)
- activated carbon

Polypropylene is the most acceptable filter-core material and one of the least expensive. This material has no photographic effect, but the surfactants used to produce the polypropylene yarns may have an effect on your process. Therefore, monitor your process carefully when you first change filters. Replace filters weekly for developers and every two weeks for other solutions.

Replenishment Rates

The specified replenishment rates in Table 2-2 are starting-point recommendations. The actual rates depend on the type of processor, the amount of paper processed, and the rate of evaporation and oxidation. Replenishment rates are given in millilitres per square metre and millilitres per square foot. To convert the rate to millilitres per minute, multiply the rate in mL/m^2 by the processor speed in m^2/min (mL/ft^2 by the processor speed in ft^2/min).

Avoid frequent adjustment of the replenishment rates. It is unlikely that you will see the effect of a rate change for some time, and the full effect will probably not be apparent for several weeks.

Table 2-2 Replenishment for Continuous Processors

Product	Replenishment for EDGE/ ROYAL, ROYAL Luminous, Photo Book Papers mL/M^2 (ML/ft^2)*	Replenishment for SUPRA VC, ULTRA, ULTRA HD, and Metallic VC Papers mL/M^2 (ML/ft^2)*
EKTACOLOR RA Developer Replenisher	135 (12.5)	145 (13.5)
EKTACOLOR RA Developer Replenisher 12	118 (11)	131 (12.2)
EKTACOLOR RA Bleach-Fix Replenisher	215 (20)	215 (20)
EKTACOLOR RA Bleach-Fix Replenisher NR	54 (5)	54 (5)
Wash, number of tanks = 1†	10,800 (1,000) or higher	10,800 (1,000) or higher
Wash, number of tanks = 2	6,460 (600) or higher	6,460 (600) or higher
Wash, number of tanks = 3	4,300 (400) or higher	4,300 (400) or higher
Wash, number of tanks = 4	2,150 (200) or higher	2,150 (200) or higher

* Starting point rates only, exact rate dependent upon utilization and image content.
† Not recommended unless other modifications made to processor to limit bleach-fix carryover

Wash Rates

The final-wash flow rate depends on the number of wash tanks and the amount of paper being processed. Some processors automatically adjust the flow rate for the amount of paper being processed. If your processor does not adjust the water flow automatically, use a rate for the maximum paper width.

If your processor has only one wash tank, there will be little washing safety factor; therefore, to minimize the effect of bleach-fix carryover, use a wash rate of at least 10,800 mL/m2 (1000 mL/ft2). You may also need to make other processor modifications to obtain adequate washing.

For multiple wash tanks, meter the wash water going into the wash tank closest to the dryer, and plumb the tanks so that the water cascades to the preceding tank in a countercurrent flow.

Low-Flow Wash—In high-volume processors with three or more wash tanks, use a low-flow wash after the bleach-fix. With a low-flow wash, you can recover silver that would otherwise be carried into the remaining wash tanks, where it is more difficult to recover. Using a low-flow wash keeps the silver concentrated so that it can be more efficiently recovered.

If your processor has four or more wash tanks, use two tanks for a low-flow countercurrent wash. If your processor has three wash tanks, use one tank for a low-flow wash. *Do not* use a low-flow wash if your processor has fewer than three wash tanks. Replenish the low-flow wash at a rate of 215 mL/m^2 (20 mL/ft^2). Use efficient squeegees at the exit of the last low-flow wash tank. If you do not regenerate the bleach-fix, combine the low-flow wash and bleach-fix overflows and recover silver from the mixture. If you regenerate the bleach-fix, do not mix the low-flow wash water with the bleach-fix overflow; recover silver from them separately. For more information on low-flow washes, see KODAK Publication No. J-212, *The Technology of Silver Recovery for Photographic Processing Facilities.*

Drying

The maximum drying temperature for KODAK EKTACOLOR Papers is 96°C (205°F).

Utilization and Maximum Weeks per Tank Turnover

Processor utilization determines which processing chemicals are best to use for your processor. Certain processing chemicals are designed to compensate for the higher rate of solution evaporation and oxidation that occurs in processors with low utilization.

A simple and convenient way to express processor utilization for continuous processors is "maximum weeks per tank turnover." A tank turnover occurs whenever the volume of replenisher you have added equals the volume of the tank solution. It may take a few hours or several weeks to produce a tank turnover, depending on the volume of the tank, replenishment rate, and the amount of paper processed. To calculate the amount of time required for one tank turnover:

1. Determine the total solution volume of the developer tank if you don't already know it.

2. Determine the weekly developer replenisher usage by keeping a record of the amount mixed and used, or by calculating the actual daily usage.

3. Divide the volume of replenisher used for one week (in litres) by the processor tank volume (in litres). The result is the number of weeks per tank turnover.

$$W = \frac{V}{R}$$

Where:

W = Weeks per tank turnover

V = Total volume of the developer tank solution

R = Total volume of developer replenisher used in one week

Table 2-1 lists the maximum number of weeks for a tank turnover for KODAK EKTACOLOR Chemicals that you can use for Process RA-4. To obtain the best performance from your processor, choose the chemical with the "Maximum-Weeks-per-Tank-Turnover" that best matches your processor's level of utilization. Be sure to use a production period that is typical for your lab when you make the determination.

FOLLOW THESE RECOMMENDATIONS CAREFULLY

When you mix chemicals properly, you take the first step toward producing high-quality results consistently. You must then be sure to operate the processor at the recommended conditions. The most critical conditions are time, temperature, agitation, and replenishment. Check the processor regularly to be sure that it meets the specifications given in the tables in this section. When it is operating at the correct conditions, you'll have less waste, less down time, higher productivity, and the best quality.

If you have any questions about how to set your processor for the conditions recommended, contact your Kodak sales representative, the equipment manufacturer, or call the Kodak Customer Assistance Team at 800-242-2424.