Z-129B
$2.00

USING
KODAK EKTACHROME R-3 Chemicals in Continuous and Roller-Transport Processors

This publication gives the steps, conditions, and replenishment rates for using KODAK EKTACHROME R-3 Chemicals to process the following papers and materials in continuous and roller-transport processors:

- KODAK EKTACHROME RADIANCE III Paper
- KODAK EKTACHROME RADIANCE III Copy Paper
- KODAK EKTACHROME RADIANCE III HC Copy Paper
- KODAK EKTACHROME RADIANCE III Select Material
- KODAK EKTACHROME RADIANCE III Overhead Material
- KODAK EKTACHROME RADIANCE III Clear Display Material
- KODAK EKTACHROME RADIANCE III Translucent Display Material

It also includes methods for calculating replenishment rates for continuous and roller-transport processors.

For information on mixing and storage of EKTACHROME R-3 Chemicals, see KODAK Publication No. Z-129A, *KODAK EKTACHROME R-3 and R-3000 Chemicals*. For information on monitoring your process, see KODAK Publication No. Z-129E, *Monitoring and Troubleshooting Processes Using KODAK EKTACHROME R-3 and R-3000 Chemicals*. If you are starting up your process for the first time, see "Starting Up Your Process R-3" on page 10.

FOLLOW THESE RECOMMENDATIONS CAREFULLY

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

If you have questions about how to set your processor for the conditions recommended, contact your Kodak representative.

USING PROCESS R-3

Table 1

Continuous and Roller-Transport Processors—Processing Steps and Conditions—Process R-3

Processing Step	Time* min:sec	Temperature °C (°F)	Comments
Total Darkness			
First Developer	1:15	38.0 ±0.3†‡ (100.4 ±0.5)	Recirculate and filter. Use precise temperature control. Use double-bladed squeegees at tank exit.
First Wash Tank 1 Tank 2	 0:45 0:45	35 to 41 (95 to 106)	Use at least two tanks with countercurrent flow. Use double-bladed squeegees at Tank 2 exit.¶
Room Light			
Reexposure	—	—	Expose to fluorescent light. A minimum of 100 lux on the paper surface for 5 to 10 seconds is required.
Color Developer	2:15	38 ±1‡ (100 ±2)	Recirculate and filter. Use temperature control. Do not squeegee at tank exit.
Second Wash	0:45	25 to 41 (77 to 106)	Use double-bladed squeegee at tank exit.¶
Bleach-Fix Tank 1 Tank 2	 1:00 1:00	 30 to 38‡ (86 to 100) 37 to 39 (98 to 102)	Two countercurrent-flow tanks with recirculation and filtration on each tank. Use temperature control on at least tank 2. Use double-bladed squeegees at tank 2 exit.
Final Wash Tank 1 Tank 2 Tank 3	 0:45 0:45 0:45	25 to 41 (77 to 106)	If using three countercurrent-flow tanks, use double-bladed squeegees at exit of last tank.§ If using low-flow option in tank 1, followed by two countercurrent-flow tanks, use double-bladed squeegees at exits of tanks 1 and 3.¶
Dry	As needed	Not over 71 (160)	Do not ferrotype KODAK EKTACHROME Papers or Materials.

* Includes immersion time and transfer time to the next solution. Transfer time should not exceed 30 seconds.

†When you start up the processor for the first time and are trying to achieve the recommended process speed (green LD), you can adjust the first-developer temperature within a range of 36.0 to 40.0°C (96.8 to 104°F). However, after the initial startup, do not modify this aim temperature; keep it within the tolerances given in this table. See “STARTING UP YOUR PROCESS R-3,” page 10.

‡When heavy paper volume requires large amounts of replenisher, you may need an auxilliary heater for the replenisher.

§You can use two countercurrent tanks for the final wash if the total wash time is 2 minutes 15 seconds or longer.

¶In no case should the wash rate be less than 2 L/min (0.55 gal/min).

Replenishment Rates

The developer replenishment rates given in the tables are starting-point recommendations; you may need to adjust them for your type of processor, the amount of processor utilization, and other variables of the processing system. With proper replenishment, you can use your processing solutions as long as the control plots indicate that the process is in control, and there are no dirt problems from the solutions.

Table 2 gives basic replenishment rates for KODAK EKTACHROME RADIANCE III Papers and EKTACHROME Select III Material. For leader-belt processors, multiply the *color-developer* replenishment rate by 1.5 to compensate for wash-water carryover by the belts.

The replenishment rates of the solutions after the first developer must be sufficient to compensate for carryover of the preceding solution in addition to chemical usage to maintain chemical concentrations and pH level. If you do not compensate for carryover, solution activity will be affected.

Table 2

Replenishment and Wash Rates for RADIANCE Papers and Select Material in Continuous and Roller-Transport Processors—Process R-3

Solution	Basic Rate mL/m² (mL/ft²)
First Developer	330 (30.6)
First Wash*	5000 (470)
Color Developer†	330 (30.6)
Second Wash	1000 (93)
Bleach-Fix*	220 (20.4)
Optional Low-Flow Wash	160 (14.6)
Final Wash	5000 (470)

* For simplified processors with single bleach-fix and wash tanks (or two bleach-fix tanks plumbed in parallel), the wash rate for the first and final washes is 25 L/m² (2.3 L/ft²); the bleach-fix replenishment rate is 500 mL/m² (46 mL/ft²).

†For leader-belt processors, multiply the color-developer replenishment rate by 1.5 to compensate for wash water carried in by the belts.

KODAK EKTACHROME RADIANCE Overhead and Display Materials—KODAK EKTACHROME RADIANCE Overhead and Display Materials requires higher replenishment rates than EKTACHROME Papers. However, you can process EKTACHROME RADIANCE Overhead and Display Materials without increasing replenishment rates if the amount of material processed is less than 10 percent of the total processing load. Follow your control plots to be sure that your process control is not affected. You can also determine the maximum amount of overhead material that you can process at one time without increasing the replenishment rate by making this calculation:

$$A^1 = 3.44 \times V$$

or

$$A^2 = 0.32 \times V$$

A^1 = area of EKTACHROME RADIANCE Overhead and Display Materials processed (in square feet)

A^2 = area of EKTACHROME RADIANCE Overhead Material processed (in square metres)

V = volume of first-developer tank in litres

If the area of EKTACHROME RADIANCE Overhead and Display Materials to be processed is equal to or greater than 10 percent of the paper area, or if it exceeds A^1 or A^2 calculated in the formula above, or if you process only EKTACHROME RADIANCE Overhead and Display Materials, use the replenishment rates given in Table 3.

Table 3

Replenishment Rates—for RADIANCE Overhead and Display Materials mL/m² (mL/ft²)

First Developer	Color Developer	Bleach-Fix
520 (48.3)	670 (62.2)	500 (46.5)*

*For simplified processors with a single bleach-fix tank, the replenishment rate is 750 ml/ft² (69.8 mL/ft²).

NOTE: These values apply to roller-transport and paper leader processors. For leader-belt processors, multiply the color-developer replenishment rate by 1.5. Use the same wash-water flow rates for overhead material and paper.

Low Use of Your Processor

The amount of time your processor is used for processing affects the process stability. Low utilization causes chemical changes in the process through evaporation and oxidation. To compensate for low utilization, you will need to modify the developer replenishers and increase the developer and bleach-fix replenishment rates. For more information, see page 7.

Squeegees

Place squeegees at the exit of the last tank of the first developer and the bleach-fix, and at each wash tank to reduce solution carryover. *Do not* use a squeegee at the exit of the color-developer tank; it will reduce development and result in lower maximum density.

Reducing solution carryover with efficient squeegees permits lower replenishment rates and more efficient silver recovery from the bleach-fix overflow. If carryover rates exceed 50 mL/m^2 (5 mL/ft^2), you may need to increase bleach-fix replenishment rates and wash rates.

Agitation

Recirculation provides agitation and filtration for the tank solutions. If possible, recirculate solutions by passing them into the bottom of the tank and out through the top (especially with the first developer). The recirculation flow rate depends on the power of the pump. The rate of solution turnover is more important than the overall flow rate. The recirculation rate should provide 0.2 to 0.5 tank volume per minute. Higher agitation may be required for low-volume and slow-transport-speed processors to maintain photographic activity. If you use multiple tanks, recirculate each tank at this rate.

The effect of agitation is particularly noticeable when recirculation stops altogether. This can be caused by a clogged filter, defective pump, etc. The effect of loss of agitation is more noticeable at slower transport speeds. Too high a rate of recirculation can oxidize all the solutions and sulfurize the bleach-fix. If air is drawn in by the recirculation system, it can cause foam and oxidation in the processing solutions. This can noticeably affect physical and photographic quality. The first indication of air sucked into the recirculation system will be decreased solution activity followed by oxidation effects.

The quality of the agitation is also important for stopping development in the first few seconds of the first wash step. If the agitation is not sufficient during those first few moments of the wash, streaking and non-uniformity may occur in the prints. It is also important to squeegee the paper or material adequately as it leaves the first developer.

Filtration

Processing solutions and wash water may contain some insoluble materials. If you do not filter out this material, it can stick to the paper, tank walls, rollers, and solution lines, and may damage the paper. Generally, filters with a porosity of 15 to 25 microns are effective.

You can use the following filter materials:

- Bleached cotton
- Cellulose with phenolic resin binder
- Fiber glass with phenolic resin binder
- Polypropylene
- Spun polypropylene
- Activated carbon
- Viscose rayon with phenolic resin binder (*Use only bleach-fix and washes. (Do not* use viscose rayon in developers)

Polypropylene is the most acceptable filter-core material and one of the least expensive. Many polypropylene yarns are produced by using surfactants. While polypropylene appears to have no photographic effect, some surfactants may. Therefore, monitor your process carefully when you first change filters. Replace these filters regularly as part of your routine maintenance schedule.

When you change filters, monitor the process carefully for color or speed shifts. If you change filter vendors, test any unknown filter material for possible photographic effects before you use it.

Activated-Carbon Filtration—If your processor has low use, install an activated-carbon filter in the color-developer recirculation line. It will prevent the buildup of oxidized chemicals that can cause pink stain. You can use the following filters:

Filter	Manufacturer or Distributor
Polysales Filter Model No. PS-232-9.8	Seneca Tek, Inc. 109 Despatch Drive East Rochester, New York 14445
Serfilco Filter Model No. SFC-10W-carbofyne	Serfilco, Inc. Division of Service Filtration Corp. 1234 Depot Street Glenview, Illinois 60025 Serfilco Europe Ashburton Road Trafford Park Manchester, M17 1RW, England
Filter Micro-Carbon Model No. C9. 75P-W5	Trumpler Clancy 34 E. Main Street Hamburg, New York 14075

Evaporation and Oxidation

To prevent solutions from becoming overconcentrated due to evaporation, top off the solutions daily at start-up. Rinse exposed gears and rollers with a squirt bottle to remove crystallized chemicals and then add sufficient *water* (at process temperature) to bring the *first-developer* solution to the proper volume. Top off both the *color developer and the bleach-fix with replenisher. If the processor is unused for several hours during the day, repeat the top-off procedure before resuming processing.* Be sure that the solution loss is due to evaporation, not leakage. Use specific-gravity measurements to monitor the additions (see Z-129A).

NOTE: Be sure to top up the first developer with *water, not replenisher*. Topping up the first developer with replenisher will lead to an overconcentrated, overactive condition (see Z-129E, Control Chart 7, page 32).

To minimize evaporation and reduce solution oxidation, keep the time that the processor is at operating temperature to a minimum. Use a timer to turn off the processing machine at the end of each day and to start it the next day. Set the timer to turn on the machine for only the minimum time required for solution warm-up before processing. Another way to reduce oxidation and evaporation is to operate the processor transport drive only during actual processing. This requires a standby switch that lets you turn off the processor drive without turning off the temperature control and solution recirculation. Avoid excessive ventilation of the processor, since this can increase evaporation.

Bleach-Fix

You can use two bleach-fix tanks in a countercurrent configuration or a single bleach-fix tank.

Two bleach-fix tanks in a countercurrent configuration

The bleach-fix has been specially formulated to provide several important advantages with this configuration:

- Reduced solution replenishment rate
- Compatibility with electrolytic silver recovery in high-current-density units
- No need for regeneration

The bleach-fix process time is 2 minutes—1 minute each in Tank 1 and Tank 2. If the tank setup makes equal times in Tanks 1 and 2 impossible, the Tank 1 time must be longer.

The bleach-fix step MUST include two double-sided squeegee assemblies, one at the entrance of the bleach-fix (following the second wash) and one at the exit of tank 2 (entrance to the low-flow wash or the third wash).

Regularly monitor the silver concentration in the bleach-fix Tanks 1 and 2 with KODAK Silver Estimating Test Papers (CAT No. 196 5466). A silver concentration greater than 7 g/L in Tank 1 and/or 3 g/L in Tank 2 will adversely affect photographic quality. Too little silver (less than 4.5 g/L) in Tank 1 causes inefficient electrolysis. Carefully check the bleach-fix replenishment rate and maintain it at 220 mL/m^2 (20.4 mL/ft^2).

The silver concentration in Tank 1 should be at least twice as much as that in Tank 2. This ratio is another measure of the bleach-fix efficiency. The ratio will vary with the type of processor (e.g., continuous vs roller-transport).

If the silver content exceeds 7 g/L in Tank 1 and/or 3 g/L in Tank 2, drain 25 percent of the corresponding tank solution into the silver-recovery collection tank; then top off the tank solution with bleach-fix replenisher. High silver content may also be caused by excessive evaporation. If excessive evaporation is the cause, carefully follow the guidelines for minimizing evaporation in roller-transport processors. If the problem still exists, dilute the bleach-fix replenisher 15 percent with water and increase the solution replenishment rate by 15 percent.

Single bleach-fix tank configuration

A single bleach-fix tank configuration (or two tanks connected in parallel) requires a higher replenishment rate than the countercurrent configuration. It must be 500 mL/m^2 (46 mL/ft^2) to maintain silver content below 3g/L but it achieves a better protection against sulfurization. This configuration is recommended for low use roller-transport processors.

NOTE: You can also monitor bleach-fix efficiency with process-control strips. If the blue density of the D-min increases by more than 0.02 from aim, check for silver retention. Refer to Z-129E, Diagnostic Chart C, page 19, and Control Chart 1, page 24.

Wash

Provide an adequate supply of clean, filtered water. Use filters that will remove particles as small as 5 microns from the incoming water supply. Replace the filters every two weeks, or more often if needed. Wash-flow rates are given in L/m² (mL/ft²) of paper processed. Set the rates for the paper-transport speed and the paper width being processed. However, do not use a flow rate less than 2 L/min (0.55 gal/min) for each wash (except low-flow wash).

The first wash requires two tanks with countercurrent flow. The third (final) wash requires two or three tanks with countercurrent flow. If you have a 3-tank final wash, you can convert the first of the final-wash tanks to a low-flow wash. Use normal countercurrent flow for the second and third tanks. See Table 4 for wash requirements.

Table 4

Wash Requirements

Wash	Time min:sec	Temperature °C (°F)	Flow Rate L/m² (mL/ft²)
First Wash Removes first developer from the paper or material and stops development	1:30 Two countercurrent flow tanks; 45 seconds in each tank.	35 to 41 (95 to 106) You must maintain this range; otherwise color-developer efficiency can be affected.	5 (465) Two countercurrent-flow tanks.*
Second Wash Removes color developer from the paper or material	45 seconds	25 to 41 (77 to 106)	1 (93)
Low-Flow Wash Removes bleach-fix from the paper or material; keeps the silver concentration high enough so that it can be desilvered electrolytically. Permits silver recovery from this wash when mixed with bleach-fix overflow.	45 seconds	25 to 41 (77 to 106)	0.16 (15) Avoid too much dilution of the bleach-fix overflow.
Final Wash Removes all residual processing chemicals	2:15 (minimum) with three tanks or 1:30 (minimum) with two tanks with a 45-second, low-flow wash.	25 to 41 (77 to 106)	5 (465) Two or three countercurrent-flow tanks.

* For simplified processors with single wash tanks, increase the wash flow rate from 5 L/m² (465 mL/ft²) to 25L/m² (2325 mL/ft²). This prevents first-developer contamination of the color developer and maintains good image stability.

***Automatic Wash Control*—**Some processors with automatic wash-control units control wash flows by measuring the conductivity (or salt concentration) of a wash solution. Connect the measuring device to the first tank of the first wash (tank adjacent to the first-developer tank). Set the unit to a minimum concentration of 12.5 mL ±2.5 mL of first developer per litre of first wash. The wash-flow rates for all three wash steps should remain in the proportion of 5:1:5 (see Table 2, page 3).

***Processors with Leader Belts*—**Some processors use continuous plastic belts to pull the paper through the solution tanks. These belts can be a source of solution contamination. First developer absorbed by the belt can contaminate the color developer. Bleach-fix by-products can also contaminate the first developer (especially on high-speed processors). To minimize the possibility of contamination, use only belts made of polypropylene, polyester, or a similar material approved for use with KODAK EKTACHROME R-3 Chemicals.

Leader-belt processors require efficient wiper-blade squeegees at the first-developer exit. If squeegees are not present, you will need to increase the first-wash flow rate to 10 L/m^2 (930 mL/ft^2). Countercurrent flow is essential for the first and final washes. Increase the color-developer replenishment rate to 500 mL/m^2 (46.5 mL/ft^2) to compensate for wash water carried over by the leader belts.

Drying

Do not ferrotype KODAK EKTACHROME RADIANCE Papers and Materials. Dry them with air-impingement dryers.

The air temperature depends on dryer design, processor speed, air-flow rate, ambient humidity and total drying time. The ideal drying temperature is between 50 and 70°C (122 and 158°F).The maximum drying temperature for EKTACHROME Papers and Materials is 71°C (160°F). Too high a drying temperature causes the paper to curl; too low a temperature reduces the paper surface gloss and increases the risk of sticking.

Drying requirements are different for EKTACHROME RADIANCE Overhead and Display Materials because of its anti-curl gelatin backing or translucent backing for the Display. Use a dryer that blows air on both sides of the material. If your dryer is not designed to do this, use a higher temperature than you use to dry paper. Remember to lower the temperature before drying paper again. In continuous processors, remove excess water with double-bladed squeegees following the final wash. With roller-transport processors, the rollers will also remove some surface moisture.

Effluent Disposal

See KODAK Publication No. Z-129A, *KODAK EKTACHROME R-3 and R-3000 Chemicals.*

HOW DOES LOW UTILIZATION OF THE PROCESSOR AFFECT MY PROCESS?

Process R-3 was designed for very efficient and economical replenishment and wash systems in machines operated at 10 percent or greater utilization. If your processor utilizes less than 10 percent of its maximum processing capacity during the time that it is at process temperature, it is considered a low-utilization process (the following section will tell you how to calculate percent utilization).

Low utilization is common in many types of processors when production volume is low. In roller-transport processors, especially wide-roll equipment, low utilization is normal.

When low utilization occurs, you may have some difficulty keeping the process in control unless you follow specific procedures. This is because the low replenishment rates of Process R-3 do not entirely offset the extreme effects of evaporation and oxidation due to low utilization. This is especially true of roller-transport processors which, by their design, have a high oxidation rate.

Developer replenishers are designed to compensate for air oxidation and for chemical compounds the paper or material produces and consumes during development. At utilization rates of 10 to 100 percent, both developers require 330 mL/m2 (30.6 mL/ft^2) of replenisher. At utilization rates less than 10 percent, developer-tank solutions will need additional replenishment to compensate for air oxidization.

To maintain the proper chemical balance in the tanks with the increased replenishment rate, you will need to prepare a modified replenisher solution. For the first developer, this solution consists of normal First Developer II Replenisher and First Developer II Starter solution. For the color developer, use normal Color Developer II Replenisher, water, and First Developer II Starter solution (see Tables 5 and 6).

NOTE: When modifying the Color Developer Replenisher for *low utilization* processes you MUST use the R-3 First Developer II Starter. Using the R-3 Color Developer II Starter in this application would result in a too low pH and in low D-max's.

For additional information on the appropriate use of starter, see Table 2 in KODAK Publication No. Z-129A, *KODAK EKTACHROME R-3 and R-3000 Chemicals.*

It's important to know your processor's utilization rate. Initially, this will help you establish the most effective replenishment rate and solution modifications to maintain a stable, in-control process. Keeping track of utilization from week to week will also allow you to adjust the replenishment rate and starter additions if utilization changes.

Generally, you do not have to adjust your low-utilization procedures unless utilization changes significantly from the average weekly utilization rate. A shift of one level up or down in the rates shown in Table 5 or 6 is significant. The shift should also be one that occurs for a significant period of time. If average weekly utilization changes for a period of time equal to the time it takes for one tank turnover of the developer, you should change the replenishment rate and starter modification. One tank turnover means using an amount of replenisher equal to the developer tank volume.

If the utilization rate decreases significantly, apply the recommendations for the lower utilization rate to maintain protection from oxidation. If the utilization rate increases, even though the photographic results are not affected by staying at the higher replenishment recommendation, you can reduce chemical use by adjusting the replenishment rate and solution modifications. If utilization varies widely from week to week, use the replenishment rate and modifications for the lowest utilization.

CALCULATING PERCENT UTILIZATION

Utilization is the ratio of the amount of product actually processed to the maximum amount that could be processed during the time that the processor is at operating temperature. Use the following information to determine both of these quantities.

NOTE: Be consistent is using either English *or* metric units throughout your calculations.

Average Amount Actually Processed

To determine the average amount (area) of paper actually processed per week, record the total square metres or square feet of paper and material processed each week. Do this for several weeks and calculate the average. Use this weekly average in calculating percent utilization. You should look at utilization over a week's time to avoid short-term changes in production volume. Day-to-day changes in volume are tolerable if the variation remains between one half to double the average weekly amount. Production exceeding this range can cause excessive process variability.

Maximum Processor Capacity

Calculate the maximum capacity (C) of the processor in square metres (or square feet) per week by the following formula:

$$C = 60 \times W \times S \times T \times N$$

Where:
- W = the maximum product width that can be processed (m or ft)
- S = the machine transport speed (m/min or ft/min)
- T = the hours per day during which the processor is at operating temperature
- N = the number of operating days per week
- 60 = the number of minutes in an hour

Example: Roller-Transport Processor

Maximum product width	W = 0.81 m
Machine transport speed	S = 1.18 m/min
Hours per day at operating temperature	T = 12 hrs/day
Operating days per week	N = 5

$C = 60 \times 0.81 \times 1.18 \times 12 \times 5 = 3{,}441\ m^2/wk$

Percent Utilization

After determining the processor's maximum capacity and the average amount of paper actually processed in a week, calculate the percent utilization (U%) by the following formula:

$$U\% = \frac{A}{C} \times 100$$

Where:
- A = the average area of product processed per week (m^2 or ft^2)
- C = the maximum processor capacity per week (m^2 or ft^2)

Example: Roller-Transport Processor

$A = 125\ m^2/wk$
$C = 3{,}441\ m^2/wk$

$$U\% = \frac{125}{3{,}441} \times 100 = 3.6\%$$

COMPENSATING FOR LOW UTILIZATION

The method of adjusting for low utilization consists of making a modified replenisher and increasing the replenishment rate. To determine the minimum replenishment necessary to compensate for low utilization, use the following recommendations for all types of processors.

Modified First Developer II Replenisher

Refer to Table 5 to prepare a *modified* First Developer II Replenisher solution and to adjust replenishment rates. The changes are based on the processor's percent utilization. To each litre or gallon of *standard* KODAK EKTACHROME R-3 First Developer II Replenisher, add KODAK EKTACHROME R-3 First Developer II Starter in the amount (mL) indicated.

NOTE: *Do not use* a modified First Developer II Replenisher to make a fresh tank solution.

Table 5

Modified Process R-3 First Developer II Replenisher for Low-Utilization Processes

Percent Utilization		Replenishment Rate		First Developer II Starter Addition (mL)		Specific Gravity	
Roller-Transport Processors	Continuous Processors*	L/m^2	mL/ft^2	To Each Litre of Replenisher, Add:	To Each Gallon of Replenisher, Add:	At 25°C (77°F) ±0.003	At 38°C (100.4°F) ±0.003
≥10%	≥6%	0.33	30.6	0	0	1.061	1.058
7 to 9%	4 to 5%	0.395	36.6	0.8	3.1	1.061	1.058
5 to 7%	3 to 4%	0.525	48.7	1.9	7.3	1.061	1.058
3 to 5%	2 to 3%	0.66	61.2	2.5	9.5	1.061	1.058
1 to 3%†	1 to 2%†	0.99	91.8	3.3	12.6	1.061	1.058

*Paper leader or leader-belt processors.

†For processors with utilization rates below 1%, this method will provide process control for some time. The developer will eventually lose activity and require replacement.

Modified Color Developer II Replenisher

Refer to Table 6 to prepare a *modified* Color Developer II Replenisher solution and to adjust replenishment rates. The changes are based on the processor's percent utilization. To each litre or gallon of standard KODAK EKTACHROME R-3 Color Developer II Replenisher, add KODAK EKTACHROME R-3 First Developer II Starter and water in the amounts (mL) indicated.

NOTE: When modifying the Color Developer Replenisher for *low utilization* processes you MUST use the R-3 First Developer II Starter. Using the R-3 Color Developer II Starter in this application would result in a too low replenishment pH and in low D-max's.

NOTE: *Do not use* a modified Color Developer II Replenisher to make a fresh tank solution.

Table 6

Modified Process R-3 Color Developer II Replenisher for Low-Utilization Processes

Percent Utilization		Replenishment Rate		First Developer II Starter Additions (mL)				Specific Gravity	
Roller-Transport Processors	Continuous Processors*			To Each Litre of Replenisher, Add:		To Each Gallon of Replenisher, Add:		At 25°C (77°F) ±0.003	At 38°C (100.4°F) ±0.003
		L/m^2	mL/ft^2	Starter	Water	Starter	Water		
≥10%	≥6%	0.330	30.6	0	0	0	0	1.040	1.037
7 to 9%	4 to 5%	0.395	36.6	0.2	34	0.8	129	1.039	1.036
5 to 7%	3 to 4%	0.525	48.7	0.4	80	1.6	303	1.038	1.035
3 to 5%	2 to 3%	0.660	61.2	0.6	111	2.1	421	1.037	1.034
1 to 3%†	1 to 2%†	0.990	91.8	0.8	154	3.1	582	1.036	1.033

*Paper leader or leader-belt processors.

†For processors with utilization rates below 1%, this method will provide process control for some time. The developer will eventually lose activity and require replacement.

Bleach-Fix

5 to 10% Utilization—You can use the standard configuration of two countercurrent-flow tanks. *Do not* modify the replenisher. Reduce the temperature of the tank solution to 30°C (86°F) and increase the replenishment rate (for KODAK EKTACHROME RADIANCE Papers and Select Material) to 330 mL/m^2 (30.6 mL/ft^2).

1 to 5% Utilization—You should replace the two countercurrent-flow tanks with a single tank. It may be possible to modify the plumbing of the tanks to make them function like a single tank. Contact the manufacturer of your processor for assistance.

Do not modify the replenisher. Reduce the temperature of the tank solution to 30°C (86°F) and increase the replenishment rate (for KODAK EKTACHROME RADIANCE Papers and Select Material) to 500 mL/m^2 (46.6 mL/ft^2).

When utilization is 1% or less, a sulfur precipitate may form. To avoid this, add the KODAK RA-4 Bleach-Fix Additive directly to the bleach-fix tank solutions. The amount of additive required will depend upon maximum processor capacity (see page 8). To calculate the daily addition (in mL) for each bleach-fix tank, multiply 0.05 times the figure for processor capacity in m^2 per week, or multiply 0.005 times the number for maximum capacity in ft^2 per week.

STARTING UP YOUR PROCESS R-3

No one set of operating conditions will provide the same results with all processors. Use the following guidelines to start up your process.

Adjusting the Processor Conditions for Initial Start-up

When you start up a processor for the first time, use the general specifications. Check your solution times, temperatures, and replenishment rates to conform to these specifications. Be sure that the recirculation equipment is operating properly. Be sure that the first-developer working tank solution was prepared with the correct amounts of First Developer II Replenisher and First Developer II Starter. The amount of starter used affects the activity of the first-developer. Verify that the color-developer tank solution was prepared with the correct amount of Color Developer II Replenisher, water, and Color Developer II Starter. It is very important to use exclusively the Color Developer II Starter to mix a fresh Color Developer II tank solution. Check the specific gravities to confirm that the solutions were properly mixed (see KODAK Publication No. Z-129A, *KODAK EKTACHROME R-3 and R-3000 Chemicals*).

Evaluate the process by processing at least three KODAK RADIANCE III Control Strips, Process R-3 (CAT No. 508 2953), at intervals. The control plots show how well the process meets the aim values. See KODAK Publication No. Z-129E, *Monitoring and Troubleshooting Processes Using KODAK EKTACHROME R-3 and R-3000 Chemicals*, for details on how to monitor your process. Evaluate the green LD control values according to the following guidelines:

1. If the green LD control values from this first evaluation are within ±0.04 of the aim values, the processing steps and conditions are producing an acceptable process speed. Record these steps and conditions; they are the operating conditions for your processor.
2. If the green LD control values from this first evaluation are more than ±0.04 from the aim values, adjust the process speed.

Adjusting Process Speed—You can adjust the process speed by changing the first-developer temperature. When you adjust the first-developer temperature, *do not* exceed a temperature range of 36.0 to 40.0°C (96.8 to 104°F). Once you determine the first-developer temperature for your processor, maintain that temperature to ±0.3°C (±0.5°F).

Before you adjust the first-developer temperature, be sure that all other process conditions, including recirculation and agitation, are set according to recommendations. *Do not* attempt to use first-developer time, replenishment rate, or starter addition to adjust process speed.

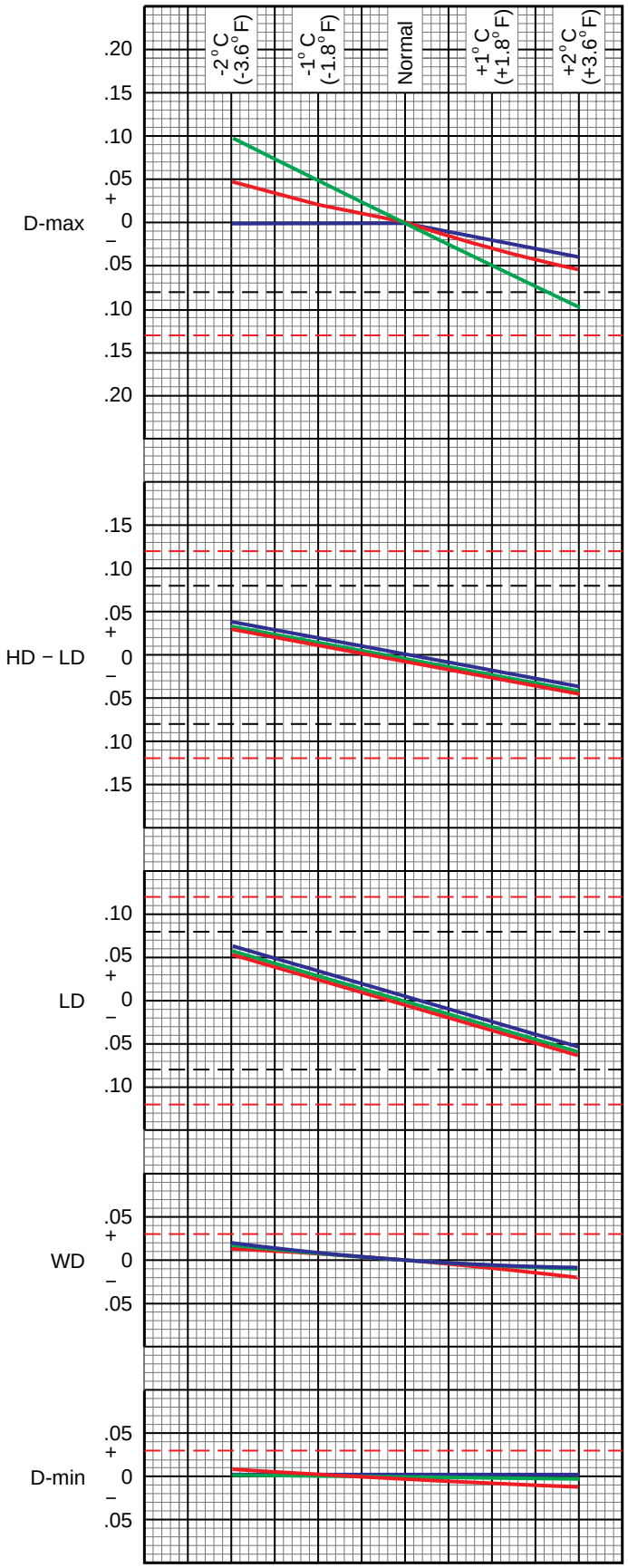
Use the chart on page 11 to determine the temperature change. After you make each temperature adjustment, evaluate it by processing a control strip. Be sure to allow sufficient time for the solution to come to temperature. Measure the temperature with an accurate thermometer. Continue to make adjustments until the green LD control value is within ±0.04 of the LD aim value. You may need to adjust the green LD value once more after the process has seasoned (i.e. after you use an amount of replenisher equal to three times the first-developer tank volume). *After that adjustment,* do not *make any further changes to the process speed. Consider this as the standard operating temperature; do not make any further changes to it.*

First-Developer Temperature Variations

If your start-up green LD control plots are not within ±0.04 density units of the reference line, use these control-chart patterns to adjust your process speed.

The activity of the first developer is directly related to the temperature of the first-developer tank solution. As first-developer temperature increases, the activity of the first developer increases and the amount of development increases. This allows less dye to form in the succeeding process steps and results in a decrease in density. Conversely, as first-developer temperature decreases, the activity of the first developer decreases. This allows more dye to form in the succeeding process steps and results in an increase in density.

In terms of control plots, the LD, D-max, and HD–LD, will increase with lower first-developer temperature and will decrease with higher first-developer temperature.



MORE INFORMATION

Kodak has many publications to assist you with information on Kodak products, equipment, and materials.

Complete information on KODAK EKTACHROME RADIANCE III Paper and Select Material is available on the Kodak website **www.kodak.com/go/professional** and through Kodak in your country.

The publications listed below are available from dealers who sell Kodak products, or you can contact Kodak in your country for more information.

J-2A *Health, Safety, and Environmental Emergency Card*

Y-55 *KODAK Process Record Form*

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