

4 Using KODAK EKTACOLOR Chemicals in Professional Finishing Labs

KODAK EKTACOLOR Chemicals are designed for use with Process RA-4. Use these chemicals for processing color papers and materials designed for Process RA-4, such as—

- KODAK PROFESSIONAL PORTRA ENDURA Paper
- KODAK PROFESSIONAL SUPRA ENDURA Paper
- KODAK PROFESSIONAL ULTRA ENDURA Paper
- KODAK PROFESSIONAL PORTRA Black & White Paper
- KODAK PROFESSIONAL PORTRA Sepia Black & White Paper
- KODAK PROFESSIONAL ENDURA Metallic Paper
- KODAK PROFESSIONAL DURAFLEX Plus Digital Display Material
- KODAK PROFESSIONAL ENDURA Transparency Digital Display Material
- KODAK PROFESSIONAL ENDURA Transparency Optical Display Material
- KODAK PROFESSIONAL ENDURA Clear Digital Display Material
- KODAK PROFESSIONAL ENDURA Clear Optical Display Material
- KODAK PROFESSIONAL ENDURA Day/Night Display Material

Several processing options are available for Process RA-4; they are described in Section 6, *Processing Options with KODAK EKTACOLOR Chemicals*.

This section lists the recommended steps, conditions, and replenishment rates for processing these papers and materials in continuous and roller-transport processors with KODAK EKTACOLOR RA Chemicals. For information on mixing and handling, see Section 1, *KODAK EKTACOLOR Chemicals*. For information on monitoring your process, see Section 8, *Process Monitoring and Troubleshooting with KODAK PROFESSIONAL Pro Strips Color Negative Paper Control Strips / for Process RA-4*. For information on using the KODAK EKTACOLOR Processing Cartridge 75 in a KODAK PROFESSIONAL RP 30 or SRP 30 Laser Printer, see Publication CIS-239, *Using the KODAK EKTACOLOR Processing Cartridge 75*.

CONTINUOUS PROCESSORS

Steps and Conditions

To use Process RA-4, your processor must be capable of operating with the conditions given in Table 4-1.

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

Solution/Step	Time* min:sec	Temperature† °C (°F)	Starting-Point Developer Replenishment Rates mL/m ² (mL/ft ²)	Maximum Weeks per Tank Turnover	Comments
EKTACOLOR RA Developer Replenisher 12 or EKTACOLOR RA Developer Replenisher or EKTACOLOR RA Developer Replenisher RT	0:45 0:45 0:45	37.8 ± 0.3 (100.0 ± 0.5) 35.0 ± 0.3 (95.0 ± 0.5) 35.0 ± 0.3 (95.0 ± 0.5)	116 (10.8)‡ 145 (13.5)‡ 194 (18)‡	1 4 8	Recirculate and filter. Use precise temperature control. Use squeegees at tank exit.
EKTACOLOR RA Bleach-Fix and Replenisher NR§ or EKTACOLOR RA Bleach-Fix and Replenisher or EKTACOLOR RA Bleach-Fix and Replenisher (with bleach-fix additive)	0:45 0:45 0:45	32 to 38 (90 to 100) 32 to 38 (90 to 100) 32 to 38 (90 to 100)	54 (5)¶ 215 (20)¶ 215 (20)¶	4 6 8	Recirculate and filter. Use squeegees at tank exit.
Wash	1:30	30 to 40 (86 to 104)	See Table 4-3		
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 other solutions 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 a crossover time of 6 seconds or less.

† Check the developer temperature frequently with an accurate thermometer.

‡ The replenishment rates are starting point recommendations for PROFESSIONAL SUPRA ENDURA Paper. For the replenishment rates for other KODAK PROFESSIONAL Papers and PROFESSIONAL DURAFLEX Plus Digital Display Materials, see Table 4-2.

§ A fresh bleach-fix tank solution prepared with KODAK EKTACOLOR RA Bleach-Fix and Replenisher NR may cause leuco-cyan dye to form with KODAK PROFESSIONAL Papers and Materials. This is due to the lower pH of the unseasoned solution. To avoid leuco-cyan dye formation, use one-half the normal volume of Part C when you prepare a fresh tank. Be sure to use the full amount of Part C when you mix replenisher.

¶ CAUTION: Overreplenishing bleach-fix can cause low pH in the tank, resulting in calibration problems with DURATRANS Plus and DURACLEAR Plus Digital Display Materials.

Squeegees

Install squeegees at the exit of the last tanks of the developer, bleach-fix, and low-flow wash to reduce solution carryover. Reducing solution carryover by using efficient squeegees permits lower replenishment rates and more efficient silver recovery. Typical carryover rates are 54 to 86 mL/m² (5 to 8 mL/ft²); however, if carryover exceeds 54 mL/m² (5 mL/ft²), you may need to increase the bleach-fix replenishment rate and wash rate.

Agitation

The developer and bleach-fix recirculation rates for high-volume processors should be 0.20 to 0.35 tank volumes per minute. With multiple tanks, the recirculation rate should be the same in each tank. Low-volume and slow-transport processors may require higher agitation to maintain process activity.

Good agitation is important during the first few seconds of the bleach-fix step. If initial agitation is poor in the bleach-fix, development may not stop uniformly, causing magenta streaks and non-uniformity. This problem can be aggravated by excessive developer carryover into the bleach-fix.

Filtration

Processing solutions and wash water 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 processors that use EKTACOLOR Chemicals:

- bleached cotton
- cellulose with phenolic-resin binder
- fiber glass 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 replenishment rates given in Table 4-2 are starting-point recommendations. The actual rates depend on the type of processor, the type of paper processed, the utilization of the processor, and the rate of evaporation. The replenishment rates are given in millilitres per square metre and in millilitres per square foot. To convert the rate to millilitres per minute, multiply the rate in mL/m² by the processor capacity in m²/min (or mL/ft² by the processor capacity in ft²/min).

Table 4-2 Replenishment Rates for Process RA-4—Continuous Processors

KODAK PROFESSIONAL Paper or Material	Replenishment Rates for EKTACOLOR RA Developer Replenisher mL/m ² (mL/ft ²)	Replenishment Rates for EKTACOLOR RA Developer Replenisher 12 mL/m ² (mL/ft ²)
PORTRA ENDURA	135 (12.6)	108 (10)
SUPRA ENDURA	145 (13.5)	116 (10.8)
ULTRA ENDURA		
ENDURA Metallic		
DURAFLEX Plus Digital Display	172 (16)	138 (12.8)
PORTRA Black & White	135 (12.6)	108 (10)
PORTRA Sepia Black & White		

If you process several products, use an average developer replenishment rate based on the product mix and adjust it as needed according to control-plot results.

Avoid frequent adjustment of replenishment rates. After any change, it may take several weeks for the full effect to be reached.

Bleach-Fix Replenishment—The starting replenishment rate for EKTACOLOR RA Bleach-Fix and Replenisher NR is 54 mL/m² (5 mL/ft²); for EKTACOLOR RA Bleach-Fix and Replenisher, the rate is 215 mL/m² (20 mL/ft²).

The bleach-fix replenishment rate must be sufficient to maintain chemical concentrations by compensating for developer carryover. If you do not compensate for developer carryover, retained-silver problems can occur. The replenishment rates for continuous processors with efficient squeegees are based on a carryover rate of 54 mL/m² (5 mL/ft²) or less. A continuous processor that does not have squeegees will need to use a higher bleach-fix replenishment rate to compensate for excessive developer carryover.

Wash Rates

Wash flow rate depends on the number of wash tanks and the amount of paper processed (see Table 4-3). Some processors automatically adjust the flow rate for the amount of paper processed. If your processor does not adjust water flow automatically, use a rate for the maximum paper load processed, not an average rate.

If your processor has only one wash tank, use a wash rate of at least 10,800 mL/m² (1000 mL/ft²). You may need to make other processor modifications to minimize the effect of bleach-fix carryover, because this rate may provide only a marginal safety factor.

Table 4-3 Wash Rates for Process RA-4

Number of Final Wash Tanks	Final Wash Rate mL/m ² (mL/ft ²)
1	See comments in text.
2	6460 to 10,800 (600 to 1000)
3	4300 to 10,800 (400 to 1000)
4	2150 to 10,800 (200 to 1000)

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 is more efficient to recover.

If your processor has four or more wash tanks, use two for a low-flow countercurrent wash. If your processor has three wash tanks, use one 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/m² (20 mL/ft²). 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 do regenerate the bleach-fix, do not mix the low-flow wash water and the bleach-fix overflows; 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*.

Maximum Weeks per Tank Turnover

Processor utilization determines which processing chemicals are best to use for your processor. Certain 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 4-1 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.

Drying

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

ROLLER-TRANSPORT PROCESSORS

Solutions in roller-transport processors are subject to increased oxidation and evaporation, because processor design and utilization rate differ from those of other types of processors. KODAK EKTACOLOR RA Developer Replenisher RT is specially formulated to reduce the effects of oxidation and evaporation.

If your processor has very low utilization (less than 4 percent), you can further protect the developer from oxidation by adding KODAK EKTACOLOR RA Developer Additive (for more information on low utilization and the use of this additive, see *KODAK EKTACOLOR RA Developer Additive*).

To minimize the effects of low utilization on the bleach-fix, you can add KODAK EKTACOLOR RA Bleach-Fix Additive to EKTACOLOR RA Bleach-Fix and Replenisher (see *KODAK EKTACOLOR RA Bleach-Fix Additive*).

Do not use solutions intended for processors with higher utilization (i.e., KODAK EKTACOLOR RA Developer Replenisher or KODAK EKTACOLOR RA Bleach-Fix Replenisher NR) in roller-transport processors unless the utilization is at least 15 percent.

Steps and Conditions

Use the processing steps and conditions in Table 4-4 for processing KODAK PROFESSIONAL PORTRA ENDURA, SUPRA ENDURA, ULTRA ENDURA, and ENDURA Metallic Papers; PORTRA Black & White and PORTRA Sepia Black & White Papers; and PROFESSIONAL DURAFLEX Plus Digital Display Materials in roller-transport processors. See Table 4-5 for replenishment rates.

To process KODAK PROFESSIONAL ENDURA Transparency and Clear Digital and Optical Display Materials, and KODAK PROFESSIONAL ENDURA Day/Night Display Material, use the steps and conditions in Table 4-9. See Table 4-5 for replenishment rates.

**Table 4-4 Processing Steps and Conditions for Process
RA-4—Roller-Transport Processors**

Solution/Step	Time* min:sec	Temperature °C (°F)	Comments
EKTACOLOR RA Developer Replenisher RT†	0:45	35.0 ± 0.3‡ (95.0 ± 0.5)	Recirculate and filter. Use precise temperature control. Use squeegees at tank exit.
EKTACOLOR RA Bleach-Fix and Replenisher§	0:45	30 to 36 (86 to 96)	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 other solutions can be one second less than the normal times. Longer than normal times should cause no adverse effect other than reducing the benefit of rapid access. For best results, use the recommended times with crossover times of 6 seconds or less. If the crossover time is longer than 6 seconds, the paper or material must be in the developer tank for at least 40 seconds.

† You can use EKTACOLOR RA Developer Replenisher in place of EKTACOLOR RA Developer Replenisher RT if your processor utilization is at least 15 percent.

‡ Check the developer temperature frequently with an accurate thermometer.

§ You can use EKTACOLOR RA Bleach-Fix and Replenisher NR if your processor utilization is at least 15 percent.

¶ Where water conservation is required, you can replace the wash with a stabilizer (see *Washless Option*).

Filtration

See *Filtration* for continuous processors.

Use of Activated-Carbon Filters to Remove Stain—In roller-transport processors, a build-up of oxidized chemicals in the developer tank solution can stain prints (typically yellow stain). To remove these oxidized chemicals and prevent staining, install an activated-carbon filter. You will see a significant stain reduction within 24 hours. The life of the filter cartridge depends on the amount of oxidation products that are treated and the size of the processor tank; however, typical length of use is about 14 days with a 75-litre (20-gallon) tank.

To reduce the possibility of contamination from the filter, pre-soak it in a small amount of developer replenisher for 24 hours before you install it. Discard the developer used for the pre-soak. You can use the following filters:

Filter	Manufacturer or Distributor
Polysales Filter Model No. PS-232-9.8	Seneca Tec, Inc. 109 Despatch Drive East Rochester, New York 14445 (585) 381-2645
Serfilco Filter Model No. SFC-10W-carbofyne	Serfilco, Inc. 1777 Shermer Road Northbrook, Illinois 60062 (847) 559-1777
	Serfilco Europe Ashburton Road West Trafford Park Manchester, M17 1RW, England 0161-872-1317
Filter Micro-Carbon Model No. C9, 75P-W5	Trumpler Clancy Inc. 34 E. Main Street Hamburg, New York 14075 (585) 649-9330

Replenishment Rates

The replenishment rates given in Table 4-5 are based on processor utilization; they are starting-point recommendations only. Actual rates depend on the type of processor, the paper or material processed, and the rate of evaporation and oxidation. If you process several products, use an average rate based on the product mix and adjust it as needed according to control-plot results. Avoid overcontrolling replenishment rates. Rate changes are likely to be small, and you may not see the full effect of changes for several weeks. If you add EKTACOLOR RA Developer Additive to the developer, use the replenishment rates given in Table 4-10. For information on low processor utilization, see *Low Utilization*.

Table 4-5 Replenishment Rates for KODAK EKTACOLOR RA Developer Replenisher RT

KODAK PROFESSIONAL Paper or Material	Processor Utilization mL/m ² (mL/ft ²)		
	Above 7%	4 to 7%	Below 4%*
PORTRA ENDURA	174 (16.2)	212 (19.8)	290+ (27+)
SUPRA ENDURA	194 (18)	232 (21.6)	290+ (27+)
ULTRA ENDURA			
ENDURA Metallic			
PORTRA Black & White	174 (16.2)	212 (19.8)	290+ (27+)
PORTRA Sepia Black & White			
DURAFLEX Plus Digital Display	247 (23)	290 (27)	323+ (30+)
ENDURA Day/Night Display	365 (34)*	430 (40)	537 (50+)
ENDURA Transparency Digital Display	495 (46)	581 (54)	861+ (80+)
ENDURA Transparency Optical Display			
ENDURA Clear Digital Display			
ENDURA Clear Optical Display			

* If you consistently operate your processor at utilizations of less than 4 percent, modify the developer with KODAK EKTACOLOR RA Developer Additive and use the rates given in Table 4-10.

Bleach-Fix Replenishment Rate—The starting replenishment rate for EKTACOLOR RA Bleach-Fix and Replenisher for KODAK PROFESSIONAL Papers and PROFESSIONAL DURAFLEX Plus Digital Display Materials is 215 mL/m² (20 mL/ft²).

For PROFESSIONAL Day/Night Display Material, the starting bleach-fix replenishment rate is 387 mL/m² (36 mL/ft²). For PROFESSIONAL ENDURA Transparency and Clear Display Materials the starting bleach-fix replenishment rate is 495 mL/m² (46 mL/ft²).

Do not use KODAK EKTACOLOR Bleach-Fix and Replenisher NR in roller-transport processors unless the processor utilization is at least 15 percent. The starting rate for EKTACOLOR Bleach-Fix NR is 54 mL/m² (5 mL/ft²). Bleach-fix regeneration is not recommended for roller-transport processors.

Common Replenishment Systems—Some laboratories prefer to use a common replenishment system for continuous and roller-transport processors. The utilization of the roller-transport processor determines whether or not a common replenishment system is practical and the correct developer replenisher to use. Follow these guidelines:

If the roller-transport processor has—

- *Less than 4 percent utilization*

Do not use a common system, because you will need to add EKTACOLOR RA Developer Additive to the EKTACOLOR RA Developer Replenisher RT for additional protection from evaporation and oxidation.

Do not use developer that is treated with additive with continuous processors.

- *4 to 15 percent utilization*

Use KODAK EKTACOLOR RA Developer Replenisher RT and EKTACOLOR RA Bleach-Fix and Replenisher in *both* types of processors with the replenishment rates in Table 4-6.

Table 4-6

Roller-Transport Processors		
KODAK PROFESSIONAL Paper or Material	Replenishment Rates EKTACOLOR RA Developer Replenisher RT	
	Processor Utilization mL/m ² (mL/ft ²)	
	Above 7%	4 to 7%
PORTRA ENDURA	174 (16.2)	212 (19.8)
SUPRA ENDURA	194 (18)	232 (21.6)
ULTRA ENDURA		
ENDURA Metallic		
DURAFLEX Plus Digital Display	247 (23)	290 (27)
ENDURA Transparency Digital Display	495 (46)	581 (54)
ENDURA Transparency Optical Display		
ENDURA Clear Digital Display		
ENDURA Clear Optical Display		
ENDURA Day/Night Display*	430 (40)	537 (50)

* For specific recommendations for belted processors, contact your equipment manufacturer.

Continuous Processors	
KODAK PROFESSIONAL Paper or Material	All Utilizations mL/m ² (mL/ft ²)
PORTRA ENDURA	174 (16.2)
SUPRA ENDURA	194 (18)
ULTRA ENDURA	194 (18)
ENDURA Metallic	194 (18)
DURAFLEX Plus Digital Display	247 (23)

- *Greater than 15 percent utilization*

Use KODAK EKTACOLOR RA Developer Replenisher and EKTACOLOR RA Bleach-Fix and Replenisher NR in *both* types of processors with the replenishment rates in Table 4-7.

Table 4-7

KODAK PROFESSIONAL Paper or Material	Replenishment Rates EKTACOLOR RA Developer Replenisher
	mL/m ² (mL/ft ²)
PORTRA ENDURA	135 (12.6)
SUPRA ENDURA	145 (13.5)
ULTRA ENDURA	
ENDURA Metallic	
DURAFLEX Plus Digital Display	172 (16)

Wash

Use four countercurrent plumbed wash tanks, if possible. If you use fewer wash tanks, increase the wash rate accordingly. For the recommended rates for the number of wash tanks, see Table 4-3. Adjust the wash-water rate for the maximum paper load processed, and then operate at this rate. Do not use average rates. For more information, see *Wash Rates*.

Washless Option

If your water supply is limited, you can use KODAK EKTACOLOR PRIME Stabilizer and Replenisher LORR in place of a wash. Use temperature-controlled, countercurrent-flow, filtered tanks that have a recirculation rate of 0.40 to 0.65 tank volumes per minute. If the recirculation or replenishment rate is too low, biological growth and precipitates may form and require frequent solution changes and tank cleaning. The stabilizer time and temperature are the same as for wash water. The stabilizer replenishment rate depends on the number of tanks (see Table 4-8). This information applies *only* to roller-transport processors.

Table 4-8 Replenishment Rates for KODAK EKTACOLOR PRIME Stabilizer

KODAK PROFESSIONAL Paper or Material	Number of Countercurrent-Flow Tanks		
	2	3	4
	mL/m ² (mL/ft ²)		
PORTRA ENDURA	780 (72)	390 (36)	195 (18)
SUPRA ENDURA			
ULTRA ENDURA			
PORTRA Black & White			
DURAFLEX Plus Digital Display			
ENDURA Transparency Digital Display	1560 (144)	780 (72)	390 (46)
ENDURA Transparency Optical Display			
ENDURA Clear Digital Display			
ENDURA Clear Optical Display			

PROCESSING KODAK PROFESSIONAL ENDURA TRANSPARENCY AND CLEAR DIGITAL AND OPTICAL DISPLAY MATERIALS

Although you can use the same processing chemicals for KODAK PROFESSIONAL ENDURA Transparency Digital and Optical and ENDURA Clear Digital and Optical Display Materials as for papers and print materials designed for Process RA-4, longer processing times and higher replenishment rates are required because these materials have thicker emulsions.

Table 4-9 gives the steps and conditions for processing these display materials in roller-transport processors using Process RA-4. You can also use these conditions to process display materials in continuous processors; however, they are usually processed in roller-transport processors because of the inconvenience of rethreading a continuous processor. See Tables 4-5 and 4-10 for replenishment rates for these materials in roller-transport processors.

Table 4-9 Processing Steps and Conditions for Process RA-4—KODAK PROFESSIONAL ENDURA Transparency Digital, ENDURA Transparency Optical, ENDURA Clear Digital, ENDURA Clear Optical Display Materials

Solution/Step	Time* min:sec	Temperature† °C (°F)	Comments
EKTACOLOR RA Developer Replenisher RT	1:50‡	35.0 ± 0.3 (95.0 ± 0.5)	Recirculate and filter. Use precise temperature control. Use squeegees at tank exit.
EKTACOLOR RA Bleach-Fix and Replenisher§	1:50¶	30 to 36 (86 to 96)	Recirculate and filter. Use squeegees at tank exit.
Wash**	3:40¶	30 to 40 (86 to 104)	
Dry	As needed	Not over 96 (205)	

* Immersion time plus crossover time to the next tank.

† Check the developer temperature frequently with an accurate thermometer.

‡ Nominal developer time range is 1:49 to 1:58. For best results, do not use extended development times with ENDURA Display Materials.

§ **Do not** use EKTACOLOR RA Bleach-Fix and Replenisher NR with Display Materials.

¶ Minimum times for other solutions can be one second less than the normal times. Longer than normal times should cause no adverse effect other than reducing the benefits of rapid access. For best results, use the recommended times with a crossover time of 6 seconds or less.

** Where water conservation is required, you can replace the wash with a stabilizer (see *Washless Option*).

LOW UTILIZATION

When a processor is used for a small percentage of its actual capacity, the processing solutions can be affected and yield less than optimum results. Percent utilization is a measure of how much of a processor's capacity is used. The utilization calculation for roller-transport processors compares the

amount of paper or material that is actually processed to the maximum amount that could be processed at its full capacity. Percent utilization is the percentage of the capacity that is actually used.

Calculating Percent Utilization

Calculate the capacity of your roller-transport processor by first determining these four items:

1. Maximum width your processor can process in centimetres or inches.
2. Transport speed (m/min or ft/min). Determine this speed by measuring the amount of paper that travels by a given point in one minute.
3. The length of time (in hours) that the processor is up to temperature each day. Use the number of hours from the time the recirculation pumps and heaters are turned on to the time they are turned off.
4. Number of operating days per week.

When you have this information, use this formula to calculate the capacity in square metres per week:

$$C = \frac{W \times S \times 60 \times T \times D}{100}$$

Where:

- C = Capacity (in square metres per week)
- W = Width (in centimetres)
- S = Transport Speed (in metres per minute)
- T = Time processor is at process temperature each day (in hours)
- D = Number of days per week the lab normally operates

To calculate capacity in square feet per week, use this formula:

$$C = \frac{W \times (S \times 12) \times 60 \times T \times D}{144}$$

Where:

- C = Capacity (in square feet per week)
- W = Width (in inches)
- S = Transport Speed (in feet per minute)
- T = Time processor is at process temperature each day (in hours)
- D = Number of days per week the lab normally operates

Next calculate the total amount of paper and material actually processed by keeping a log. Each time paper or material is processed, note the date, time, and amount. For rolls, record the width and approximate length; for sheets, note the size (8 x 10 inch, 16 x 20 inch, etc.) and the number of sheets. At the end of the week, convert these figures to square metres or square feet by using the formulas below.

To calculate the total square metres in rolls of paper:

$$\frac{L1 \times W \times N}{100} = \text{total sq m}$$

To calculate the total square feet in rolls of paper:

$$\frac{L1 \times W \times N}{12} = \text{total sq ft}$$

To calculate the total square metres in sheets of paper:

$$\frac{L2 \times W \times N}{10,000} = \text{total sq m}$$

To calculate the total square feet in sheets of paper:

$$\frac{L2 \times W \times N}{144} = \text{total sq ft}$$

Where:

- L1 = Length of roll in metres (or feet)
- L2 = Length of a sheet in centimetres (or inches)
- W = Width of roll or sheet in centimetres (or inches)
- N = Number of rolls or sheets of a particular size

Add the total square metres (or square feet) of all paper and material processed for the week. To calculate the percent utilization, divide this figure by the figure you obtained for capacity according to the following formula:

$$U = \frac{P}{C} \times 100$$

Where:

- U = Percent utilization
- P = Amount of paper and material processed in one week (in square metres or square feet)
- C = Weekly capacity of processor (in square metres or square feet)

Compensating for Low Utilization

The amount of processor utilization affects process stability. Low utilization causes chemical changes in the solution through evaporation and oxidation. Increased replenishment can compensate for lower utilization up to a point; however, at extremely low utilization in roller-transport processors, additional protection is needed to maintain process stability. To obtain this additional protection, you can add KODAK EKTACOLOR RA Developer Additive to KODAK EKTACOLOR RA Developer Replenisher RT and KODAK EKTACOLOR RA Bleach-Fix Additive to EKTACOLOR RA Bleach-Fix and Replenisher. Add these chemicals *only* to replenisher solutions; *do not* add them to the tank solutions.

KODAK EKTACOLOR RA Developer Additive

If processor utilization is less than 4 percent, use EKTACOLOR RA Developer Additive. When you mix this concentrate with EKTACOLOR RA Developer Replenisher RT, follow the instructions carefully. When you add the concentrate to the replenisher, you must also dilute the mix by adding more water. For example, if you use this additive to treat a 12½-U.S. gallon mix of EKTACOLOR RA Developer Replenisher RT, you must bring the mix to a final volume of 15.6 gallons—instead of 12½ gallons. Once you treat the EKTACOLOR RA Developer Replenisher RT with the developer additive, use only the replenishment rates given in Table 4-10. *Do not* add this additive directly to the developer tank solution or use it with EKTACOLOR RA Developer Replenisher.

Table 4-10
Replenishment Rates for KODAK EKTACOLOR RA Developer Replenisher RT Treated with KODAK EKTACOLOR RA Developer Additive

KODAK PROFESSIONAL Paper or Material	Processor Utilization	
	4 to 7%	Less than 4%
	mL/m² (mL/ft²)	
PORTRA ENDURA	323 (30)	377 (35)*
SUPRA ENDURA		
ULTRA ENDURA		
ENDURA Metallic		
PORTRA Black & White PORTRA Sepia Black & White Generic Black & White		
DURAFLEX Plus Digital Display		
ENDURA Transparency Digital Display	753 (70)	861 (80)†
ENDURA Transparency Optical Display		
ENDURA Clear Digital Display		
ENDURA Clear Optical Display		

* Rates as high as 753 mL/m² (70 mL/ft²) may be required at utilizations of 1 percent or less.

† Rates as high as 1076 mL/m² (100 mL/ft²) may be required at utilizations of 1 percent or less.

KODAK EKTACOLOR RA Bleach-Fix Additive

Mix EKTACOLOR RA Bleach-Fix and Replenisher according to the instructions packaged with the chemicals. If your processor utilization is less than 4 percent, add KODAK EKTACOLOR RA Bleach-Fix Additive to the bleach-fix replenisher. *Do not* add any additional water to the bleach-fix replenisher when you use the additive. *Do not* add the bleach-fix additive *directly* to the bleach-fix tank solution. Use the amount of additive shown in Table 4-11. Use the replenishment rates given in Table 4-5.

Table 4-11 Treating Bleach-Fix Solutions for Low-Utilization Processing

If Your Final Replenisher Volume is	Use This Amount of EKTACOLOR RA Bleach-Fix Additive
1 L	15.2 mL
10 L	152 mL
20 L	304 mL
25 gal	1440 mL

Other Adjustments for Evaporation and Oxidation

In addition to using additives in the developer and bleach-fix as part of your routine processing, you can make the following adjustments to compensate for evaporation and oxidation.

Bring Tank Solution Back to Level—When the tank level drops, it is usually because of evaporation, but first check that it was not caused by a leak. If the cause is not a leak, bring the tank to the proper level by adding water at the start of the processing day to keep the solutions from becoming too concentrated. Overconcentration affects developer and bleach reactions, and can cause process-control problems and excessive crystal formation on the tank walls and racks. At the end of each processing day, rinse the top rollers and sides of the racks and tanks with warm water.

Minimize Processor Operating Time—To reduce oxidation, minimize the amount of time that the processor is kept at operating temperature. Turn the processor off at the end of each work day and whenever you know that it will not be used for several hours during the day.

Turn Off the Transport Drive Except During Processing—To reduce oxidation further, turn off the transport drive except during processing. Install a standby switch that allows you to turn off the transport drive without shutting down the recirculation pumps and temperature control.