



Maintenance

Once your process is in good chemical, mechanical, and sensitometric control, you need to keep it at that level of control.

At this point, you have eliminated (or minimized) sources of variability so that the process is stable, and you have adjusted it to aim and optimized it to provide optimum film quality. If you monitor the key process parameters—make measurements and plot them, evaluate data plots, investigate and correct changes—your process should stay in good control.

In addition to the procedures for process control, follow the maintenance procedures described in this section.

GENERAL MAINTENANCE

Processing machines in professional labs require regular maintenance to ensure optimum performance. We cannot overemphasize the importance of careful and frequent maintenance.

Think of professional Process E-6 machine maintenance in the same way as professional racing-car maintenance. Professional racing cars are examined and serviced much more frequently and carefully than the average family car. For example, oil and tire pressures and engine temperature are monitored much more frequently, and higher-quality spare parts are used in the professional racing car. Without excellent maintenance, the performance of the racing car will not live up to the demands of its owner, driver, and fans.

The professional Process E-6 machine requires the same kind of high-quality maintenance program for optimum performance.

Checklists provide a convenient and efficient method of ensuring complete maintenance for Process E-6. A daily checklist should include all activities that are required on a daily basis, such as draining wash tanks and checking dryer temperature. The daily checklist should include all chemical and mechanical measurements. Other lists can include less frequent activities, such as filter changes.

Following a complete checklist will help ensure that the process is started up consistently, and that all the proper process parameters are being monitored. Checklists are especially important if the process operates more than one shift per day, if the regular machine operator is away, or if the operator is new and unfamiliar with Process E-6.

General checklists are included in Section 17. Make customized checklists for each machine and each specific operation, and use them to record machine history.

The chart on page 16-2 shows the ideal schedule of measurements and maintenance that you should observe for all processors.



PROCESS-MONITORING AND MAINTENANCE FREQUENCY CHART

| Solution/Step | Time | Temperature | Agitation | Replenishment Rate | Specific Gravity | Key Chemical Component* | Filter Change | Drain and Replace |
|-----------------|------|-------------|-----------|--------------------|------------------|-------------------------|---------------|-------------------|
| First Developer | D | D | D | D | D | D | EOW | |
| First Wash | M | D | D | | | | EOW | D |
| Reversal Bath | M | | | D | D | D | † | EOM |
| Color Developer | M | D | D | D | D | D | EOW | |
| Pre-Bleach | M | | | W | W | | † | M |
| Bleach | M | | D | W | W | | EOW | |
| Fixer | M | | D | W | W | | EOW | |
| Final Wash | M | | D | | | | EOW | D |
| Final Rinse | M | | | W | | | † | ‡ |
| Dry | | D | | | | | | |

* Measure bromide concentration in the first developer, reversal-agent concentration in the reversal bath, and sulfite concentration in the color developer.

† We do not recommend that you recirculate this solution. However, if your machine is equipped with a recirculation system for this solution, we recommend that you recirculate the solution for only the first 15 minutes of the day and change the filters every other week.

‡ Drain final-rinse tanks as needed for cleanliness.

D = Daily

EOW = Every other week

W = Weekly

EOM = Every other month

M = Monthly

Replenishment Systems

Most replenishment systems incorporate three functions: chemical mixing, film sensing, and chemical delivery. All three must operate properly and consistently to maintain a good process.

Chemical mixing: In chemical mixing, consistency and accuracy are very important. Consistency is important in the mixing vessel you use, the order in which you mix the chemicals, the water supply, and the mixing time and method. Accuracy is important when you measure chemicals, concentrates, and water. **Do not** overmix or aerate replenisher solutions. Store mixed chemicals in tanks with floating lids (to minimize oxidation and evaporation) and dust covers (to prevent contamination). **Do not** store replenisher solutions at high temperatures.

Film sensing: Automatic sensing devices in processing machines vary by manufacturer, and include infrared scanner bars, mechanical rollers, and tabs on racks. Regardless of the type of measuring device, calibrate all mechanical and electrical parts frequently, preferably on a daily basis.

Chemical delivery: Your chemicals are probably delivered by a gravity-feed or metered-pump system. A gravity-feed system uses flowmeters or needle valves that allow chemicals to run continuously into the tanks as film is processed. Check flowmeters frequently to ensure consistent delivery (some meters exhibit pressure changes as the volume of replenisher in the storage tank decreases).

A metered-pump system is the most common system used with rack-and-tank and roller-transport

processors. The pumps are run by a timer or a microswitch. Calibrate the pumps daily, especially in blender and in-line dilution systems.

The replenishment system in an in-line dilution or blender system is a process within itself. Monitor and control it just as you do your tank solutions. Frequently calibrate and maintain the pumps, and check the tubing regularly.

Daily Maintenance

- Drain the wash tanks at the end of every day or shift to help prevent buildup of biological growth (slime). If possible for 8- or 16-hour operations, leave the tanks empty overnight and then fill them with fresh water in the morning; see your processor manual for the procedure recommended for your equipment. Daily draining and refilling may not be enough to prevent slime buildup. If slime accumulates in your wash tanks, clean them by wiping the inside of each tank with a sponge and rinsing the tanks with warm water.
- Calibrate the replenisher pumps for the first developer, reversal bath, and color developer.
- Check the nitrogen supply (for your agitation system) at the beginning of each shift.

Weekly Maintenance

- Calibrate the replenisher pumps for the pre-bleach, bleach, fixer, and final rinse, and record the calibration. The replenishment rates for these solutions are not as critical as those for the first developer, reversal bath, and color developer, but you should monitor them weekly to prevent problems.
- Measure the specific gravity of the pre-bleach, bleach, and fixer tank solutions.

Biweekly Maintenance (Every Other Week)

- Replace *all* filters, regardless of their appearance. This helps prevent biological growth (slime) in the filter housings. Use recirculation filters that are in the range of 15 to 20 microns.
- For best results, install pressure gauges before and after each filter so that you can easily detect plugged filters. If a 5-pound-per-square-inch difference in pressure occurs between the two gauges, replace the filter.

Monthly Maintenance

- Measure the time of all solutions that you do not measure daily. Use a stopwatch to measure the time that the film is in a solution from the time the film enters the solution to the time it enters the next solution (or wash).
- Drain your pre-bleach tank, flush it with hot water, and replace the solution. You must do this regularly because the solution is not recirculated or agitated. Process by-products may precipitate and collect at the bottom of the tank. If these precipitates build up, they can transfer dirt to the film.
- Check all recirculation systems.

Bimonthly Maintenance (Every Other Month)

Drain your reversal-bath tank, flush it with hot water, and replace the solution. You must do this regularly because the solution is not recirculated or agitated. Process by-products may precipitate and collect at the bottom of the tank. If these precipitates build up, they can transfer dirt to the film.

Rack-and-Tank Machines

Use floating lids on all solution tanks—except the bleach and fixer tanks—in rack-and-tank machines. Rinse the floating lids after you remove them at daily start-up. (This will prevent dried chemicals from entering the tanks when you reinstall the lids. Dried or crystallized chemicals can plug filters.)

Follow these other maintenance steps as well as the procedures in your processor manual:

1. Clean pickup cups or lifts every day. Remove chemical residue to prevent corrosion.
2. Clean the rack slides by wiping them with a damp sponge; then use a clean, lintless cloth sprayed with silicone. (**Do not** transfer any silicone to the tank solutions.)
3. Rinse the racks, hangers, weights, and clips between each use to prevent solution contamination.
4. Thoroughly clean the machine once a week. Wash the tank dividers or crossover plates. (Check that the rim of each tank is free of dried chemicals. If you have to remove dried chemicals, **do not** let them fall into the tanks.)

Continuous Processors

If your processor is equipped with wiper blades or squeegees, check and clean them every day. Replace blades or squeegees that are worn or have a scaly buildup. Check the pressure on the blades or squeegees daily.

Rinse all rollers above the solution level with warm water every day. (This will help prevent chemical buildup that can scratch film.)

Roller-Transport Processors

Roller-transport processors are sensitive to dirt; they require a more involved maintenance routine.

1. Rinse the top (or crossover) rollers with warm water every day. (This will help prevent chemical buildup that can scratch film.)
2. When the tank solutions are up to operating temperature, run KODAK Roller Transport Cleanup Film 4955 through the processor daily at start-up. Make sure that the film comes into contact with the entire width of the rollers. **Do not** reuse the cleanup film.
3. Clean the racks in the first-developer tank every week. Clean all other racks once a month. (Do this by cleaning a few racks each week.) See your owner's manual for instructions on cleaning the racks.

Note: You can use sonic cleaning to loosen dirt on racks. However, if you use sonic cleaning to clean racks that have hollow rollers, the cleaning solution may fill the rollers and contaminate tank solutions.

If you cannot remove silver buildup by following your manufacturer's cleaning instructions, follow this procedure:

1. Rinse the rack thoroughly with water.
2. Spray the rack with household bleach (e.g., Clorox or 5-percent bleach) diluted 1:2 with water.
3. Let the rack stand for 5 minutes; then rinse it **thoroughly** with water.
4. Rinse the sink with water to remove all traces of the bleach from the sink and the drain before proceeding to step 5.

WARNING: Flush the sink and drain **thoroughly** before proceeding to step 5. Fixer will react with traces of bleach and release strong gases.

5. Spray the rack with fixer concentrate diluted 1:1 with water to dissolve silver salts.

6. Rinse the rack **thoroughly** with water.

Caution: Be sure to remove all of the dilute fixer concentrate—even a small amount of fixer can contaminate tank solutions.

7. If necessary, repeat steps 1 through 6.

All Machines

1. Check all filter gaskets when you change filters.
2. Lubricate the drive chain once a month.
3. Occasionally check that the air flow from the darkroom is positive. If it is not, air from the dryer will flow back through the machine and cause an increase in solution temperature and/or excessive evaporation during processing. Check for positive air flow by holding a candle near the feed tray. The smoke from the candle should move toward the machine, not back toward the darkroom.
4. Check all hose fittings once a year. (Hoses tend to shrink with age, so check that the clamps are tight enough to prevent leaks. Check all hoses for cracks.)
5. We recommend that you drain every tank at least once a year and clean and inspect it. Place your solutions in holding tanks while you clean the processor tanks.
6. Check for rust and metal parts in tanks.