# 7.8 Photographic and X-Ray Equipment

EPA WaterSense

## Overview

The traditional process of developing film can be quite water-intensive. Water is used during both the image development and printing processes. In X-ray equipment, water is sometimes also used for equipment cooling. Some X-ray film processing machines require a constant stream of cooling water flowing at a rate from 0.5 to 2.5 gallons per minute (gpm)[55] to as much as 3.0 to 4.0 gpm[56] to ensure acceptable image quality. Cooling water with a flow rate as low as 0.5 gpm can discharge more than 250,000 gallons of water annually. A number of advancements in X-ray technology, including digital imaging, however, are reducing the need for this water-intensive process.

For more traditional film processing, developing and printing can occur in a self-contained "mini-lab" with very little water use.[57] These changes also reduce or eliminate the need to use chemicals in film processing. Dry printing processes similar to laser printing are also available that do not use water.

Because of recent advances in imaging technology, many facilities have moved to digital photographic or X-ray film processing and computerized viewing and printing. Digital imaging has changed the means by which images are recorded and printed and eliminated the use of water entirely. X-ray equipment found at dental offices and other places where small pictures are taken use very little water for development. A typical dental office "wet" film processor uses under 1.0 gallon of water per day.

If converting to digital imaging is not feasible, retrofitting existing equipment to recycle the final rinse effluent as make-up for the developer/fixer solution can be a cost-effective option to significantly reduce photographic or X-ray film processing water use.

## Operation, Maintenance, and User Education

For optimum traditional photographic and X-ray equipment efficiency, consider the following tips:[58]

- Adjust the water flow to the film processor to flow at the minimum acceptable flow rate specified by the equipment manufacturer. Post minimum flow rates near the processor and educate users on how to adjust and operate the equipment.
- Check the solenoid valve on the X-ray equipment cooling water to ensure it is working properly and stop flow when the equipment is in standby mode. If necessary, install a flow meter in the supply line to monitor flow from the equipment.

[55] East Bay Municipal Utility District (EBMUD). 2008. *WaterSmart Guidebook—A Water-Use Efficiency Plan Review Guide for New Businesses*. Pages PHOTO1-8. www.ebmud.com/for-customers/conservation-rebates-and-services/commercial/watersmart-guidebook.

[56] U.S. Environmental Protection Agency (EPA) and U.S. Energy Department (DOE), Energy Efficiency & Renewable Energy (EERE), Federal Energy Management Program (FEMP). May 2005. *Laboratories for the 21st Century: Best Practices, Water Efficiency Guide for Laboratories*. Page 6. www1.eere.energy.gov/femp/program/labs21_bmp.html.

[57] EBMUD, *op. cit.*

[58] EPA and DOE, EERE, FEMP, *op. cit.*

- For X-ray equipment in particular, turn off the cooling water flow when the unit is not in use.

## Retrofit Options

To reduce the water use associated with traditional photographic or X-ray equipment, the primary retrofit option is to install a recycling system, which recycles the final rinse effluent as make-up for the developer/fixer solution.[59] An automatic shut-off valve can also be installed to turn off the flow of water when the unit is not in use. For these retrofits, it is essential to follow prescribed maintenance schedules in order to maintain water savings.

## Replacement Options

When looking to purchase new photographic or X-ray equipment or to replace older equipment, consider digital X-ray and photography equipment and computerized laser or ink-jet printing options.

If transitioning to digital equipment is not feasible, look for equipment with a squeegee that removes excess chemicals from the film. The squeegee can reduce chemical carryover and the amount of water needed for the wash cycle.[60] If replacing a traditional wet printing, high-rinse flow system, consider a mini-lab system. Mini-labs provide a "washless" or "plumbingless" film development process. In these systems, wet chemical solutions are added only as needed for the amount of film being processed. A reservoir captures spent chemical solutions, which can be recovered and recycled.[61] It should be noted that mini-labs do not work for large frame X-ray film. They are for small camera picture prints only.

## Savings Potential

Replacing traditional X-ray film processing equipment with digital imaging equipment will eliminate water use entirely, but it might not be cost-effective for every facility due to the high cost of the new equipment. Digital equipment, however, provides other advantages in addition to water savings, such as ease of use and image transfer and storage.[62] If converting to digital imaging is not feasible, retrofitting existing equipment to recycle the final rinse effluent as make-up for the developer/fixer solution can be a cost-effective option.

Retrofitting traditional X-ray equipment with a recycling system has been shown to save 500,000 to 1,600,000 gallons of water per year per X-ray film processor,[63] based on studies conducted by several water utilities in California.

[59] *Ibid.*
[60] *Ibid.*
[61] EBMUD, *op. cit.*
[62] Alliance for Water Efficiency. X-ray Film Processors Introduction. www.allianceforwaterefficiency.org/X-ray_Film_Processors.aspx.
[63] Koeller, John, et al. August 2004. *A Report on Potential Best Management Practices*. Prepared for the California Urban Water Conservation Council. Pages 16-22. www.cuwcc.org/products/pbmp-reports.aspx.

## Additional Resources

Alliance for Water Efficiency. X-ray Film Processors Introduction. www.allianceforwaterefficiency.org/X-ray_Film_Processors.aspx.

East Bay Municipal Utility District. 2008. *WaterSmart Guidebook—A Water-Use Efficiency Plan Review Guide for New Businesses*. Pages PHOTO1-8. www.ebmud.com/for-customers/conservation-rebates-and-services/commercial/watersmart-guidebook.

Koeller, John, et al. August 2004. *A Report on Potential Best Management Practices*. Prepared for the California Urban Water Conservation Council. Pages 16-22. www.cuwcc.org/products/pbmp-reports.aspx.

EPA and DOE, Energy Efficiency & Renewable Energy, Federal Energy Management Program. May 2005. *Laboratories for the 21st Century: Best Practices, Water Efficiency Guide for Laboratories*. Page 6. www1.eere.energy.gov/femp/program/labs21_bmp.html.