

What You Should Know About Film Processing Chemistry

Presented by Air Techniques, Inc.

Seven variables impact radiographic quality. They are:

1. Film type, freshness and storage
2. Exposure
3. Processing time
4. Processing temperature
5. Chemistry formulation and strength
6. Chemistry replenishment rate
7. Processor maintenance

This educational Question and Answer article will focus specifically on Film Processing Chemistry. It has been prepared to assist people who process dental film.

1. *What is Chemistry?*

Chemistry is the collective name for the solutions that are used to process radiographic films. Most Chemistry for dental use consists of two solutions, Developer and Fixer. Chemistry is a complex mixture of dissolved compounds. Developer has an alkaline pH. Developer contains agents to bring out the latent image; accelerators and restrainers to control the development of the latent image; preservatives to protect against oxidation; hardeners to protect the emulsion and buffers to maintain correct pH. Fixer has an acidic pH to counteract the alkaline Developer. Fixer contains agents that remove unexposed silver halide grains, thus making the image stable in light; preservatives to extend solution life; hardeners to protect the emulsion and buffers to maintain the correct pH.

2. *What does each solution do?*

The Developer and Fixer solutions are well named. All brands of film chemistry work according to the same basic principles. When light or X-radiation strikes a piece of film, the sensitized silver compound suspended in the emulsion undergoes an invisible chemical change. This change creates what is called the latent image. Developer converts this invisible image to a visible image. However, this "developed" image is very unstable and if exposed to light or X radiation will almost instantly turn completely black. Fixer sets the image so it is stable in light and permanent, in effect "fixed".

3. *Is all Chemistry the same?*

No. Manufacturers will adjust the quantities of component ingredients in their Chemistry formulation to match the performance and price parameters they have established for their product.

4. *What should I know to obtain maximum performance from my Chemistry?*

First, make sure that the Chemistry selected is appropriate for your equipment and application. If in doubt, check with the equipment manufacturer. Second, your Chemistry must be fresh. Chemistry is a perishable product. All Chemistry solutions have a finite life span before they lose their chemical energy and become ineffective. That means time alone will render the Chemistry useless, even if no film has ever been processed in it. In addition to age, storage conditions will affect the life and usability of the Chemistry. For example, Air Techniques Chemistry should not be stored below 40°F.

5. *How do I know my Air Techniques Chemistry is fresh?*

Every carton of Air Techniques Chemistry is marked with a Lot Number and a "Best if Used By" date. Each individual bottle is marked with the same Lot Number that is printed on the carton. See figures A and C.

6. *Why does Air Techniques Chemistry have a "Best if Used By" date and not a specific "Expiration" date?*

Chemistry solutions age and gradually lose their chemical energy over time. Their service life does not end with an abrupt event, as when a light bulb burns out. Consequently, the day after the "Best Use" date, there may not be any perceptible change. The "Best Use" date is imprinted so users will be aware that Chemistry activity level is or is not within the manufacturer's performance specifications.

7. *I only have a Chemistry bottle, not the packing carton. How can I determine from the Lot number the "Best if Used By" date?*
A typical Lot Number would look like this: 01204 2. See figures B and D. The first digit is an internal control. The next three digits "120" indicate the Julian date of production; this Chemistry was made on the 120th day of the year, April 29th. The fifth digit, "4", indicates the year of production, 2004. The last digit after the space, in this case a 2, indicates that this bottle belongs to the second batch produced that day. Air Techniques Chemistry has a one year storage life. So, this bottle is "Best if Used By" April 29th, 2005.
8. *Does Air Techniques Chemistry have a characteristic color?*
Normal color range for Developer is clear to a light tea hue. The color will vary among lot numbers. Fixer is clear.
9. *My developer is very dark, almost black, and has an ammonia smell. What does this mean?*
These characteristics indicate the developer is exhausted, contaminated, past the "Best Use" date or a combination of these factors.
10. *How does Air Techniques monitor Chemistry quality and performance?*
Air Techniques is an ISO 9001 certified manufacturer. As such, the company is required to adhere to a range of Quality Assurance procedures. Air Techniques Chemistry is subject to continuous testing. Two types of tests are done: Chemical and Performance. Chemical testing verifies the ingredient composition of the Chemistry solution. Performance testing verifies that the Developer actually develops film and that the Fixer actually fixes the film.
11. *I have an Air Techniques Chemistry question that was not covered in this article. How can I get an answer?*
You can E-mail your question to Mitch Beckwith, Technical Service Manager at: MBECKWITH@airtechniques.com. Include your processor model and serial number.

A/T 2000 Chemistry Box



ALL Chemistry Boxes starting from January 15th 2004 now have a **Best if Used By** date stamped on each box. This date indicates a one year shelf life.

Figure A.

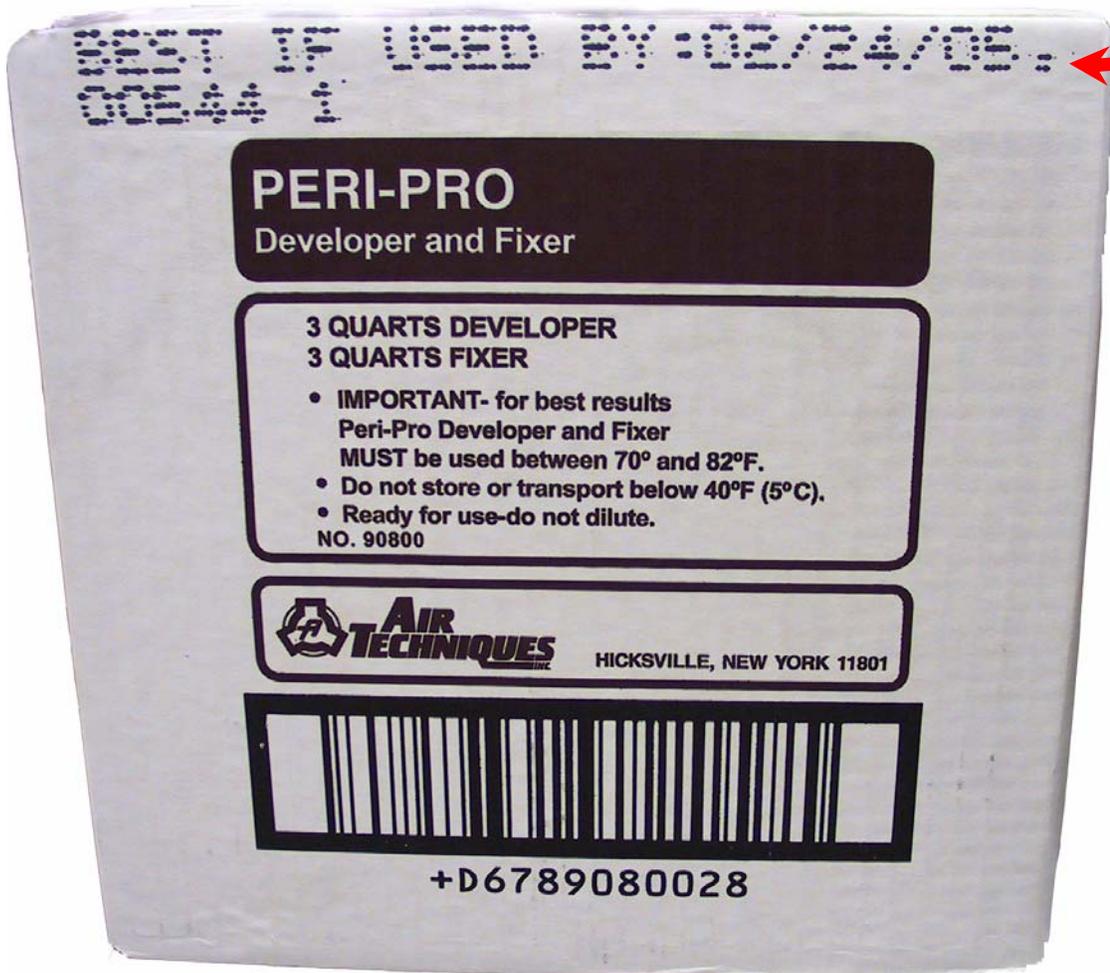
A/T 2000 Chemistry Bottles



On each Bottle of Developer & Fixer is a date code stamp. To determine the **Best If Used Date**, drop the first number. The next three numbers are the Julian Calendar Date and Fifth number is the Year. The sixth number is the batch # of the day. The shelf life is 1 year from this date. The Example shown is the 120th day of 2004 (April 29th 2004) Batch #2.

Figure B.

Peri-Pro Chemistry Box



ALL Chemistry Boxes starting from January 15th 2004 now have a **Best if Used By** date stamped on each box. This date indicates a one year shelf life.

Figure C.

Peri-Pro Chemistry Bottles



On each Bottle of Developer & Fixer is a date code stamp. To determine the **Best If Used Date**, drop the first number. The next three numbers are the Julian Calendar Date and Fifth number is the Year. The sixth number is the batch # of the day. The shelf life is 1 year from this date. The Example shown is the 54th day of 2004 (February 24th 2004) Batch #1.

Figure D.