

An Overview of X-Ray Film Processing

On January 1, 1896, Roentgen sent a copy of his first paper on x-ray with samples of his x-ray photographs to his colleagues. Photographic positive prints were made from x-ray plate of his wife's hand. In early days of radiology, radiographs were made by photographers or by physicians, whose hobby was photography. Radiography was considered a special branch of photography; in fact, radiography was often referred to as "the new photography".

The technology of x-ray plate making has vastly changed since 1896. Today we have x-ray film with polyester base. The polyester base gives dimensional stability and helps rapid drying after development process. The emulsion technology has progressed minimizing any variation between different lots of emulsion coating. Today, the majority of variation in radiography is due to chemical processing of x-ray film. A variation in x-ray film processing can give rise to:

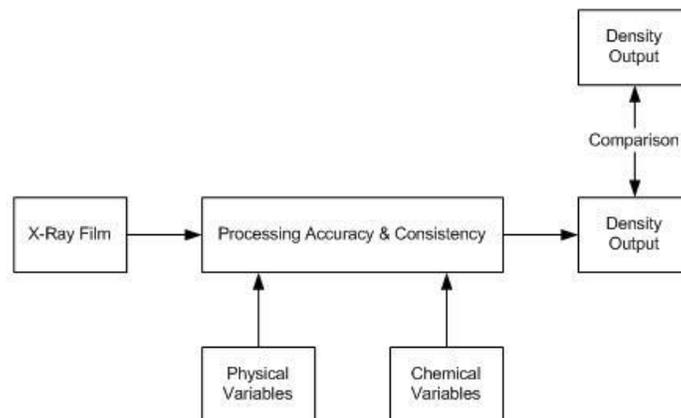
- Delay in image availability
- Loss in image quality
- Unnecessary patient exposure to radiation
- Reduce productivity
- Environmental contamination
- Decrease in imaging center profitability

The aforementioned variables are minimized by controlling two major goals of clinical processing. These goals are:

- Processing accuracy
- Processing consistency

Processing accuracy is established by matching the x-ray film characteristic values, Base Fog, Dmax and Dmin, to the values recommended by the film manufacturer. This process is known as "Processing Accuracy". After establishing the processing accuracy, it is important to maintain this accuracy level by ongoing quality assurance program. A control chart is made to track the quality of the process consistency.

Once the initial process accuracy is established, it is highly recommended that clinic maintain the x-ray film and the chemical supply same as used in developing the film characteristics. If at any time, a change in the supply is necessary the clinic must undertake the process of re-evaluation of x-ray film and the chemicals, figure 1 shows the process of establishing accuracy and consistency an imaging center.



Physical Variables:

In order to keep all the processing variables under control, an imaging center should use an automatic processor.



The x-ray processor controls the processing time cycle, temperature and automatic replenishment of chemicals. The time cycle is measured from when the film enters the processor until it drops out and is ready for viewing. Most medical x-ray film processors are designed for cycle time of 90 seconds. This time is divided into four phases:

- Development immersion time - the most important factor in developing an image. In most processors, it is 23 to 32 seconds
- Fixing
- Washing
- Drying

In most cases, the development temperature is controlled at 90° F.

Chemical Variable:

Chemical processing of x-ray film is a very unstable process. An improper x-ray chemical processing will result in:

- Delay in image availability
 - Loss of image quality
 - Loss of contrast
- Increase base fog
- Unnecessary patient exposure
- Artifacts
- Environmental contamination
- Reduced productivity
- Decrease in imaging center profitability

In conclusion, for maximizing the imaging center profitability and minimizing patient exposure the clinic must maintain process accuracy and consistency by ongoing quality control chart. Any variables such as different source of x-ray films or development chemical from different sources are avoided at all cost. However, if it becomes necessary to change the source of x-ray film or the chemicals, clinic should reestablish the process accuracy, consistency and ongoing quality control.