Radiological Equipment Techniques (Lec 10)

Automatic Processor

Automatic processing has resulted in **better image quality** because each radiograph is processed in **exactly** the **same way**. The opportunity for human variation and error is nearly absent.

Advantages of Automatic Processing:

• Saves time and manpower

• Processing time is reduced to 90 seconds

• The variability in results caused by hand-dunking is eliminated

• Radiographs are available in minutes

• There is no variance in temperature

• Allows standardization of techniques

• Overall, efficiency is improved

The principal components of an automatic processor are: (See figure and table below)

1. The transport system.

2. The temperature control system.

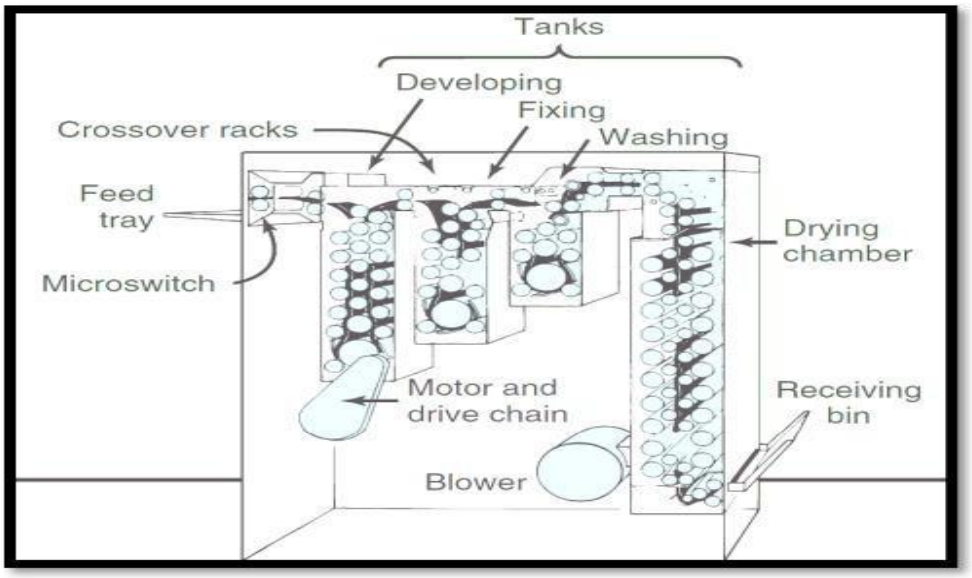
3. The circulation system.

4. the replenishment system.

5. The dryer system.

Principal Components of an Automatic Processor

System	Subsystem	Purpose
Transport		Transports film through various stages at precise intervals
	Roller	Supports film movement
	Transport rack	Moves and changes direction of film via rollers and guide shoes
	Drive	Provides power to turn rollers at a precise rate
Temperature		Monitors and adjusts temperature at each stage
Circulation		Agitates fluids
	Developer	Continuously mixes, filters
	Fixer	Continuously mixes
	Wash	Single-pass water flows at constant rate
Replenishment	Developer	Meters and replaces
	Fixer	Meters and replaces
Dryer		Removes moisture, vents exhaust



1.1 Transport System

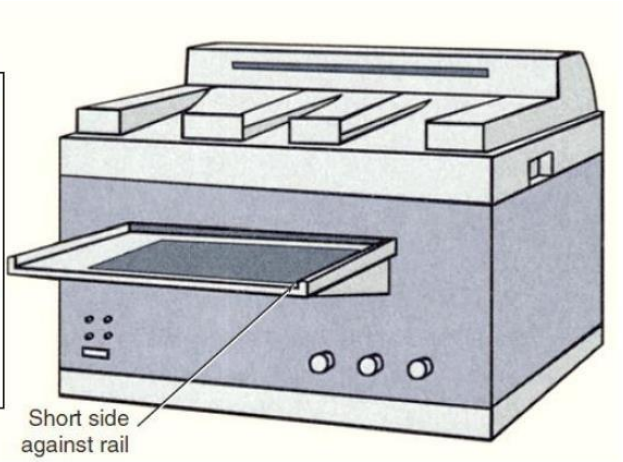
The transport system begins at the **feed tray**, where the film to be processed is inserted into the automatic processor. There, **entrance rollers** grip the film to begin its trip through the processor.

• **A microswitch** is engaged to control the replenishment/replacement rate of the processing chemicals.

Always feed the film **evenly** using the side rails of the feed tray and alternate sides from film to film (Figure below). This ensures even wear of the transport system components.

[From the entrance rollers, the film is transported by rollers and racks through the wet chemistry tanks and the drying chamber and is finally deposited in the receiving bin.]

Figure: Place the short side of the film against the side rail of the feed tray and alternate films from one side to another.



The transport system **not only transports the film**; it also **controls processing** by controlling **the time the film is immersed in** each wet chemical. Timing for each step in processing is governed by careful control of the rate of film movement through each stage.

[The transport system consists of the following three principal subsystems:

rollers (turn film around), transport racks, and drive motor.]

1.2 Temperature Control System

The developer, fixer, and wash **require precise temperature** control.
The developer temperature is most critical, and it is usually maintained at 35°C (95°F). Wash water is maintained at 3°C (5°F) lower.

Temperature is **monitored at each stage by a thermocouple or thermistor** and is controlled thermostatically by a controlled heating element in each tank.

1.3 Circulation System

Agitation (movement of one or more components of a mixture) is necessary to **continually mix the processing chemicals, maintain a constant temperature** throughout the processing tank, and **aid exposure of the emulsion** to the chemicals.

In automatic processing a circulation system continuously **pumps the developer** and **the fixer**, thus maintaining **constant agitation** within each tank.

[The developer circulation system requires a filter that traps particles as small as approximately 100 μm to trap flecks/spots of gelatin that are dislodged/removed from the emulsion.]

[Cleaning the tanks and the transport system should be a part of the routine maintenance of any processor.]

[Water must be circulated through the wash tank to remove all of the processing chemicals from the surface of the film before drying; this **ensures archival quality**. An open system, rather than a closed circulation system, usually is used.]

1.4 Replenishment System

The replenishment system **measures the proper quantities of chemicals** into each tank **to maintain volume and chemical activity**.

Although replenishment of the developer is more important, the fixer also has to be replenished/refilled.

Wash water is **not recirculated** and therefore is continuously and completely replenished/replaced.

1.5 Dryer System

A wet or damp/moist finished radiograph easily **picks up dust particles** that can result in **artifacts.** Furthermore, a wet or damp film is difficult to handle in a viewbox.

When stored, it can become **sticky and may be destroyed.**

The dryer system **consists of** a

1- Blower
2- ventilation ducts
3- drying tubes
4- an exhaust system.

The dryer system **extracts all residual moisture** from the processed radiograph, so it drops into the receiving bin dry.

A finished radiograph that is damp easily picks up dust particles that could **result in artifacts**.

[Most processing faults leading to damp/moist film are because of depletion of glutaraldehyde, the hardener in the developer.]

2- Care of screen

High-quality radiographs require that radiographic intensifying screens receive proper care.

Screen handling requires the highest/utmost care **because even a small fingernail scratch can produce artifacts** and degrade the radiographic image.

Screens should be handled only when **they are new** and are **being installed in cassettes** and when **they are being cleaned.**

When loading cassettes, **do not slide in** the film. A sharp corner or the **edge can scratch** the screen.

[Place the film inside the cassette. Remove the film by rocking/vibrating the cassette on the hinged edge and letting it fall to your fingers.]

[Do not leave cassettes open because the screens can be damaged by whatever might fall on them, be it dust or darkroom chemicals.]

[Do not dig the film out of the cassette with your fingernails.]

[Radiographic intensifying screens must be cleaned periodically].

• The frequency of cleaning is determined primarily by **two factors**: the amount of use and the level of dust in the work environment.]

Maintaining good screen-film **contact** is important. Screen-film contact can be checked by radiographing a wire mesh (Figure A below). I**f darker**

areas of blurring are seen on the film (Figure B below) then screen-film contact is poor and should be corrected, or the cassette should be replaced.