Film and processing quality assurance

Image Receptors
- Direct action – non screen film
- Indirect action – screen film
- Digital sensor

Direct Action – Non Screen Film
- Usually intra-oral film
- Non screen film – reacts to predominately x-rays
- Use the fastest film consistent with satisfactory clinical results
- Wherever possible these should be film category E or F.
- These films give the highest possible detail.

FILM SPEEDS Intra Oral
- E speed is twice as fast as D speed and F speed is 20% faster than E speed
- D-E speed – Exposure is halved
- It may be necessary to have the machine altered if the output does not go low enough – must be done by a specialised engineer or
- A filter can be used to absorb part of the primary beam

Indirect Action – Screen Film
- These films react predominately to light.
- They are used with intensification screens.
- They ensure the lowest dose possible to the patient.
- Detail can be compromised and must be balanced with that which is necessary to be seen.
- The fastest FILM/SCREEN combination must be used consistent with satisfactory diagnostic results
Film speed should be at least 400

**Indirect Action – Intensification Screens**

- Photoelectric effect results in the intensification screen emitting light
- The colour of light emitted by the screen MUST be compatible with the film
- Rare Earth screens emit blue or green light
- Rare earth screens are recommended.
- 4-5 times faster than calcium tungstate screens.
- Old panoramic machines may need to be reprogrammed (engineer).
- Screens and films must be compatible.

**Processing**

**CROSS SECTION OF A RADIOGRAPHIC FILM**

- **PROTECTIVE LAYER**
- **EMULSION**
- **ADHESIVE**
- **BASE LAYER**
- **ADHESIVE**
EMULSION

PROTECTIVE LAYER

Processing

- Manual
- Automated
- Automatic
- Self developing films

Manual and automatic are predominately used

Processing

Series of actions by which the invisible latent image stored within the emulsion of the radiographic film is converted into a visible permanent image.

Processing Stages

- Development
- Rinse - not usually used in automatic
- Fixation
- Washing
- Drying

Processing – Development

- The X-Rays interact with the silver halide crystals and sensitise them.
- Silver halide is reduced to black metallic silver by the developer solution (alkaline)
- Black grey parts of the image are produced.
Rinse or Squeegee Rollers

- Removes residual developer
- Often not used in automatic development where “Squeegee Rollers” are used instead to stop transference of developer into fixer.

Fixer

- Unsensitised silver halide crystals are removed by the acidic fixer.
- At clearing time the transparent parts of the image are produced ....the image is white light safe and readable but lacks longevity
- Clearing time = time to remove unsensitised crystals.
- At approximately double the clearing time the emulsion is hardened and the film is ready to be washed and dried

Wash

- Removes residual fixer to assure longevity of the radiograph.
- Wash tanks if not changed regularly are a breeding ground for fungus, which will affect the longevity and viewing of the radiograph.

Dry

FINISHED BLACK AND WHITE IMAGE

Manual Processing

- Development time depends on temperature,
  5 minutes at 20 degrees c.
- Rinse – 10 to 20 seconds.
- Fixation – 8 to 10 minutes.
- Wash – Cold running water 10 to 20 minutes

Equipment needed

- Dry : dust free area
- Processing tanks
• Film hangers
• Thermometer
• Timer
• Heater

Dark Room
• Essential for manual processing
• Light tight
• Dry and wet areas
• Safe lights/bee hive

25 Watts – 1.2 metres from work surface.
40 Watts – 2.4 metres from the work surface
• Filter – Kodak GBX2

Automatic Processing
• Machine with roller system
• May have a daylight loading facility
• Development – 1.5 minutes at 27 degrees C.
• No rinse.
• Fixation 1.5 minutes
• Wash 1.5 minutes
• Dry 1.5 minutes

QUALITY ASSURANCE
• The World Health Organisation has defined radiographic quality assurance programmes as – an organised effort by the staff operating a facility to ensure that the diagnostic images produced by the facility are sufficiently high quality so that they consistently provide adequate diagnostic information at the lowest possible cost and with the least possible exposure of the patient to radiation
Quality control measures are essential in general dental practice as they are in radiography departments. This importance of quality is acknowledged in the UK in THE IONISING RADIATION REGULATIONS 1999 which makes quality assurance in dental radiography and mandatory requirement. IN 2001 GUIDANCE NOTES FOR DENTAL PRACTITIONERS ON THE SAFE USE OF XRAY EQUIPMENT is a section devoted to quality assurance and should be essential reading for dental care professionals.

AIMS

- To produce diagnostic radiographs of a consistently high standard.
- To reduce the number of repeat radiographs.
- To determine all sources of error and to allow correction.
- To increase efficiency and to reduce radiation dose to patients and staff to as low as reasonably practicable

ALARP

Film Reject Analysis

Subjective evaluation of film quality involving a record of the radiograph produced in practice, in particular poor quality or rejected radiographs.

Problems

- Operator technique
- X Ray settings
- Image Receptors
- Darkroom Environment
- Processing

Films

- Storage
- Handling
- Stock Control

Screens and Cassette
Light tightness
Film screen contact
Identification
Regular Cleaning

Darkroom
Cleanliness
Light tightness- Darkroom-dark box –cassette
Safe lights
Screen film contact
Coin tests

Processing
Manual
Stir solutions
Agitate films
Tank lids
Film hangers.

Solutions – Manual
Correct concentration
Correct temperature
Correct replenishment.

Automatic Processing
Processor served regularly
Tanks cleaned and drained
Rollers cleaned and bleached
Test film
Replenishment

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Monitoring Processing

- Test radiograph daily
- Compare with reference film

Quality Assurance in Practice

Daily

- Clean darkroom or light box
- Check solution levels
- Change water
- Process a test film
- Compare test film with reference- daily
- Replenish chemicals
- Retain film reject log With steps to rectify

Change of Chemistry

- Change developer and fixer and water
- Clean tanks and roller systems
- Produce new reference film
- Regular bleaching when needed