

NAME: HIRA GUL

ID NO: 14949

PAPER: RADIATION SCIENCES AND TECHNOLOGY

SUBMITTED TO: SIR WAQAS

QUESTION NO:1

ANSWER:

OPERATING CONSOLE:

INTRODUCTION:

- The part of the x-ray imaging system most familiar to the radiologic technologist is the operating console.
- The operating console allows the radiologic technologist to control the x-ray tube current and voltage so that the useful x-ray beam is of proper quantity and quality.

THE OPERATING CONTROLS:

1:mAs

2:kvp

3:line compensator:

1:mAs.

- Radiation quantity refers to the number of x-rays or the intensity of the x-ray beam.
- Radiation quantity is usually expressed in milliroentgens (mR) or milliroentgens/milliamper-second (mR/mAs).

2:kvp.

- Radiation quality refers to the penetrability of the x-ray beam and is expressed in kilovolt peak (kVp) or, more precisely, half-value layer (HVL).

3:Line compensator:

- The line compensator measures the voltage provided to the x-ray imaging system and adjusts that voltage to precisely 220 V.
- Older units required technologists to adjust the supply voltage while observing a line voltage meter.
- Today's x-ray imaging systems have automatic line compensation and hence have no meter.

Explanation:

- Most operating consoles are based on computer technology. Controls and meters are digital, and techniques are selected with a touch screen.
- Numeric technique selection is sometimes replaced by icons indicating body part, size, and shape.
- Many of the features are automatic, but the radiologic technologist must know their purpose and proper use.
- Most x-ray imaging systems are designed to operate on 220 V power, although some can operate on 110 V or 440 V.

- Unfortunately, electric power companies are not capable of providing 220 V accurately and continuously.

HIGH VOLTAGE GENERATORS:

- The High Voltage Generator of an x-ray machine is responsible for increasing the output voltage from the auto transformer to the kVp necessary for x-ray production.
- On High Voltage generator, some heat is generated in the high voltage section and is conducted to oil.
- The oil is used primarily for electrical insulation.
- The high-voltage generator may be housed in an equipment cabinet positioned against a wall, and it is always close to the x-ray tube, usually in the examination room.
- A few installations take advantage of false ceilings and place these generators out of sight above the examination room.
- For newer generator designs that use high-frequency circuits require even less space in the examination room.

QUESTION NO :2

ANSWER:

EXTERNAL COMPONENTS OF X-RAY TUBE:

- External part includes;

1:Tube support .

2:Protective housing.

3:Glass or metal envelope.

TUBE SUPPORT:

- X-ray tube and housing assembly are quite heavy and require a support mechanism so that the radiological technologist can position it.
- There are three methods of x ray tube support.

a: CEILING SUPPORT SYSTEM:

- ceiling support system is probably the most frequently used.
- It consists of 2 perpendicular sets of mound rails.
- This allow for both longitudinal and transverse travel of thr x ray tube.

b: FLOOR TO CEILING SUPPORT SYSTEM:

- The floor to ceiling support system has a single column with rollers at each end,one attached to a ceiling mounted rails and the other attached to a floor mounted rail.
- The tube slides up and down the column as the column rotates.

c: C- ARM SUPPORT SYSTEM:

- Interventional Radiology suites often are equipped with c arm support system so called because the system is shaped like a letter C.
- These systems are ceiling mounted and provide for very flexible x rays tube positioning.

2:GLASS OR METAL ENVELOPE:

- The glass enclosure is made up of pyrex glass.

- The envelope maintains a vacuum inside the tube to allow more efficient x ray production and longer tube life.
- The primary function of the envelope is to provide support and electrical insulation for the anode and cathode.

3:PROTECTIVE HOUSING:

- Supports tube
- Cools
- Insulates from high voltage

QUESTION NO: 3

ANSWER:

THREE FUNCTIONS OF ANODE IN X RAY TUBE:

- It is an electrical conductor for x-ray tube
- The electrons received that emitted from the cathode and conducts them through the tube to the connecting cables and back to the high voltage generator.
- It provides mechanical support for the tungsten target

1:ANODE QUALIFICATIONS:

- Anode is the positive side of the x-ray tube, electricity is conducted and radiates heat and contains the target.
- The anode must be a good thermal dissipator. Because when the projectile electrons from the cathode interact with the projectile electrons from the cathode interact with the anode, more than 99% of their kinetic energy is converted into heat.
- This heat must be dissipated quickly. Copper, molybdenum, and graphite are the most common anode materials.
- Adequate heat dissipation is the major engineering hurdle in designing higher capacity x-ray tubes.

2: TARGET OF X RAY TUBE:

- The target is the area of the anode struck by the electrons from the cathode. In stationary anode tubes, alloying the tungsten (usually with rhenium) gives it added mechanical strength to withstand the stress of high speed rotation.
- High capacity x-ray tubes have molybdenum or graphite layered under the tungsten target. Both molybdenum and graphite have lower mass density than tungsten, making the anode easier to rotate.

3: ROTATING ANODE:

- The rotating anode x-ray tube allows the electron beam to interact with a much larger target area, and therefore the heating of the anode is not confined to one small spot as in stationary anode tube.
- The rotating anode tube provides nearly 1000 times more area to interact with the electron beam than a stationary anode tube. Higher tube currents and shorter exposure times are possible with the rotating anode.
- Heat capacity can be further improved by increasing the speed of anode rotation.
- The speed of rotation on most rotating anodes is 3400 rpm (revolutions per minute).

- The anodes of high capacity tubes rotate at 3400 rmp and 10,000 rpm.

END OF PAPER....!