

Chapter: 5 NON-DESTRUCTIVE TESTING

Non-Destructive Testing

Non-destructive testing, as the name implies, does not damage or reduce the service life of the component.

1. MAGNETIC PARTICLE (MAGNAFLUX) INSPECTION

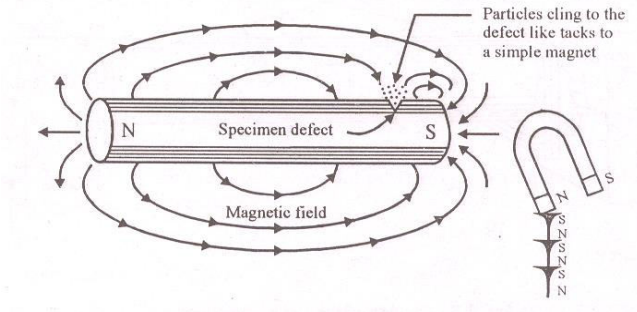


Fig. Principle of Magnaflux Method

The component to be inspected for flaws is magnetized and the ferromagnetic powder is applied to the component.

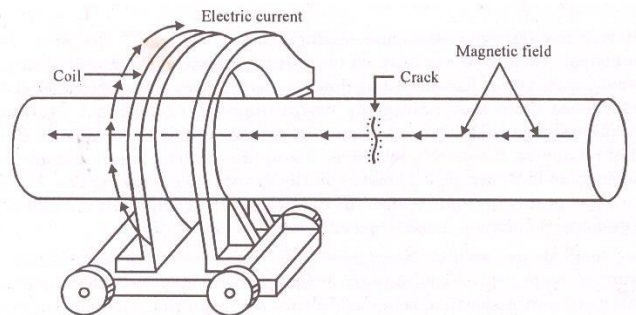


Fig. Longitudinal Method of Magnetisation

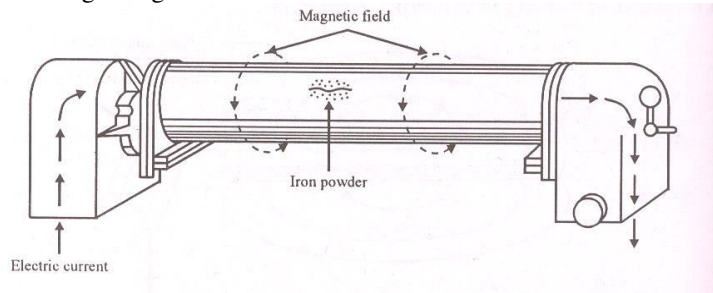


Fig. Circular Method of Magnetisation

Magnetization of the component is done either by using an external magnetic coil or by passing an electric current through it.

A magnetic pole is formed at the crack or flaw, which causes the magnetic powder to concentrate on this area and the flaw, gets easily detected.

When the part is magnetized lengthwise, transverse cracks are easily detected.

When part is magnetized cross- wise lengthwise cracks are easily detected.

2. DYE PENETRANT INSPECTION

Invisible cracks, porosity and other defects on the surface of components can be easily detected by this technique.

The steps for inspection are as below

- (i) Cleaning of surface. (Grease, oil etc. must be removed.)
- (ii) Drying of surface.
- (iii) Applying dye-penetrant on clean and dry surface.
- (iv) Removing excess penetrant by a soft and clean cotton.
- (v) Applying developer on the surface. This pulls out the dye from the flaws and the flaws are revealed by the colour of the dye.

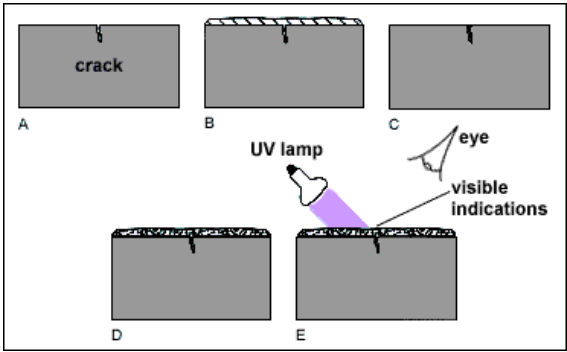


Fig. Principle of Dye Penetrant Test

3. ULTRASONIC INSPECTION

The principle of ultrasonic testing involves a measure of the time required by ultrasonic vibrations to penetrate the material of interest, reflect from the opposite side or from an internal discontinuity and return to the point where the waves were first introduced.

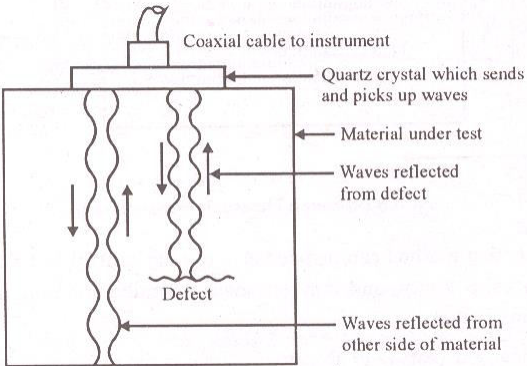


Fig. Detection of Defects by ultrasonic waves

Pulse generator produces ultrasonic waves and these waves are passed into the component through a quartz transducer crystal.

As soon as the wave comes across a discontinuity, it gets reflected back.

This is indicated as a pattern or "pip" on the oscilloscope screen.

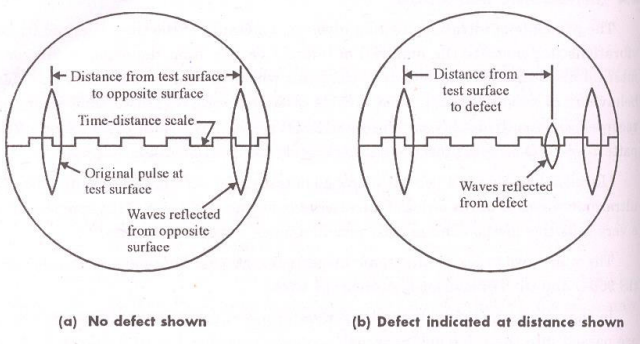


Fig. Oscilloscope screen of ultrasonic Tester

4. RADIOGRAPHY

a) **X-Ray or γ ray radiography:** This is used for detecting defects in components manufactured by casting, welding, forging, etc.

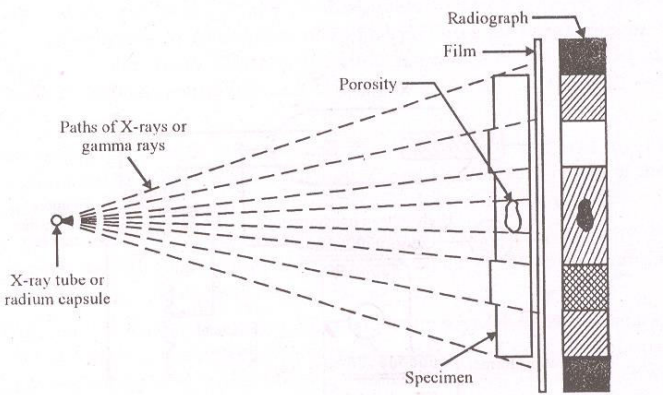


Fig. Production of Radiograph

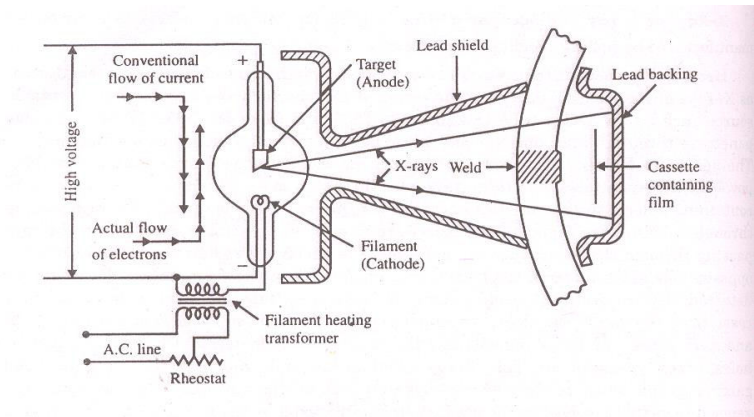


Fig. Arrangement of Radiography of a welded Joint

b) Gamma ray radiography:

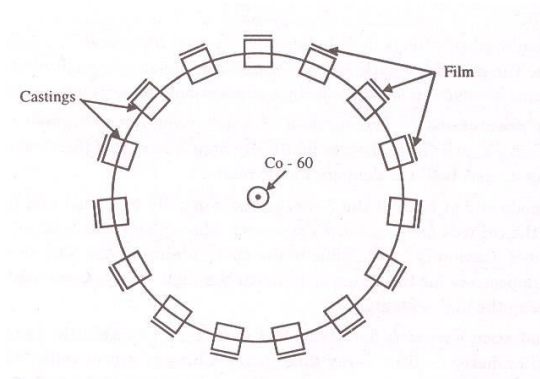


Fig. Gamma ray Radiography

This technique of detecting the defects in the components is very much similar to that of X-ray radiography. In this method, γ -rays which are produced by radioactive decay of Radium and its salts or isotope such as Cobalt 60 are used.