

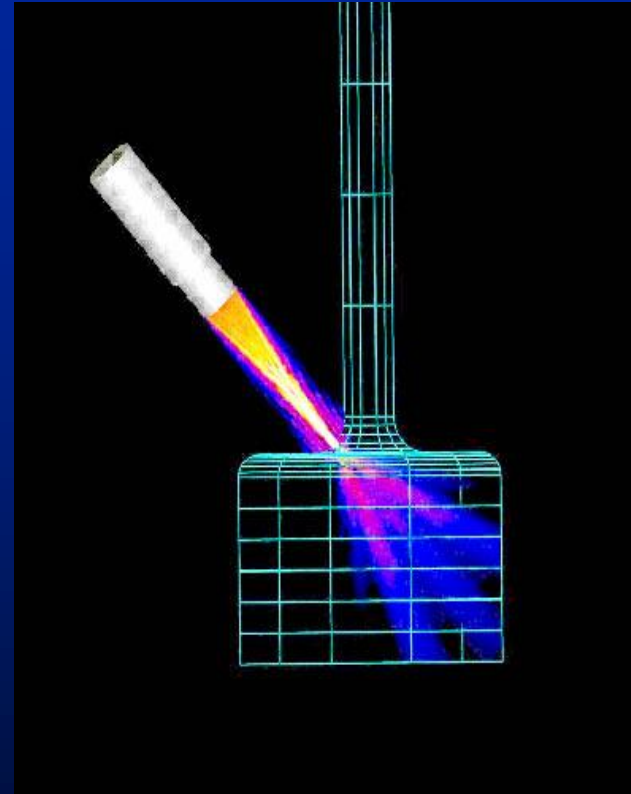
When the inspector needs to do NDT & DT inspections

By; AHMED SAMIR



Definition of NDT

The use of noninvasive techniques to determine the integrity of a material, component or structure
or
quantitatively measure some characteristic of an object.



i.e. Inspect or measure without doing harm.

What are Some Uses of NDE Methods?

- Flaw Detection and Evaluation
- Leak Detection
- Location Determination
- Dimensional Measurements
- Structure and Microstructure Characterization
- Estimation of Mechanical and Physical Properties
- Stress (Strain) and Dynamic Response Measurements
- Material Sorting and Chemical Composition Determination



Fluorescent penetrant indication

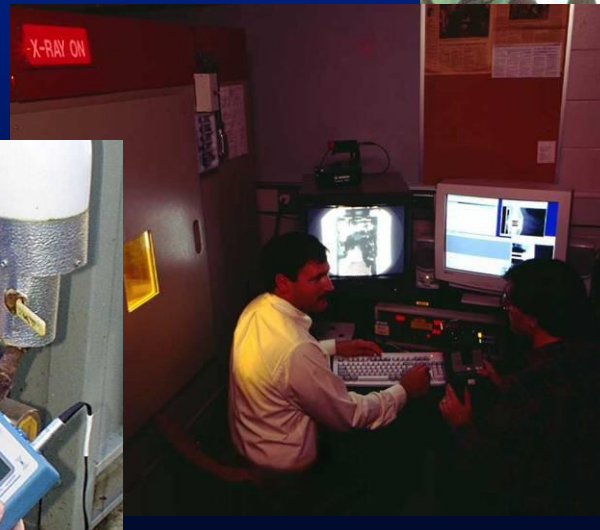
When are NDE Methods Used?

There are NDE application at almost any stage in the production or life cycle of a component.

- To assist in product development
- To screen or sort incoming materials
- To monitor, improve or control manufacturing processes
- To verify proper processing such as heat treating
- To verify proper assembly
- To inspect for in-service damage

Six Most Common NDT Methods

- Visual
- Liquid Penetrant
- Magnetic
- Ultrasonic
- Eddy Current
- X-ray



Visual Inspection



Most basic and common inspection method.

Tools include fiberscopes, borescopes, magnifying glasses and mirrors.

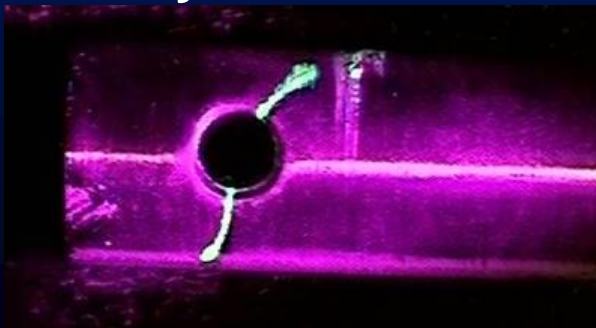
Portable video inspection unit with zoom allows inspection of large tanks and vessels, railroad tank cars, sewer lines.



Robotic crawlers permit observation in hazardous or tight areas, such as air ducts, reactors, pipelines.

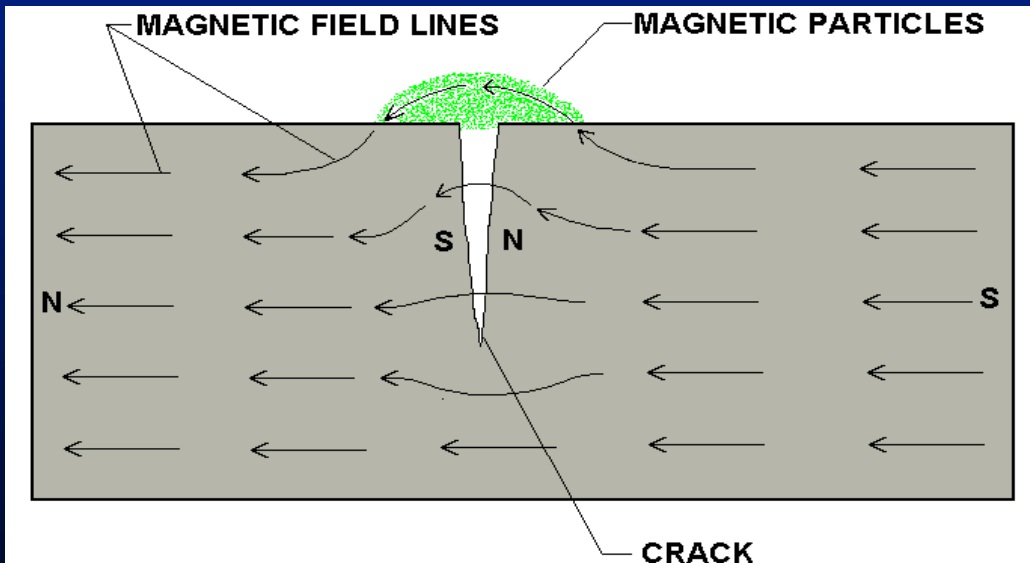
Liquid Penetrant Inspection

- A liquid with high surface wetting characteristics is applied to the surface of the part and allowed time to seep into surface breaking defects.
- The excess liquid is removed from the surface of the part.
- A developer (powder) is applied to pull the trapped penetrant out the defect and spread it on the surface where it can be seen.
- Visual inspection is the final step in the process. The penetrant used is often loaded with a fluorescent dye and the inspection is done under UV light to increase test sensitivity.

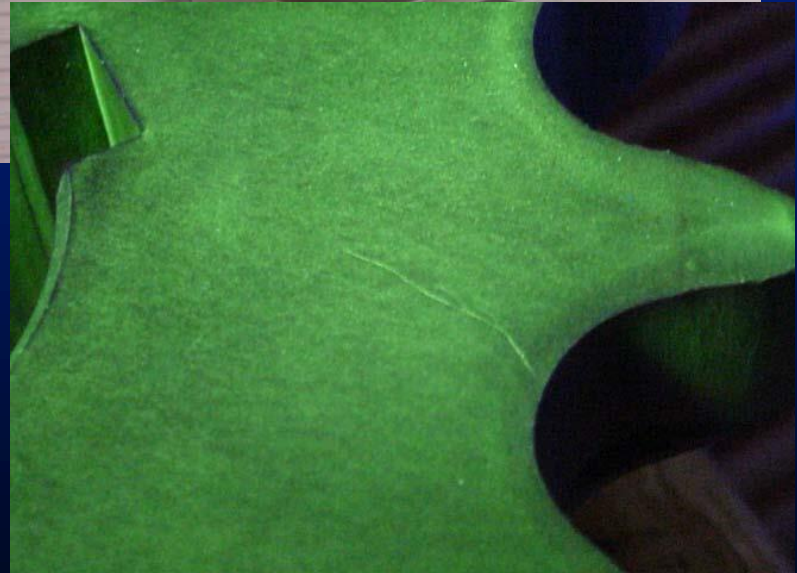
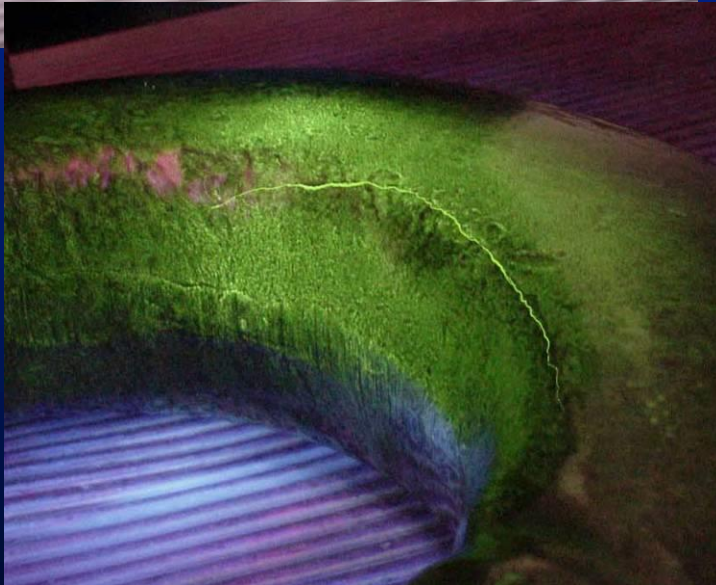


Magnetic Particle Inspection

The part is magnetized. Finely milled iron particles coated with a dye pigment are then applied to the specimen. These particles are attracted to magnetic flux leakage fields and will cluster to form an indication directly over the discontinuity. This indication can be visually detected under proper lighting conditions.

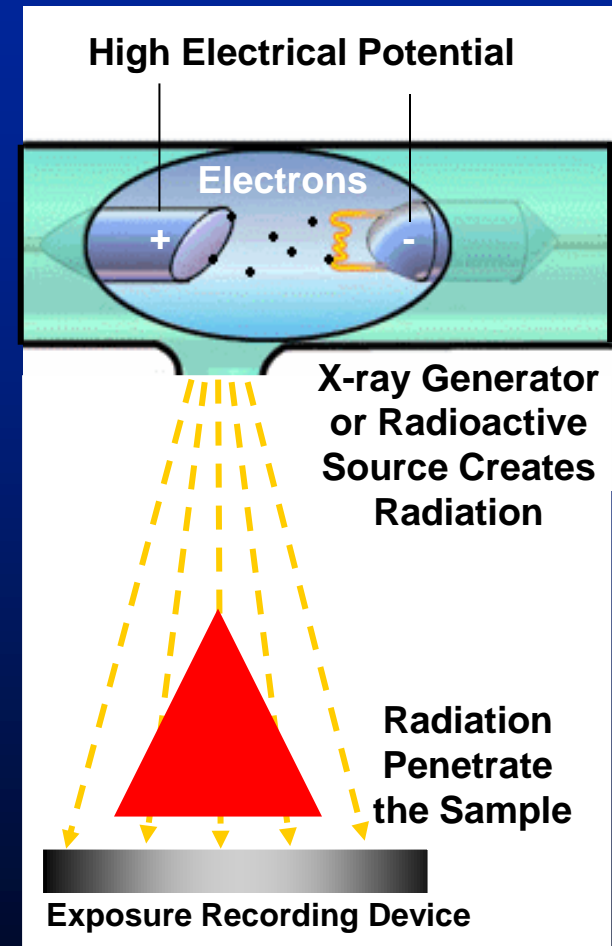
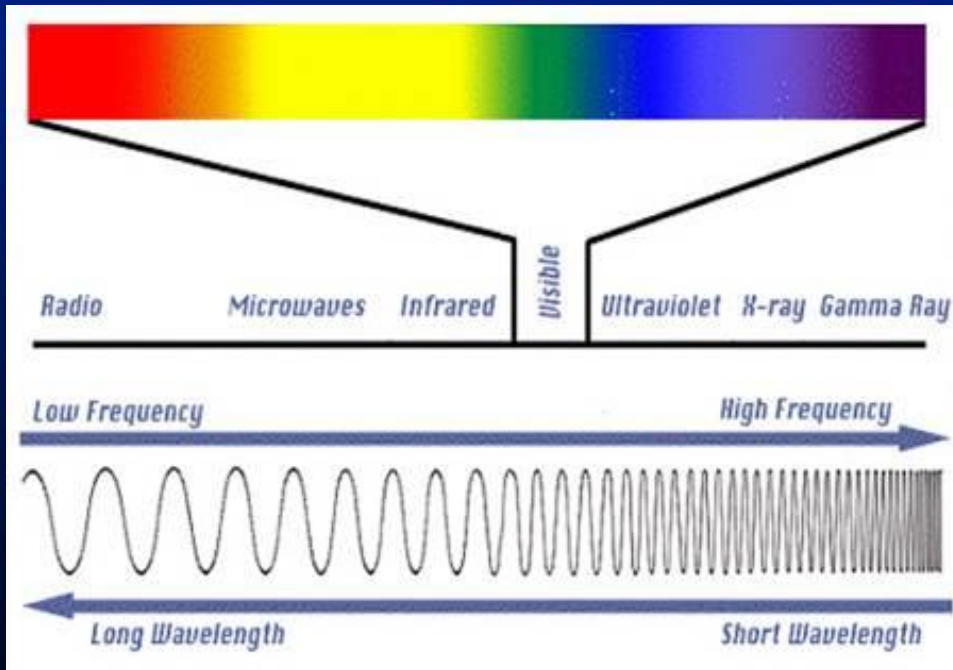


Magnetic Particle Crack Indications



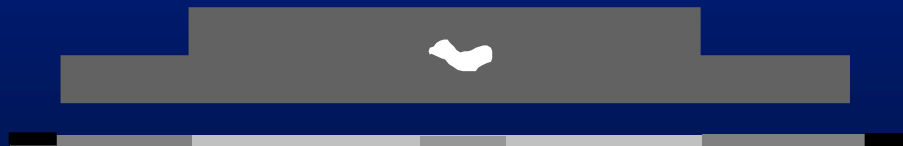
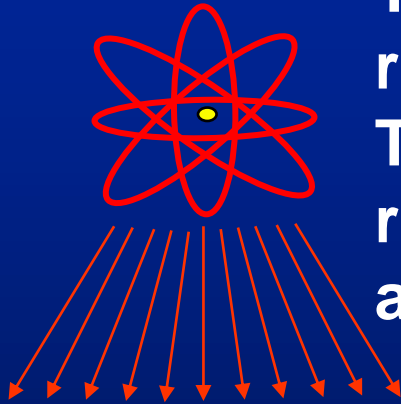
Radiography

The radiation used in radiography testing is a higher energy (shorter wavelength) version of the electromagnetic waves that we see as visible light. The radiation can come from an X-ray generator or a radioactive source.

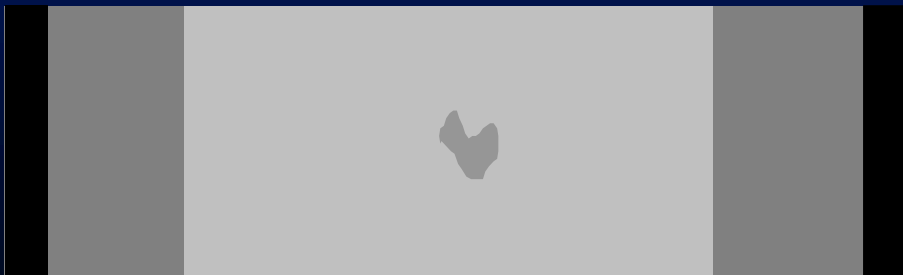


Film Radiography

The part is placed between the radiation source and a piece of film. The part will stop some of the radiation. Thicker and more dense area will stop more of the radiation.

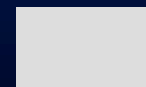


X-ray film



Top view of developed film

The film darkness (density) will vary with the amount of radiation reaching the film through the test object.

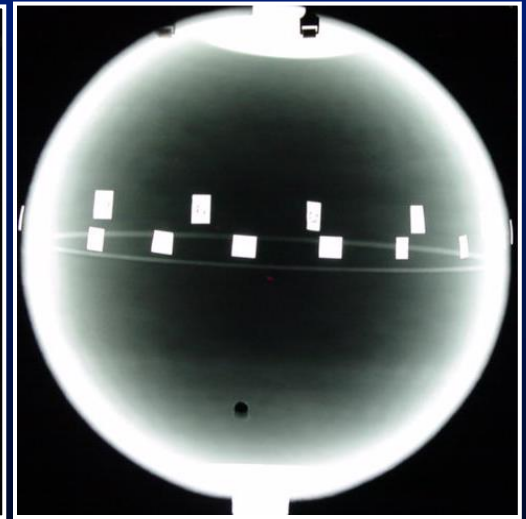
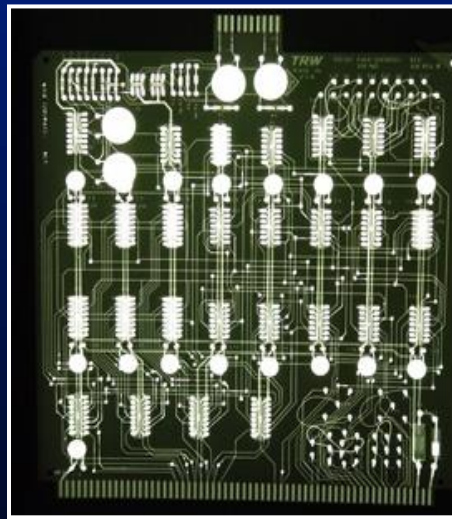
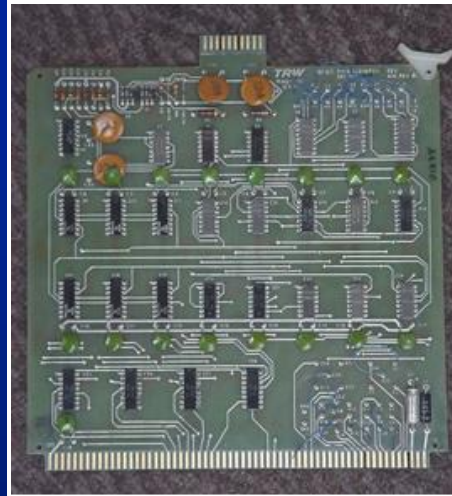


= less exposure

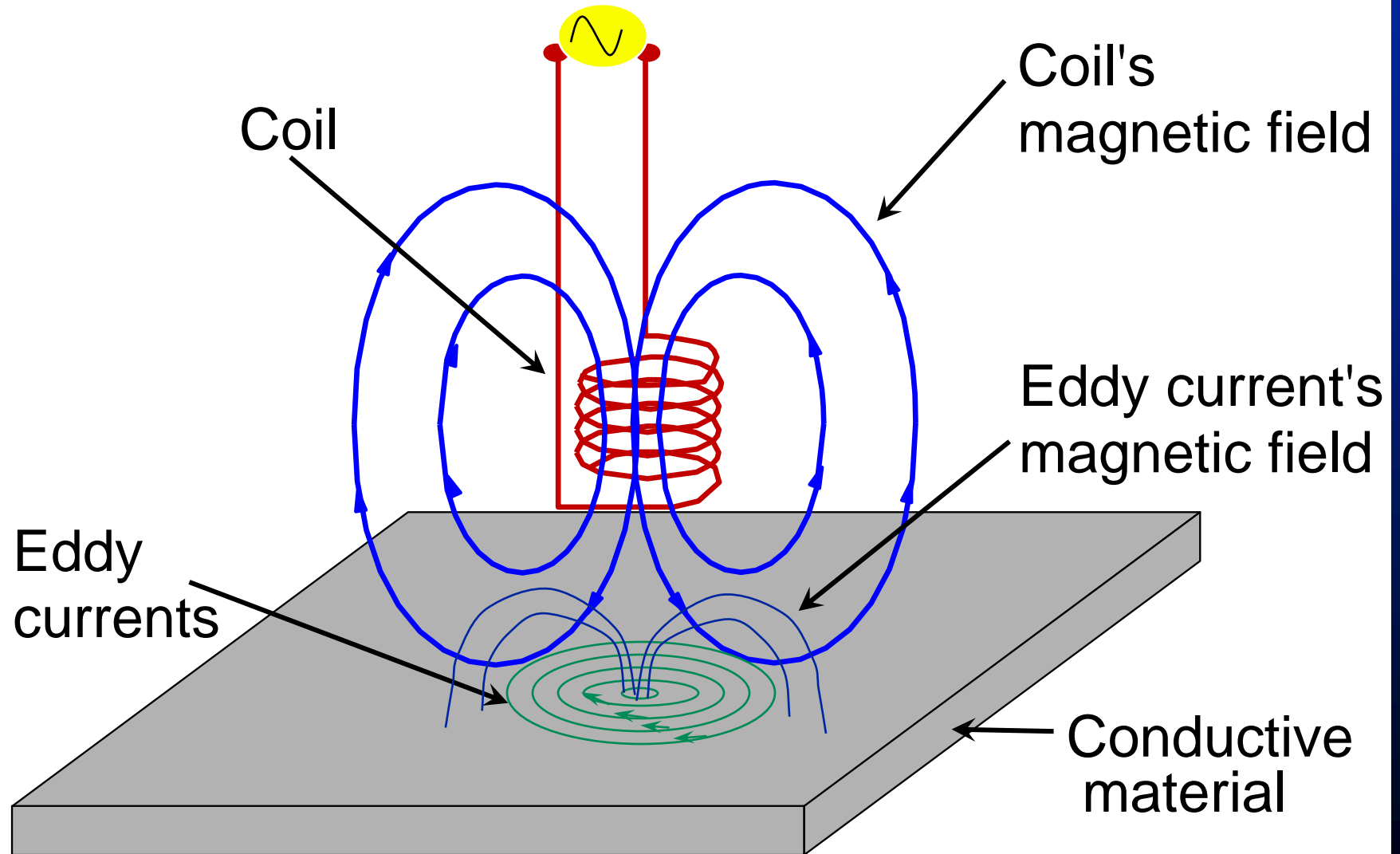


= more exposure

Radiographic Images



Eddy Current Testing



Eddy Current Testing

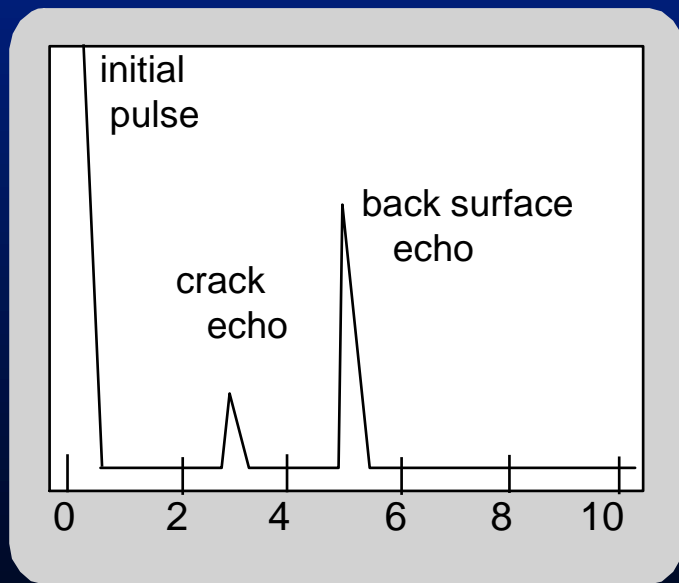
Eddy current testing is particularly well suited for detecting surface cracks but can also be used to make electrical conductivity and coating thickness measurements. Here a small surface probe is scanned over the part surface in an attempt to detect a crack.



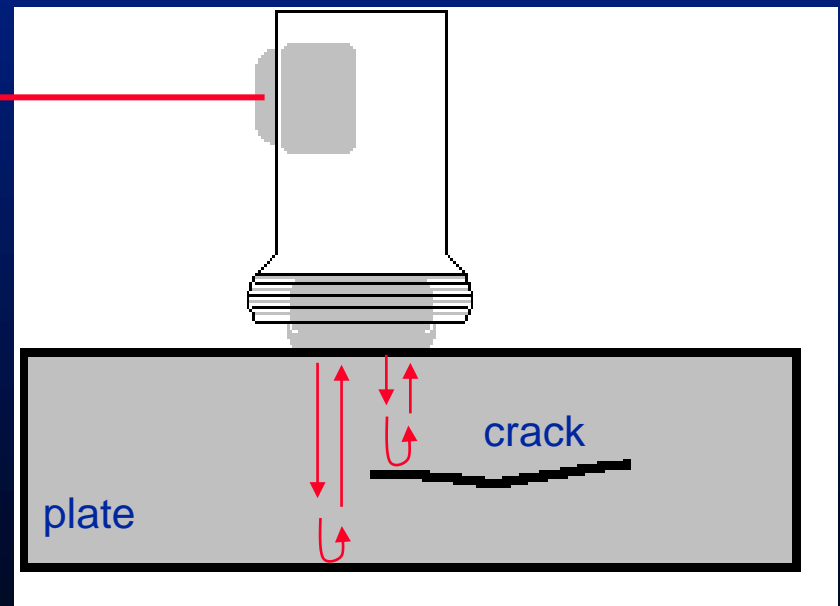
Ultrasonic Inspection (Pulse-Echo)

High frequency sound waves are introduced into a material and they are reflected back from surfaces or flaws.

Reflected sound energy is displayed versus time, and inspector can visualize a cross section of the specimen showing the depth of features that reflect sound.



Oscilloscope, or flaw detector screen

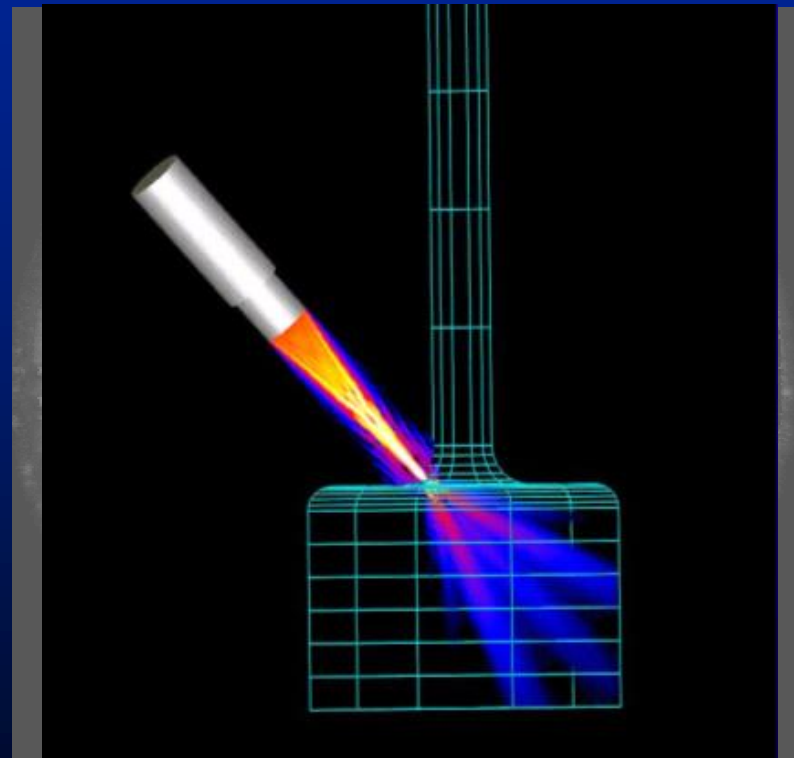


Ultrasonic Imaging

High resolution images can be produced by plotting signal strength or time-of-flight using a computer-controlled scanning system.



Gray scale image produced using the sound reflected from the front surface of the coin



Color image of the sound reflected from the back surface of the coin (inspected from "heads" side)

Common Application of NDT

- **Inspection of Raw Products**
- **Inspection Following Secondary Processing**
- **In-Services Damage Inspection**

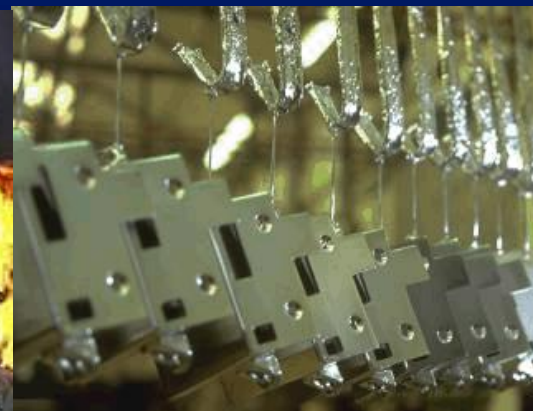
Inspection of Raw Products

- Forgings,
- Castings,
- Extrusions,
- etc.



Inspection Following Secondary Processing

- Machining
- Welding
- Grinding
- Heat treating
- Plating
- etc.



Inspection For In-Service Damage

- Cracking
- Corrosion
- Erosion/Wear
- Heat Damage
- etc.

