

## Comparison of Non-Destructive Testing methods.

Method	Principle	Advantages/Disadvantages/ Application
<b>Penetrant</b>	Color contrast or fluorescent penetrating liquid applied to surface, penetrates crack by capillary action and remains trapped when surface excess liquid removed. A developer, generally white powder, then applied to surface causes penetrant in crack to leak out and render crack visible.	This method will detect only surface-breaking cracks and faults. Simple and convenient to use, but care required in surface preparation, draining off and interpretation of indications. It can be applied to any non-porous metallic metal.
<b>Magnetic</b>	Material is magnetized by direct flux flow or by high current induction. Where a crack or fault is close to the surface opposite magnetic poles are created. A magnetic powder (akin to iron filings) applied to surface will gather at opposite poles created by magnetizing force and thus render crack or fault visible.	This method can only be applied to ferromagnetic materials, and requires ancillary magnetizing equipment. Cracks or faults will be shown only if they cut the flux lines, may be required. Efficiency is also dependent on application of correct flux or current level for item under investigation.
<b>Eddy Currents</b>	Essentially an electrical measuring method, whereby eddy currents are induced in surface of material. Variations in material such as defects and electrical conductivity will affect phase and amplitude of eddy currents. This information can be displayed as meter readings or as oscilloscope display.	Quick and convenient to use for measuring conductivity, testing wire and tube for faults, and for detecting surface-breaking cracks. Also useful in determining, in conjunction with hardness tests, the heat treatment condition of aluminum alloys. Successful use dependent on application of correct flux or current level for item under investigation.
<b>Ultrasonics</b>	High frequency vibrations in the form of a longitudinal or angled beam are included in material by a piezo-electric crystal internal defects will reflect beam back to crystal which converts energy to an oscilloscope. Beam can be transmitted and received by the same crystal or through transmitting methods can be used where the beam is transmitted and received by separate crystals.	Will detect internal fault, e.g. forging bursts and inclusions, also subsurface faults in welding. Correct application requires high operating skill correct probe selection, knowledge of test item geometry, and calibration standards. Applicable to a wide range of materials but unsuitable for castings. Correct selection of beam frequency for application under consideration is also necessary.
<b>Radiography</b>	This is the industrial used of a well-established medical technique. X-rays of gamma rays are passed through material to a photographic type film. Variations in absorption are seen as contrast on the film.	Will detect internal flaws in materials and is frequency used on castings and weldments. Expensive in terms of both manpower and plant, and ionization regulations are applicable. Care needed to ensure X-ray beam correctly aligned for expected defect

## Comparison of Non-Destructive Testing methods.

<b>Method</b>	<b>Principle</b>	<b>Advantages/Disadvantages/ Application</b>
<b>Visual</b>	“Eyeball”, hand-held lens, or portable microscopes are used to view the item in question.	Useful in preliminary examinations before application of above methods, or in post-viewing of defects revealed by them.