

Non - destructive testing methods

Objectives : At the end of this lesson you shall be able to:

- state the definition of Non-Destructing Testing
- list the different type of NDT Methods
- explain the principle and process of Liquid penetrant testing Method
- state the Advantages and disadvantages of Liquid penetrant testing
- explain the principle and process of Magnetic Particle Testing Method
- state the Advantages and disadvantages of Magnetic particle Testing Method.

Importance of Non-Destructive Testing in Automotive Industry

Automobile companies face when accidents happen because of component failures, the stringent quality control requirements expected by organizations or the high number of human lives lost in accidents, the automobile industry has reduced 'cutting' of its components and has transitioned into non-destructive testing for its automotive parts. A malfunction of a component, however small, can have catastrophic consequences. Hence NDT plays an important role in the quality control of a product. It is used during all the stages of manufacturing of a product. It is used to monitor the quality of the.

- a) Raw materials which are used in the construction of the product.
- b) Fabrication processes which are used to manufacture the product.
- c) Finished product before it is put into service.

Definition of NDT

Non-destructive testing (NDT) is the use of physical methods which will test materials, components and assemblies for flaws in their structure without damaging their future usefulness.

Types of NDT methods

The methods of NDT range from the simple to the complicated. Which are commonly used are:

- 1 Visual or optical inspection
- 2 Dye penetrant testing
- 3 Magnetic particle testing
- 4 Eddy current testing
- 5 Radiographic testing and
- 6 Ultrasonic testing.

Liquid Penetrant Testing (Fig. 1)

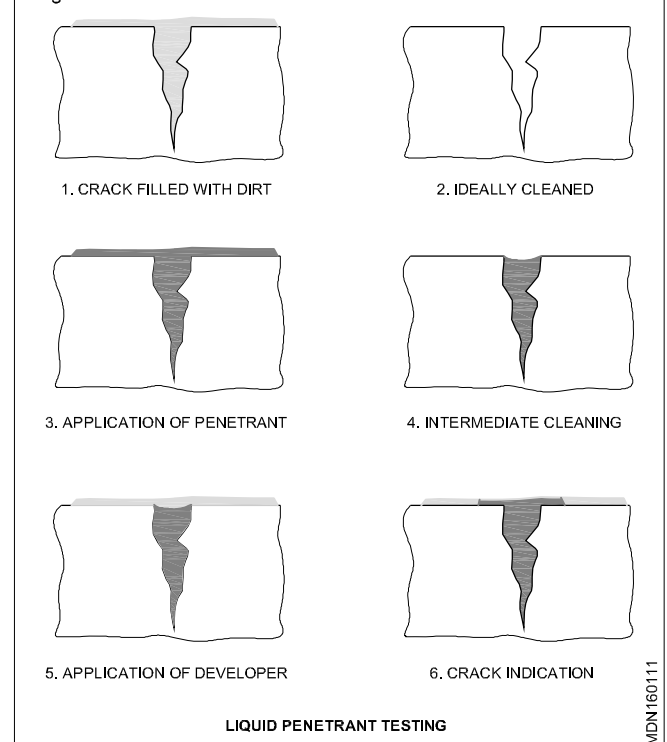
A liquid penetrant dye is passed through the object to be inspected. By capillary action, the liquid seeps into the defects in the material. A developer is applied to the material which pulls back the penetrant and forms an indication on the surface of the material, which is much easier to see than the crack itself.

This non-destructive testing technique can be used to find the cracks, pores and other surface defects.

Basic Process of LPT

- 1 **Clean & Dry Component**
Pre clean area, spray on cleaner, wipe off with cloth.
- 2 **Apply Penetrant**
Spray Penetrant, allow short penetrant time 5-10 min
- 3 **Remove Excess Penetrant**
Spray cleaner on wiping towel and wipe surface
- 4 **Apply Developer**
Spray on thin uniform film of developer
- 5 **Visual Inspection**
Inspect defects will show as bright red lines/dot in while developer background as pink colour

Fig 1



Advantages

- Parts with large surface areas can be measured rapidly at a low cost
- Low initial investment cost
- Parts with complex shapes can be inspected

Disadvantages

- Can be applied only on nonporous materials
- Chemicals used could be toxic, and so precautions need to be taken
- Cleaning necessary before and after material is tested by this technique

Magnetic particle testing (MPT) (Figs 2 & 3)

Magnetic particle testing is used for the testing of materials which can be easily magnetized. This method is capable of detecting open to surface and just below the surface flaws.

In this method the test specimen is first magnetized either by using a permanent or an electromagnetic yoke or by passing electric current through or around the specimen.

Whenever minute magnetic particles are sprinkled onto the surface of such a specimen, these particles are attracted by these magnetic poles to create a visual indication approximating the size and shape of the flaw.

Basic Process of MPT

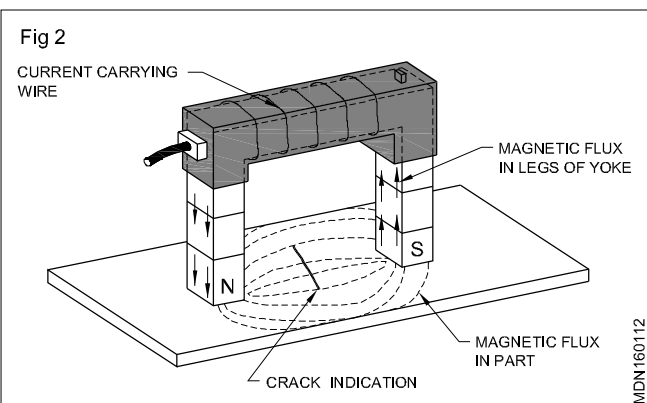
(a) Preparation of the inspection surface.

Surface preparation by grinding, machining, Cleaning may be accomplished using detergents, organic solvents, de-scaling solutions, paint removers, sand or grit blasting methods.

(b) Magnetization of the inspection surface.

The method of magnetization shall be done using either electromagnetic yoke or permanent magnet, with pole spacing to be between a minimum of 3 inches (76.2mm) and a maximum of 8 inches (203.2mm).

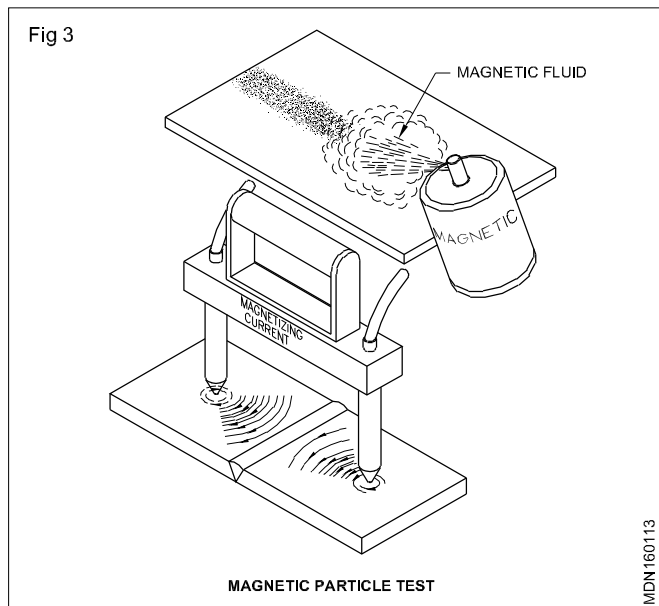
The Yoke shall be placed in contact with the surface to be examined and energized.



Electromagnetic yoke

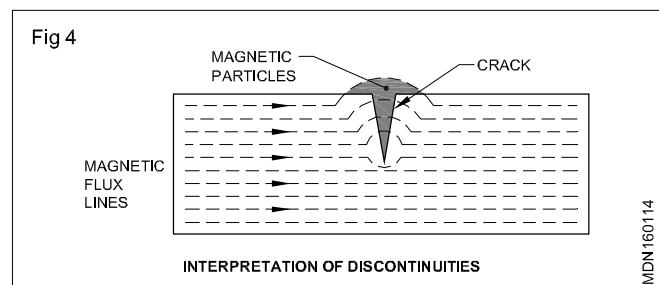
(c) Indicating medium selection and application.

While maintaining the magnetic field the magnetic dry particles are applied to the area between the poles.



(d) Interpretation of discontinuities. (Fig. 4)

In magnetic particle testing an indication could be any magnetically held magnetic particle pattern on the surface of the part being tested.



(e) Demagnetization

Finished parts processed with wet inks should be immediately cleaned and dried to prevent the chances of surface corrosion or wear between moving parts.

(f) Post cleaning

Finished parts processed with wet inks should be immediately cleaned and dried to prevent the chances of surface corrosion or wear between moving parts.

Advantages

- Rapid inspection of large surface areas
- Surface and subsurface flaws can be detected

Disadvantages

- Can only be used for inspection of ferromagnetic materials.
- A relatively smooth surface required for application of this method.
- Non-magnetic materials like paints, coatings etc. affect the sensitivity of this testing technique.