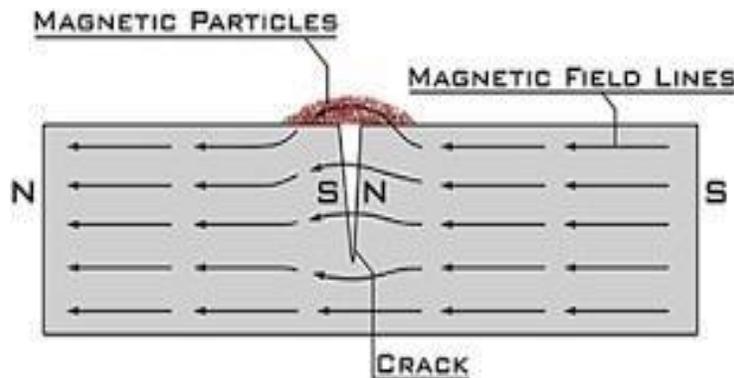


## MAGNETIC PARTICLE TESTING :

Magnetic particle testing is one of the most widely utilized NDT methods since it is fast and relatively easy to apply and part surface preparation is not as critical as it is for some other methods. This method uses magnetic fields and small magnetic particles (i.e. iron) to detect flaws in components. The component being inspected must be made of a ferromagnetic material (a materials that can be magnetized) such as iron, nickel, cobalt, or some of their alloys.

Underwater inspection is another area where magnetic particle inspection may be used to test items such as offshore structures and underwater pipelines.

**BASIC PRINCIPLE:-** It can be considered as a combination of two nondestructive testing methods: magnetic flux leakage testing and visual testing. For the case of a bar magnet, the magnetic field is in and around the magnet. Any place that a magnetic line of force exits or enters the magnet is called a “pole” .



When a bar magnet is broken in the center of its length, two complete bar magnets with magnetic poles on each end of each piece will result. The magnet is just cracked but not broken completely in two, a north and south pole will form at each edge of the crack. The magnetic field exits the north pole and re-enters at the south pole.

The magnetic field spreads out when it encounters the small air gap created by the crack because the air cannot support as much magnetic field per unit volume as the magnet can. When the field spreads out, it appears to leak out of the material and, thus is called a flux leakage field.

The iron particles are sprinkled on a cracked magnet, the particles will be attracted to and cluster not only at the poles at the ends of the magnet, but also at the poles at the edges of the crack. This cluster of particles is much easier to view the actual crack and this is the basis for magnetic particle inspection.

The first step in a magnetic particle testing is to magnetize the component that is to be inspected. Any defects on or near the surface are present, the defects will create a leakage field. After the component has been magnetized, iron particles, either in a dry or wet suspended form, are applied to the surface of the magnetized part. The particles will be attracted and cluster at the flux leakage fields, thus forming a visible indication that the inspector can detect.

### **Advantages and Disadvantages**

The primary advantages and disadvantages when compared to other NDT methods are:

#### **Advantages**

- High sensitivity (small discontinuities can be detected).
- Indications are produced directly on the surface of the part and constitute a visual representation of the flaw.
- Minimal surface preparation (no need for paint removal)
- Portable (small portable equipment & materials available in spray cans)
- Low cost (materials and associated equipment are relatively inexpensive)

#### **Disadvantages**

- Only surface and near surface defects can be detected.
- Only applicable to ferromagnetic materials.
- Relatively small area can be inspected at a time.
- Only materials with a relatively nonporous surface can be inspected.
- The inspector must have direct access to the surface being inspected.