Dry Film = Wet Film x % Solids of Coating

Errors in film thickness estimates result in a needless expenditure of time, material, and money. If a film is too thin, its hiding power and protective capabilities may be inadequate and time will be lost in recoating the surface. If a coating application results in a dry film being excessively thick, failures such as cracking, flaking, or excessive drying time may result. Also, there is the cost factor of applying too much coating.

Wet Film

In order to control the process variables when applying a coating to a surface, it is often desirable that measurements are made to determine thickness while the coating is still wet. Wet film measurement is done by devices based upon the shape of the surface area, and the expected range of thickness. In addition, wet film measurements are also very useful for coating systems where the dry film thickness can only be measured destructively.

Dry Film Thickness

Measuring coating thickness accurately maximizes quality and minimizes material costs. Dry film checking can be carried out non-destructively or destructively, for multi-layer applications.

Non-Destructive Gages

These include the mechanical type gage that uses a magnet, electronic / digital type gages, and ultrasonic technology that can measure the thickness of coatings on concrete, wood, or plastics. Electronic gages extend the range of coating substrates beyond the magnetic (ferrous) substrate, because they are able to measure the thickness of coatings on non-ferrous (ex. aluminum) substrates or any non-conductive material on a conductive substrate by means of eddy-current.

- Ferrous materials include:
  steel, cast iron, ferritic stainless steel, duplex stainless steel
- Non-ferrous materials include:
  aluminum, brass, bronze, copper, magnesium, stainless steel (other than those mentioned above), titanium, uranium and zinc
- Examples of non-ferrous coatings (on ferrous substrates):
  paint, powder coatings, electro-plating, galvanizing, rubber, hard chrome, various enamels, sprayed metal and ceramics

Measurement Technologies

Magnetic Pull-Off (Ferrous)

These gages consist of a permanent magnet, a calibrated spring, and a graduated scale. The attractive force between the permanent magnet and the magnetized steel pulls the magnet toward the steel. The magnitude of this attractive force is related to the separation distance between the magnet and the steel, hence the thickness of the film between the two.

Magnetic Induction (Fe)

This method uses two magnet coils where the magnetic field changes if brought near a ferromagnetic substrate.

The change of the magnetic field is related to the distance between the probe and substrate – thus to film thickness. The second of the two coils takes up the magentic current. This magnetic coupling between both magnetic poles is the measure used for film thickness. In addition, electromagnetic induction uses alternating magnetic fields, generated by a ferromagnetic coil. Today, highly precise Hall-effect semiconductors are integrated in modern Ferrous probes.

Eddy Current Measurements (NFe)

This method is required when measuring non-conductive coatings (NFe) on non-ferromagnetic substrates (NFe) such as aluminum. The eddy-current measurement method is based on the principles of the electromagnetic induction technique described above. A coil of fine wire conducting a high frequency alternating current sets up a magnetic field which changes its direction according to the alternating current connected. When the NFe probe comes in contact with the conductive substrate, eddy currents are generated, which affect the magnetic field of the coil. The effect depends on the characteristics of the substrate and the distance between the probe and substrate (i.e. film thickness).