Techniques for Measuring Plating Thickness of Zinc, Zinc, Iron, and Zinc Nickel Plated Surfaces
by Ron Glaser
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There are many ways to measure Zinc, Zinc-Iron, and Zinc-Nickle plated parts. Some of the more popular methods include, Magnetic induction, Hall effect, Cross section and X-Ray fluorescence. Magnetic induction and X-ray are probably the most popular for measuring these finishes.

The magnetic induction principle is based on a probe coil making contact with the sample and inducing a magnetic field. The thickness of the coating is directly proportional to the magnetic resistance. As the coating gets thicker the reluctance becomes larger and is recorded as a thickness measurement. The gage is typically portable and calibrated with flexible films of varying thicknesses. For the most accurate measurement the user should calibrate on the actual part they are intending to measure.

There are factors which may influence the accuracy of measurement which includes:

- Magnetic permeability of the steel part. If the part does not have homogenous permeability – the measurement values can vary quite a bit. This may be inherent in the steel that's used, work hardening, heat treatment, case hardening etc.
- Geometry of the part. The instrument should always be calibrated on the uncoated specimen in the area that has the same geometry as to be measured.
- Edge effect. The instrument used will determine the magnetic field that is induced in the part. The probe must not be too close to the edge of the part (dependent on the probe/instrument) or the field effect will have a large impact on the accuracy of the measurement.
- Surface/substrate Roughness. This can have a large impact on the measurement precision and accuracy and must be handled appropriately with averaging using a large diameter probe or taking the average of multiple readings.
- Highly operator dependent. Operator variation is typically much higher for magnetic induction due to the operator handling the probe. Operator training on force applied to the probe, bringing the probe down perpendicular to the part etc. will help with this. Also, a probe can be installed in a fixturing device to help with introducing the probe to the part.
- Substrate thickness dependent. Depending on the probe used, the depth of penetration should be lower than the actual substrate thickness that's being measured.

EDXRF (X-ray fluorescence) is typically a bench top measurement instrument and is calibrated with known plated samples of varying thicknesses which should cover the range of measurement.

There are a few factors that must be looked at to assure accurate measurements.

- Samples should be in focus with the camera. Some instruments will use a laser or camera focusing to enhance reproducibility.
- Spot size of the collimator should be smaller than the part to be measured. Unless special considerations are made it is very important that the collimated X-ray beam not overshoot the sample being measured.

The above methods can measure a variety of coating/substrate combinations to good effect. Both methods must adhere to the principles of each measurement device and the user must be acutely aware of the factors that can produce error.