testing

Meeting coating thickness specs

Handheld gages can deliver lab-quality readings lineside at assembly plants, ensuring proper metal protection in vehicles.

Edited by Elizabeth Engler Modic

Handheld coating thickness gages can measure material coverage on ferrous substrates such as structural steel assemblies and body panels and non-ferrous substrates such as aluminum or carbon fiber.

While making cars and trucks look great is important, applying the correct amount of coatings onto vehicle bodies is more important for protecting metal substrates from corrosion and ensuring long product lifespans. The automotive industry needs accurate coating thickness measurement when plating, anodizing, powder coating, or spray coating vehicle bodies.

Properly applied coatings, with thickness measured in mils (0.001") or microns (0.001mm) are crucial to avoid coating breaches that lead to corrosion of the underlying substrate. Precise application to specification, along with coating measurement, can also prevent leaks and other safety issues.

However, conducting frequent, laboratory-quality coating thickness tests throughout the manufacturing process has been difficult. Traditionally, this required meticulous sampling and preparation, as well as taking the sample to the lab for evaluation. Portable coating thickness gages are not new, but most fail to provide the accuracy, speed, or simplicity required for quick checks.

Newer handheld devices allow personnel to easily and quickly perform lab-quality coating thickness measurements. Some options offer instant coating thickness measurement of almost any non-magnetic coating on ferrous substrates such as steel panels and non-ferrous substrates such as aluminum and carbon fiber reinforced plastic (CFRP). This is possible using only one hand, even on curved and complex surfaces.

Simplifying the testing process allows automotive original equipment manufacturers (OEMs) to increase quality checks while optimizing costs.

THICKNESS READING BENEFITS

Coating thickness directly affects vehicle and component quality for paint, electroplating, anodizing, and other coating applications. Checking paint coating consistency on a vehicle provides a product with a superior finish and offers essential data about the consistency of the paint when it's wet.

"Incorrect paint consistency can affect drying times or eventual flaking of the paint film," says John Bogart, managing director of coating thickness tester manufacturer Kett US. "Too little paint coating and you are left with cosmetic issues in opacity and protective issues such as corrosion, wear, and exposure."

When specificity and adhesion matter in anodizing and electroplating, a coating thickness gage should be able to read the coating thickness to the most minute measurement. This can play a major role in preventing corrosion while optimizing the process to eliminate excess use of expensive plating products.

Testing anti-corrosion pipe/piping coatings can also find weak spots where the coating is too thin and a coating breach could make the substrate susceptible to corrosion, Bogart says.

“Knowing about these trouble spots can prevent a problem well before it occurs,” he says. “This could involve engine piping and tubing or exhaust tail pipes. A nondestructive gage is a perfect way to ensure that the protective coating has not been applied too thinly. Excessively thin coatings are more likely to be chipped or breached, which can lead to corrosion promoters such as water or oxygen getting under the coating and accelerating corrosion in the substrate.”

Kett US’ LZ-990 coating thickness tester can determine substrates and quickly gage coating thicknesses to 0.1µm, allowing more frequent lineside tests throughout various coating processes.
Photos courtesy of Kett US

SIMPLIFYING MEASUREMENT

Traditional laboratory coating thickness measurement techniques are useful in the right settings but lack the simplicity and flexibility required for frequent spot checks. Sampling, sample preparation, and taking the sample to the lab for evaluation require time and participation of trained staff.

Other conventional coating tests, such as scratch testing, are destructive or invasive and damage the sample. Scratched products cannot be returned to the production line, requiring re-coating or repairs that add time and expense to processes. Also, since only a small portion of the component may be tested, results may not represent the entire situation.

In certain environments with multiple substrates, many older handheld devices either had difficulty determining the substrate or using the correct test for the application. So, multiple measurement devices had to be used, complicating testing.

Finally, typical coating measurement methods were usually unable to accurately measure curved or complex surfaces, preventing easy spot checking of pipe, piping, and convoluted component design coating compliance.

Kett’s LZ-990 portable coating thickness gage combines two of the most widely used measurement methods – magnetic inductance and eddy current – in a dual-mode device that measures thickness of almost any non-magnetic coating on ferrous and non-ferrous substrates.

The unit automatically determines the substrate and uses the appropriate measurement circuit, enabling instant, non-destructive testing on painting, plating, anodizing, and organic coatings with up to 0.1µm accuracy. Such testing takes less than a second to display the measurement.

Providing accurate, repeatable measurements requires consistent contact between the instrument and the test surface, so the unit uses a spring-loaded probe to generate consistent contact pressure with the measured surface. The probe includes edge guides to ease measurement of curved and edged surfaces. The probe’s foot design provides a firm

platform when placed onto the test piece.

Bogart says numerous design considerations in handheld coating thickness gages can simplify measurement and improve versatility.

Eliminating moving parts in the tester (other than the probe) improves accuracy and durability. Similarly, the unit should be impervious to vibration, with measurement independent of its orientation.

To save time during testing, he recommends units with large screens to quickly read results that can be stored in the gage and transferred to a computer and/or printer for documentation and process monitoring. An instrument that stores many test measurements allows operators to perform numerous tests before downloading results.

“Easier, more accurate automotive coating and plating measurement with handheld units will improve quality checks wherever needed. Defects can be immediately detected and corrective action undertaken to minimize scrap and faulty components,” Bogart concludes.

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