international
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60 years of excellence

Elcometer celebrates 60 years of instrument manufacturing by opening their new headquarters in Manchester, England.

The opening of Elcometer's new World Headquarters took place in November 2007. Based in Manchester, England and incorporating over 5,110m² (55,000 sq.ft.) of production, research and development, office and training facilities, Elcometer is well placed to continue being a leading force in inspection technology.

To officially open the new Headquarters and to celebrate six decades in the business, Elcometer hosted a World Conference with over 70 of its distributors from around the Globe attending.

Mr Ian Sellars, Managing Director since 1962, conducted the opening ceremony. He is the sixth generation of the Sellars family in business in Manchester.

The conference was a showcase for the new products including the new Elcometer 456 Mk3 Digital Coating Thickness Gauge, incorporating Bluetooth® wireless technology; the Elcometer 266 Holiday Detector, which redefines porosity detection; the new Elcometer 415 Paint and Powder Thickness Gauge for measuring coatings on smooth metal surfaces and the new Elcometer 224 Digital Surface Profile Gauge for fast measurement of blastcleaning.

With their new state of the art training suite, Elcometer can continue to grow their successful customer training programme, which has seen over 100 attendees in the last 12 months. For more information about Elcometer's present instruments, visit www.elcometer.com

product of the month

Elcometer 101 Magnetic Coating Thickness Gauge

There are still some applications that old technology handles better than modern equipment. Such is the case with the "Elcometer", the company's first gauge.

Coatings on hot surfaces, such a metal dies for casting aluminium components, are too hot for the plastic surround of a modern gauge but do not affect the metal contacts of the Elcometer 101. And metal layers on top of carbon steel up to 9mm thick are measurable without the problem of signal absorption the electronic ones have.

Even slightly magnetic coatings containing nickel, cobalt or delta-ferrite hardly affect the reading of the 2-pole system of the Elcometer 101. The magnetic flux prefers to go through the substrate, not the coating.

So this old model still proves to be a useful gauge today.

For further information on the Elcometer 101 or any of the coating thickness gauges available from Elcometer, visit www.elcometer.com or contact your local distributor.

The digital Elcometer 456 (left) developed from the original "Elcometer" (now 101), which had no electrical parts.

Checking when wet

The application of a coating to a surface such as concrete is not simply a matter of putting some material on it to change the colour or to obliterate the surface. It is supposed to provide protection, which it can only do when it is the right thickness. But how do you know how thick it is on a surface as rough as concrete? Well, you measure it. But first, let us think about what to measure.

Which thickness?

The minimum protection is where the coating is thinnest, over a lump of aggregate or a peak of concrete. The coating will be thickest over a depression or hole but this does not provide any extra protection. And counting the number of litres covering an area gives only a vague idea of average thickness, it does not allow for absorption, evaporation or roughness. Minimum thickness is the most useful parameter simply because this is where the coating will wear down first.

How to measure it?

The most practical measurement of how much coating is applied is done at the coating stage. If the operator finds it is too much, or too little, the application or spreading rate can be adjusted to stay on target. The applied thickness is checked with a Wet Film Comb (Elcometer 112, 115, 3238 etc.) by pushing it into the coating. It is a metal strip with 'fingers' of different lengths relative to the two end ones. In use, the comb will only sink as far as the tops of the concrete 'peaks'. Some of the 'fingers' will dip into the wet coating, others will not. The thickness is calculated from the marks as the average of the highest wet value and the lowest dry value.

How much coating?

Rough concrete, where there is a big difference in depth from peaks to valleys, will require more coating than smooth. However, the important thing is the minimum cover, not the spreading rate (litres/m^2).

We can calculate how thick the wet coating should be applied for it to dry or cure to the correct dry film thickness. These two parameters are related by the Volume-Solids figure for the coating, which is stated on the manufacturer's data sheet.

$$\text{Wet Film Thickness} = \frac{\text{Dry Film Thickness}}{\text{Volume Solids \%}}$$

For example, 3mm / 75% = 4mm of wet coating required.

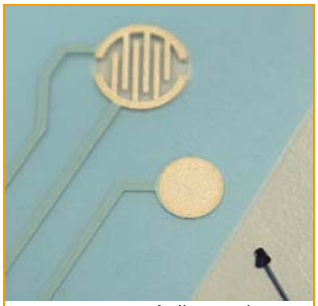
Some coatings shrink much more than this so some allowance must be made for the coating that gets sucked from the peaks into the valleys as it dries.

Once the target wet film thickness has been agreed, a check during application will confirm it is correct or if the spreading rate needs to be changed.

The performance of a coating on concrete can only be assured if the applied thickness is right. By monitoring the wet thickness with a comb gauge, we can be sure the dry coating will do its job for a long time.

Problem solved

The problem was to measure the thickness of a small area of thin silver on plastic. A micrometer had limited reach without cutting the sheet and the materials were too thin for ultrasonics. Elcometer's technical support staff offered a solution.



A 5mm spot of silver paint on plastic

The silver was part of the contacts under a keyboard. It was in the form of paint (>60% by weight) screen-printed onto plastic sheets. Silver is a very good conductor of electricity but is better than copper for switch contacts. Unfortunately, it costs about 70 times as much as copper, so you don't want to be using more than is necessary.

A way was found to measure it using an F-type probe without cutting or interfering with the silver. Placing the plastic sheet over a steel block or zero plate meant the total thickness could be measured and then the thickness of the plastic subtracted from it.

Because the diameter of the silver spot was small, only 5mm, a straight miniature probe (T456FM3---C) was much easier to place in this small area than the regular probe was. So, what appeared at first to be a difficult requirement became quite a simple task.

Elcometer have tried many techniques over the years and may be able to suggest something. So, if you cannot think of a way to measure a coating, contact us for advice. Don't forget to describe the job in detail because materials, thicknesses and sizes are important.

More carbon and less steel

Researchers at the Department of Energy's Oak Ridge National Laboratory, USA, working as part of a consortium with Ford, General Motors and DaimlerChrysler, are trying to figure out how to lower the cost of carbon fibre composites by half. That would then make it a viable substitute for metal in cars.

The big advantage of carbon fibre is that it is one-fifth the weight of steel and just as strong and stiff, which makes it ideal for structural or semi-structural components in automobiles.

Replacing half the ferrous metal in current automobiles could reduce a vehicle's weight by 60 percent and fuel consumption by 30 percent, according to some studies. The resulting gains in fuel efficiency would also reduce greenhouse gas and other emissions by 10 to 20 percent.

Preliminary results of computer crash simulations showed that cars made from carbon fibre would be just as safe as metal ones.

The non-metal substrate would still need to be painted to hide the variation in its dark colour.

http://www.ornl.gov/info/press_releases/

concrete inspection

Olympics 2012

The design of the main 80 000 capacity stadium for the 2012 London Olympic Games was unveiled November 2007.

The stadium will be built by a consortium led by contractor Sir Robert McAlpine and includes HOK Sport, Buro Happold, HED and Savills Hepher Dixon.

The Olympic Delivery Authority is the public body responsible for organising the 2012 games and is the client for the project. It is chaired by John Armitt, formerly of Costain, who said, "London's Olympic Stadium is designed to be different. 'Team Stadium' have done a fantastic job against a challenging brief - their innovative, ground-breaking design will ensure that the Olympic Stadium will not only be a fantastic arena for a summer of sport in 2012 but also ensure a sustainable legacy for the community who will live around it."

The central 'bowl' of the stadium will be sunk below ground level to bring spectators close to the action. A 28m span cable-supported roof will cover two thirds of the seated area, while a fabric curtain will wrap around the structure providing additional protection and shelter.

Proposed Olympic Stadium for London 2012

Elcometer expect there will be need for its range of gauges, both on and off site. To confirm the quality of the concrete structure, covermeters will be necessary with various probes. Metal fittings will be of galvanised steel and some will be painted. Even though this will be done off site, indoors, there are still many checks required to ensure conditions are appropriate to achieve a good quality coating.

A new 'old'

New forms of concrete might abate environmental pollution. This is quite a development for something the Romans invented more than 2,000 years ago and used to build architectural masterpieces such as the Pantheon.

Scientists at the Italcementi Group in Bergamo, Italy, developed a self-cleaning concrete that keeps buildings from turning black from pollutants in the atmosphere.

The research branch made the concrete by adding very fine particles of the white pigment titanium dioxide to the cement. When it absorbs ultraviolet light, it becomes highly reactive and can kill bacteria and fungi. It also breaks down pollutants such as nitric oxide, sulphur dioxide and many volatile organic compounds that contribute to the darkening of concrete.

This new self-cleaning concrete has already been used in several buildings, including a modern church in Rome called the *Dives in Misericordia*.

standards news

ASTM D7378-07

Standard Practice for Measurement of Thickness of Applied Coating Powders to Predict Cured Thickness

This practice describes the thickness measurement of dry coating powders applied to a variety of substrates. Use of some of these procedures may require repair of the coating powder. This practice is intended to supplement the manufacturers instructions for the operation of the gauges and is not intended to replace them. It includes definitions of key terms, reference documents, the significance and use of the practice, and the advantages and limitations of the instruments.

Automatic powder coating booth

Three procedures are provided for measuring dry coating powder thickness:

Procedure A Using rigid metal notched (comb-type) gages (Such as the Elcometer 155).

Procedure B Using magnetic or eddy current coating thickness gages (Such as the Elcometer 456FNF).

Procedure C Using non-contact ultrasonic powder thickness instruments (Such as the Elcometer 550).

Coating powders generally diminish in thickness during the curing process. These procedures therefore require a reduction factor be established to predict the film thickness of powder coatings after curing.

Procedures A and B measure the thickness of the applied coating powders in the pre-cured, pre-gelled state. By comparing results to the measured cured powder thickness in the same location, a reduction factor can be determined and applied to future thickness measurements of the same coating powder.

Manually applied powder coating

Procedure C results in a predicted thickness value based on a calibration for typical coating powders. If the powder in question is not typical then a calibration adjustment can be made to align gauge readings with the actual cured values, determined by other measurement methods.

applications: paint on plastic

In this series of articles, we look at specific applications, answer some of the most commonly asked questions and provide practical advice. This month, we look at painted plastic.

Plastic handle looks like metal

Its light weight and low cost are the main reasons for using plastic for all kinds of applications. Freedom of design and shape come as a bonus. In the past, an object that was made as a metal casting or bent from a sheet is today moulded from plastic. One factor that has not changed is the need to paint or coat the item so that it looks better or to give it increased protection. This is where Elcometer comes in.

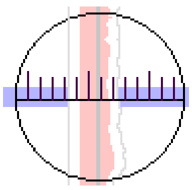
Quality control

Tests to confirm that paint or varnish on a plastic item is correct include the following: Adhesion, thickness, hardness, gloss and colour. Tests for durability are done mainly at the design stage.

The **Adhesion** or grip between the paint and the plastic substrate is commonly tested using an adhesive tape applied to an area especially cut into small squares. Really, this is a test of how bad the adhesion is. The test is described in Standards AS 1580.408.4 (60µm max, 11 cuts 1mm apart then cuts at 90 degrees), ASTM D 3359-B (50µm max, 6 or 11 cuts 1mm apart then cuts at 90 degrees) and ISO 2409 (60µm max, 6 cuts at 1mm apart then cuts at 90 degrees). The result can give some idea about the initial cleanliness (or not) of the plastic substrate and its ability to retain a coating.

Other types of controlled 'physical abuse', such as **Abrasion, Scratching and Scrubbing,** can be simulated in laboratory tests. Although these are mainly done at the design stage, sometimes samples are taken from the production line to see if the coating is still capable of resisting these tests.

The **thickness** of organic coatings on plastic can often be determined using specialist (and expensive) ultrasonic systems. But it is much easier (and costs less) to measure the same coating when applied to metal. So, by fixing metal pieces to a plastic component and passing it through the coating cycle, it becomes quite simple to monitor the paint line. In fact, the same sample can be reused many times simply by applying some new metal test pieces to it.



PIG test viewed through the microscope

Destructive tests of coating thickness on plastic tend to be unpopular and are not very repeatable, but results on harder substrates can be quite good. The Elcometer 141 Paint Inspection Gauge (PIG) and the Elcometer 195 Säberg Drill can be used for this, provided the substrate is a different colour to the coating.

A liquid coating will need to cure or dry before it is hard enough to handle but by how much? A simple test for **hardness** is to push a pencil held at 45 degrees to the sample. A hard pencil will slide along a hard surface but will cut into a softer one. Having found the hardest grade of pencil that makes no damage, recently coated items can be tested with it. If damage results, the coating is not strong enough yet and needs more time or heat to cure.

The **appearance** of the final assembly is very important for the purchaser. It is also important for parts that were made at different times in different places or conditions and brought together into one assembly. Any variation in **gloss** will appear as a change in colour, even when the coating is 'the same', so measuring gloss before this stage will avoid rejections. The Elcometer 400 Novo-Curve Glossmeter measures the specular gloss on curved and narrow shapes as well as on flat panels.

Novo-Curve (above) and a spectrophotometer

The variation in final **colour** of parts when different suppliers use 'similar' coatings or base materials, yet produce visually different results, can be worked around by sorting the components by shade before assembling those parts that are similar. An instrument such as the Elcometer 6075 Spectrophotometer can detect differences more consistently over a longer period than even a trained person can.

Other checks

Designing a product goes beyond its shape and function. The outside appearance and **durability** are also important and affect not only the product's sales-appeal but also its reputation during its service life. For example, domestic surfaces need to resist scratches and impact. They must also be kept clean but how much washing and wiping can they endure? Isolating a particular parameter and doing a specific test can find answers to these questions. An Abrasion and Washability Tester, such as the Elcometer 1720, can be set up in so many ways depending on the specific information being sought from the test.

Conclusion

Coatings applied to plastic parts can be controlled in similar ways as those on metal, using the same instruments with little change in the technique.

Should you require any further information on testing coated plastics or if there is a subject you would like to see mentioned in Elconews e-zine, e-mail us at: editor@elcometer.com

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