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Supporting the Australasian Corrosion Association

Paul Jenkins, Phillro Industries Australia, reports on the ongoing support for the ACA.

As part of Elcometer's ongoing support for NACE, a donation was made recently to the Australian Corrosion Association at its Headquarters in Melbourne.

The Australasian Corrosion Association (ACA) runs NACE Coatings Inspection Courses throughout their region under the Auspices of NACE in the U.S.A. NACE and the ACA recognize Elcometer's coatings inspection products as being the best available and so rate them as the ideal choice for students of the NACE Certificate Courses.

Under the guidance of Accredited Instructors, students are trained in the correct use of Elcometer gauges for coatings inspection, from start to finish.

Paul Jenkins from Phillro Industries made the presentation to Mal Brooks, Executive Officer of the ACA, at their Australian Headquarters in June this year. The gauges came just in time for the new round of courses beginning later that month. They were a welcome contribution as part of ongoing support for the well-respected NACE courses.

The ACA run NACE courses in Australia's Northern Territory, Queensland, New South Wales, Victoria, Western Australia and South Australia. They also run them in New Zealand, Kuala Lumpur and Bangkok. The Coatings Inspection Level 1 & 2, Protective Coatings Quality Control and Basic Corrosion courses are conducted every month in at least one of these locations.

As part of the support, Phillro Industries will inspect the Elcometer gauges on an annual basis to ensure that they are maintained in top working order for continuing use in the NACE Courses.

For more information about Elcometer's instruments, visit www.elcometer.com

product of the month

Elcometer 456³ Coating Thickness Gauge with *Bluetooth*® wireless technology

Building on the strengths of the previous gauge, the Elcometer 456 now features RS232 data output on all models. Standard and Top models now come with *Bluetooth*® wireless technology at no extra cost.

The new Elcometer 456 gauges also have a large backlit screen with large font display for clear viewing of readings in any environment. Memory versions are capable of storing up to 40,000 readings in up to 999 batches.

The intuitive menu system in 26 languages makes this a truly international gauge and the most advanced yet easiest to use hand held coating thickness gauge available on the market today.

The new Elcometer 456 Coating Thickness Gauge is available in any combination of basic, standard and top functionality with integral (built-in) and an extensive range of separate plug in probes. The integral gauges feature a built in Bigfoot™ probe allowing for consistent and repeatable results. Separate probe versions have an extensive range of plug in probes for measurements of a diverse range of coating thicknesses and metal substrates.

Bluetooth® wireless transmission allows instant data transfer to a PC, PDA or mobile phone. ElcoMaster™ and ElcoMaster™ Mobile Data Management System makes creating reports, analyzing and storing data quick and simple and is provided free of charge. It also allows instant reporting, so there is no need to return to the office to create a report – results can be e-mailed from a mobile phone or PDA as soon as the readings have been taken. Photographs of the site can also be taken and e-mailed along with the report.

For further information on the Elcometer 456 or any of the coating thickness gauges available from Elcometer, visit www.elcometer.com or contact your local distributor.

coatings on site

High voltage porosity testing

One of the causes of protective coating failures such as corrosion, rusting and pitting is due to flaws in the coating. Typical flaws include pinholes, holidays, inclusions, air bubbles, cracks and thin spots.

Failures cost both time and money to repair. All of these problems are easily detectable either during the coatings procedure or as part of the maintenance programme by using the Elcometer 266 DC Holiday Detector.

The high voltage test method detects flaws in a non-conductive coating applied on to conductive substrates. The voltage is set so that, if the coating is electrically weak in an area, there is sufficient voltage to breakdown the gap between the high voltage probe and the conductive substrate.

As soon as this breakdown occurs and current starts to flow from the high voltage probe then the test on that specific area of the coating is over and a flaw has been detected. As the high voltage probe is moved over a good area of the coating the high voltage is re-established and the testing process recommences.

The Elcometer 266 has been specifically designed to revolutionise high voltage DC testing of coatings, making it safer, easier and more reliable than previously possible.

When the Elcometer 266 detects a flaw and sparks, the current flow reduces to a low level to minimise risk to both the user and the coating.

The integrated automatic voltage calculator allows the user to simply enter the coating thickness value and select the standard and the gauge will automatically set the correct voltage. The gauge also features an internal jeep tester, removing the need for two gauges. The closed loop system with internal voltmeter guarantees the voltage output at all times.

Second hand grip

The optional second hand grip is designed for two handed use without compromising safety and is ideal for testing pipes and tank floors.

Other features include safety handle ribbing, waterproof to IP65, accurate sensitivity adjustment and interchangeable handles.

For more information on the Elcometer 266, all the features, accessories and latest ordering information, visit www.elcometer.com or contact your local Elcometer distributor.

coatings in the lab

Self cleaning bathrooms

Scientists in Australia are using nanotechnology to develop an environmentally friendly coating that can clean and disinfect itself. This means that every part of the coating will stay clean and there will be less use of cleaning chemicals or disinfectants.

Such self-cleaning materials have previously been limited to outdoor use because they require ultraviolet light to activate the molecules in the surface.

The new coatings contain tiny particles of titanium dioxide, which activate when they absorb ultraviolet light from the sun. Presently, they are being modified to respond to longer wavelengths so they can be activated indoors, such as by the lamp in a bathroom.

The light gives the particles an oxidising ability, which is stronger than chlorine bleach. This enables the coating to break down organic compounds and to kill bacteria. Laboratory experiments proved that the coating can even kill *E. Coli (Escherichia coli)*.

E. Coli bacteria

The new material also makes a surface resistant to wetting so liquid dirt is simply not welcome to stick to it.

The modified titanium dioxide is an additive to the coating, which must still be applied correctly. Therefore, the thickness will be measured for quality purposes. The additive should not affect an Elcometer 456 Coating Thickness Gauge reading so the gauge can be used normally. It will measure coatings on metal such as steel and aluminium, subject to the normal rules of calibration. For those coating applied to non-metal substrates, alternative techniques are used, including metal test pieces and cutting into the coating.

For more information on the Elcometer 456 Coating Thickness Gauge or any other products available, visit www.elcometer.com or contact your local Elcometer distributor.

concrete inspection

Concrete & climate change

The topic that everyone is talking about, whether they agree with it or not, is climate change.

Construction companies are under constant pressure to reduce their carbon footprint and to be as environmentally friendly as possible.

Concrete used in construction offers a number of environmental benefits in terms of climate change, because of the ingredients used in its manufacture.

The raw materials required for producing concrete are among the most abundant minerals on Earth. Many areas of the world are self-sufficient in these materials, so many of them can be obtained locally. This reduces both the environmental and economic costs of concrete production.

Concrete can utilise by-products of other industrial processes, such as fly ash, pulverised fuel ash and ground blast furnace slag. Used aggregates, concrete waste and old concrete can be crushed and recycled to manufacture new concrete.

Using recycled materials can however present problems in terms of salt contamination. Too much salt in concrete structures can cause premature corrosion of the steel reinforcing bars, which in turn causes the concrete structure to fail. In buildings and bridges, this can cost lives. Therefore before the concrete is manufactured the salt content of the constituent materials should be tested.

The Elcometer 134 CSN Test Kit is ideal for trouble free testing of chlorides, sulphates and nitrates.

All components of the kit are pre-measured and pre-dosed for accurate testing. All results are recorded in parts per million (ppm) removing the need for complicated calculations. A colorimeter for sulphate testing is provided in the kit and all consumables can be replenished. For more information on the range of salt detection equipment from Elcometer, visit www.elcometer.com or contact your local distributor.

Elcometer 331 chargers

The following accessories are now available for the Elcometer 331 Concrete Covermeters:

TW33119304	Battery Charger
TW33119305	Mains Lead, UK
TW33119306	Mains Lead, EU
TW33119307	Mains Lead, US
TW33119304A	Battery Charger & Mains Lead, UK
TW33119304B	Battery Charger & Mains Lead, EU
TW33119304C	Battery Charger & Mains Lead, US

standards news

ISO 16276:2007

Corrosion protection of steel structures by protective paint systems. Assessment of and acceptance criteria for the adhesion/cohesion (fracture strength) of a coating. Part 1: Pull-off testing. Part 2: Cross-cut testing and X-cut testing.

The objective of this standard is to achieve uniformity of practice in the assessment of protective coatings and to establish acceptance criteria. It differs from ISO 4618, ISO 2409 and ASTM D3359, which are adhesion test methods for general purposes. The new phrase 'fracture strength' is introduced as including both adhesion and cohesion described in laboratory test method ISO 4618.

PART 1

Different types of adhesion tester can be used for this test. One particular model is usually stated in a job specification because the results obtained from different types of equipment are not always the same. The test procedure to follow is that given by the manufacturer in their instruction book.

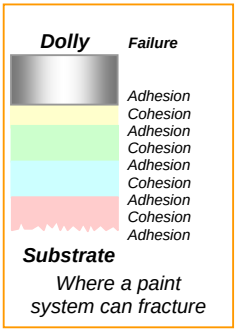
The additional requirements of this standard are a sampling plan, interpretation of the results and how a pass or fail is determined.

Adhesion Sampling Plan

Sampling area	*Measurements*
≤1000m²	**3 per 250m² area**
>1000m²	**12 plus 1 per additional 1000m² area.**

Interpretation

Where within the coating the fracture occurred suggests what may be wrong. The cohesive strength of a particular layer may be weaker than it should be or the adhesion between two layers could be bad. This fracture point must be noted in the report.



Where a paint system can fracture

This is ISO 16276-2 Level 4. Most of the area of the X-cut under the tape has been removed.

PART 2

Section 6.4 is the Cross-cut test for coatings up to 250 microns thick, using the method and rating in ISO 2409 (2 or 3mm lattice).

Section 6.5 is the X-cut test. Two cuts are made with a sharp knife, 40mm long at 30 to 45 degrees. Then a piece of adhesive tape 75mm long is applied and pulled off soon after. The result is reported.

Sampling Plan

Sampling area	*Measurements*
≤1000m²	**1 per 200m² area**
>1000m²	**5 plus 1 per additional 1000m² area**

Vitreous enamel

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 are looking at vitreous or porcelain enamel.

Enamel is part of everyday life and found all around us. It covers many kitchen surfaces including cookers, saucepans and washing machine drums. You will find enamel covering cast iron or steel baths, clock faces and signs. Enamel is also used famously in highly decorated Fabergé eggs.

Public signs that last for decades

WHAT IT IS

Enamel is called either vitreous or porcelain enamel. It is made in a furnace when tiny coloured glass particles are melted on to red-hot metal at 800° Celsius. As it cools, it fuses to give glass-coated metal. It's not new; it started in Cyprus 3500 years ago.

Porcelain enamel contributes to the strength of the metal substrate. It provides better wear and abrasion resistance than metal so is used on bunkers, silos and chutes. Its smooth surface is easy to clean so it is ideal for sinks, lavatories, bathtubs, washing machines and cooker tops. Enamelled steel sheets are also used for chalkboards.

Silo made from vitreous enamelled steel sheets.
(Image courtesy of Silo System)

The enamel's chemical bond combines with a mechanical bond when it melts over the rough surface of the substrate. Since moisture or rust cannot penetrate beneath the enamel, it will not flake away from exposed edges or from damaged areas. This strong adhesion provides lasting protection to the metal underneath.

QUALITY CONTROL

Enamel on domestic cookers and ovens

The **thickness** of vitreous enamel on a steel substrate is measured using an F-type probe but first, the gauge should be calibrated to a similar uncoated item.

As cooker rings and boiler heat exchangers are often a multi-curved surface, calibrate on a curve that is similar to the one to be measured on for accurate results.

Pinholes can form when the enamel is still hot and gas bubbles burst through the surface. Even when the enamel is cold, there may be bubbles below the surface with a fragile shell that can easily break, exposing the substrate at the bottom of the bubble. Such pinholes are not critical on whiteboards in a school but certainly are important in a silo on a farm, holding aggressive slurry.

The tests for pinholes are described in ISO 8289. For the Type A test, a low-voltage tester with a wet sponge is used, such as the Elcometer 270 switched to 9 volts. One terminal of the tester is connected to the substrate, the other to the sponge, which is then moved over the surface of the sample. When some water enters a pinhole, it completes a circuit and triggers an alarm.

Low-voltage pinhole tester Elcometer 270

To test the thicker enamel found in chemical reactors, a high voltage probe is necessary, according to ISO 2746. The Elcometer 236 or 266 can be used for this test. With the return lead connected between the instrument and the vessel, the brush probe is moved along the surface of the enamel. A spark will jump where the enamel does not provide sufficient insulation to prevent it, triggering the alarm. This test also finds cracks and weak spots in eroded enamel, especially inside reactors that have been used with strong acids and chemicals.

High-voltage tester, Elcometer 266

OTHER CHECKS

Because vitreous enamel remains quite shiny, **specular gloss** is rarely measured. And because the range of **colours** of enamel is much less than that of paint, there is no need to measure its colour precisely. To avoid variations, a batch of panels for one job will be fired together and so will be a reasonable match anyway.

Sometimes resistance to impact and scratching are measured but this is done in a particular way, different to that used for testing paint.

CONCLUSION

Vitreous or porcelain enamel is a strong coating on metal that gives long service in many harsh environments – providing it is of the correct quality for the application.

Should you require any further information on vitreous enamelling or if there is a subject you would like to see covered, e-mail us at: editor@elcometer.com

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