elconews e-zine
international
June 2005

The future looks good for paint applicators

John Fletcher, Technical Support Manager, Manchester, notes a strengthening trend towards qualifications.

Providing a means of obtaining a formal qualification is recognised as a good way to ensure a flow of people into the anti-corrosion industry. Without some new people, there will be a vacuum when the experts retire.

A number of organisations around the world now provide vocational training for those who are interested in becoming more skilled. For example, someone could become a Paint Applicator and later add more skills to become a Paint Inspector.

NORSOK, NACE and ICOR have developed a range of training to help not only Paint Inspectors reach a high standard, but also others involved in applying anti-corrosive coating systems to steel structures.

NEW UK SCHEME STARTED

The ICATS scheme for training and certifying industrial coating applicators completed its first 'train the trainers' course recently.

Those who completed this course are now training staff in a number of companies. They use computer-based training material, which contains relevant products from the Elcometer range.

Those who complete the training then register with the Institute of Corrosion. This proves their competence to high profile specifiers such as the Highways Agency, Network Rail, London Underground, several local authorities and some private developers.

LOCAL SUPPORT AVAILABLE

Elcometer has seen a link between having a gauge in front of the students and the sales orders that follow some time later. It recognises that students do need tools to learn with. The equipment for these courses is often provided from the demonstration stock of a local distributor. Educator and student benefit from having real instruments to work with; the supplier has advertising.

Sometimes, practical information about the use of the gauges is needed. This can be provided in the form of say an hour's presentation and demonstration in front of the students. Salespeople rarely get such a chance with a buyer!

JUST ASK

If you are a trainer and have not contacted a local Elcometer distributor, please don't hesitate, just ask. And if the training course is to be held in a number of locations, then contact one of the Elcometer regional offices to coordinate the effort.

Welcome to our new publication

A word from the editor, John Podvoiskis, Technical Support Engineer, Manchester.

This new news publication from Elcometer combines two earlier ones. It is intended for all our customers, internal and external.

There was "Elconews", which ran from August 1995 until March 2005. It was an internal newsletter for our offices and distributors around the world and was sent monthly. It covered news and technical information as well as commercial details.

We also had an electronic publication; "E-zine", which was emailed to a list of interested readers who gave us their email address. Its content was more technical than commercial and it has been published about 5 times a year since July 2001.

Now, these two types of content have been merged into one new publication. With it, we hope to not only satisfy all our current readers but to reach some new ones.

"The new format should suit more of our customers most of the time," said Michael Sellars, Director of Elcometer. "Readers should find something of interest in each issue and may even learn something new about the broad range of test and inspection equipment in the Elcometer catalogue."

So we hope you do enjoy reading our new Elcometer E-zine.

As before, we invite you to suggest a new topic or give us your comments. We also welcome contributions of your own material (but not direct marketing). If you send us a short article with a picture, we would be pleased to consider including it in a future edition of elconews e-zine.

Please email to editor@elcometer.com.

Good reading!

product of the month

The Elcometer 138 Bresle kit and patches test how much salt is on a surface before applying a coating.

This method measures the conductivity of the solution when a sample of salt is washed off with pure water.

The kit contains patches, pure water, syringes, a small beaker and a conductivity meter. Everything is held in a plastic briefcase for convenience.

coatings on site

Force and stress - so often misunderstood

Force is a pull or a push in one direction, acting on a point, such as someone pulling on a rope tied to something heavy. The unit of measure is the 'newton'. One newton is approximately the force of gravity acting on one apple.

Stress is a force applied to an area, such as the pull-stub or dolly of an adhesion tester. It is measured in 'newtons per square millimetre', also called 'Megapascals' (MPa). The property of a coating or material under stress is sometimes called its Tensile Adhesion Strength.

Pressure is similar to stress because the force acts on the same area but in the opposite direction. Shoes are subject to pressure due to the person wearing them being pulled by gravity and pressed into them.

EXAMPLE

The Elcometer 1910 PAT Adhesion Tester provides a force of 6.3kN acting on an element (dolly) with a diameter of 20mm.

The resulting stress (tensile adhesion) is force/area = $6300/(\pi \cdot 10 \cdot 10) = 20.05 N/mm^2 = 20.05 MPa$.

Pipeline joints

New pipelines between Baku, Tblisi and Ceyhan link the Caspian oil fields to the Mediterranean Sea. The steel pipes are covered in polyethylene (PE) and the joints with epoxy.

Because of the huge variation in weather conditions along the route of this line and the difficult access for maintenance, the corrosion resistance of the coating had to be high. This is where our gauges came in.

To confirm the PE had no holes, high voltage holiday detectors such as the Elcometer 236 were used. The same test was applied to the epoxy coating on the welded joints.

Adhesion of the epoxy to the PE was checked with an X cut. The narrow wedge in the middle of it was then lifted up with a knife to see how far back it peeled - the less, the better. This destructive test was done selectively.

The thickness of the coating was confirmed by measuring adjacent to the weld zone but not on the weld itself, which has different magnetic properties that affect the readings.

This pipeline is expected to be pumping crude oil in 2006. Tankers will collect it from the terminal in Ceyhan, Turkey and transport it to refineries around the world.

EXHIBITIONS

SED 2005 National Event for Construction, Milton Keynes, UK
Journées NDT de la COFREND, France
ELMIA YTFORUM, Sweden
Austrotec, Austria
Technology 2005, Israel

coatings in the lab

110V Salt spray

If your electricity supply is 110 volts, you can now buy our salt spray cabinet.

The Elcometer 1120 Salt Spray Tester performs many of the standard or industrial tests that determine how resistant coatings are to corrosion. It provides a mist of brine in controlled conditions of humidity and temperature. These conditions promote rapid rusting of steel exposed by a cut through the coating.

This equipment was originally designed for a 220V supply (now classed as 230V). Following a big demand from the American market, a 110V version of the system has been introduced. Other countries around the world that have 110V electricity supply can now take advantage of this.

Orders for the 110V version of the Elcometer 1120 Salt Spray Tester are being accepted now.

Rust-less and cheaper

This article is based on a news release issued by American Chemical Society

A plastic coating that virtually eliminates rust and corrosion — which could help cars, bridges, pipelines and other metal structures last up to 10 times longer — was described at the 220th national meeting of the American Chemical Society, the world's largest scientific society.

The coating, polyaniline, can be applied to nearly any metal, said Bernhard Wessling Ph.D. of Ormecon Chemie GmbH, Germany. It is already being used for projects in several Asian and European countries.

Conventional coatings act as temporary barriers to environmental assaults. By contrast, polyaniline reacts with metals to create what Wessling describes as an "organic metal [that could] last forever."

Rust and corrosion occur when a metal [such as steel] donates some of its electrons to oxygen, weakening the structure. Painting the metal or plating it with zinc can delay this. Zinc, which is a good electron donor, reacts with oxygen, leaving the metal underneath unaffected. But there is a limit to how long paint and zinc coatings can last.

Polyaniline works differently. Being a catalyst, it mediates the reaction that leads to rust. The polymer accepts electrons from the metal and, in turn, donates them to oxygen. This two-step reaction forms a layer of pure iron oxide that halts further corrosion.

Under controlled laboratory conditions, polyaniline prevented rust 10,000 times more effectively than zinc, reported Wessling. In field tests, it was three to 10 times more effective. Still, says Wessling, that's enough to outlast the usefulness of most products.

The polymer coating compares favourably to zinc in another way, according to Wessling; it is cheaper.

concrete inspection

Covermeters do work

Covermeters have been proved capable of measuring the thickness of concrete over reinforcment bars, according to recent tests performed by RILEM in Europe.

Results of a comparative test under 10 different test conditions show 5 competing instruments successfully measured the 'covercrete' within an accuracy of 10%.

"These results are an encouraging starting point [for] establishing specifications", said Roberto Torrent, Chairman of the Technical Committee TC 189-NEC, writing in RILEM Magazine.

These results were when the thickness was less than 40mm and the size of the bars was known. When there was less information provided and the concrete was thicker, the covermeters were generally less successful at maintaining this accuracy.

Although the results varied between instruments, one of them was rated as 'completely successful'. To find out which one, you must wait for the full report, which is to be published by RILEM later in 2005.

Reinforcement missing?

If you test a large concrete floor with a covermeter and do not get a reading, what does it mean? It is possible there is no metal there.

Don't worry, steel rebars are here to stay, but it is important to be aware of what is happening in the research laboratories.

Present experiments are mixing plastic fibres into the concrete to make it more elastic. Sometimes rods of fibre-reinforced plastic (FRP) are also used.

Many problems during the life of concrete are due to cracks that form when the concrete is still young. Their frequency and size has been found to reduce when lots of polypropylene fibre is mixed in before casting. The normally brittle concrete then sets stronger, is more durable and not subject to corrosion.

Stainless steel rebars

To avoid problems due to the corrosion of carbon steel rods in reinforced concrete, different stainless steels are used instead.

Austenitic stainless steel type 304 or 316 is nearly non-magnetic but it can still be detected by a covermeter using the pulse-induction technique. The readings indicate the rebars are deeper than they are by some 10mm (medium and large diameters).

Duplex stainless type 2205 is magnetic so it is detected. So is carbon steel clad with austenitic stainless steel.

Stainless steel rebars have been used in marine environments where chloride-attack is the big problem. They are also specified for bridges and structures required to last in excess of 25 years.

standards news

Dry films on rough surfaces

A number of new standards seem to be appearing. Closer investigation shows that some of these are simply previously accepted methods being given a new number.

One recent example is a standard for measuring paint on steel structures. EN ISO 2808:2001 Method 10, which is the same as BS3900-C5:1997 Method 10 from 4 years earlier. The title of these is as long as a paragraph so we will omit it here.

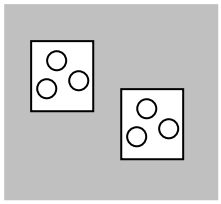
These two methods are identical. The first pages of the documents vary because of the standards organisations responsible for them.

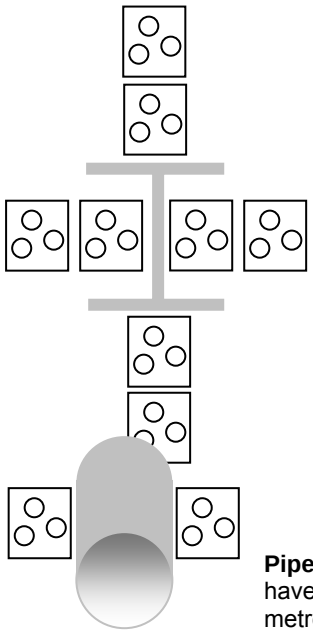
COLLECTING READINGS

One part of this standard describes how to collect readings. Because of variations due to the rough surface of the (usually) steel substrate, an average must be calculated but in a certain way.

It begins with the concept of a Reference Area in which 3 readings are taken close to each other. The method explains how many of these reference areas there must be in a unit surface of the item.

Panels have two Reference Areas per square metre (see diagram on the right).





Beams (left) have two Reference Areas per metre length, both on the web (middle part) and on the flanges (top and bottom part).

This item has eight surfaces.

The inside corners and edges are usually stripe-coated before the main coat is applied so the readings will be thicker here.

Pipes and cylinders (left) have 2 Reference Areas per metre length (one per side).

Larger pipes must have more readings.

REPORT

For each item or for each general area the Mean (average, $\bar{x}$) and Standard Deviation (σ) of the group of readings is recorded. These are then compared with the job specification.

In the next issue, we will look at collecting readings for EN ISO 19840.

We welcome your comments and questions.
editor@elcometer.com

Adhesion testers

In this issue, we look at the various systems that test the adhesion of coatings.

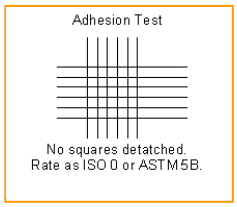
Tests for how well a coating is attached to a surface are divided into 2 general groups; to find how bad or how good the adhesion is.

HOW BAD?

A coating applied to sheet metal should stay on the substrate. What causes it to fall off is usually inadequate cleaning or pre-treatment of the metal.

So that sheet metal can move in a press or bending machine, it is coated with a lubricant (soap). This must be cleaned off before a coating is applied but if some of it stays on, the paint will cover the item but may not attach to its surface. Slight bending or a mar (blunt scratch) could lead to the film detaching.

A test for how bad the adhesion is cuts the coating up into small squares. None of them must fall off; they should stay stuck even if pulled with adhesive tape. This is the Cross Hatch Test, performed using the Elcometer 107 or Elcometer 1542.



A simpler version used for pipes and thick coatings is the X-cut (Saint Andrew's Cross) test, done with the Elcometer 1541. Two cuts are made about 30° apart and the coating is unpicked from their intersection.

Powder coatings form a strong continuous layer but like the skin on a Clementine or Mandarin orange, they may not be attached to what is below them. Impact (Elcometer 1615) and bending (Elcometer 1506, 1510) tests determine how well a coating can follow a substrate that is stretched or distorted. But these tests are along the plane of the coating; they do not test adhesion, which is perpendicular to the substrate. Do not confuse these two tests.

HOW GOOD?

To measure how strongly a coating is held, it is pulled perpendicular to the substrate. This stresses the coating until something breaks.

The breakpoint is the weakest link and may be anywhere between the substrate and the face of the dolly or pull-stub used to pull it. The test determines if there is an adhesion failure or cohesive failure. And if the break is above the surface of the coating, the adhesion of the coating is much stronger than the test equipment or the test method.

PULLING FORCE

Standard methods require the stress to be increased slowly and smoothly. Doing so avoids increasing the force in a pulse, which magnifies its effect.

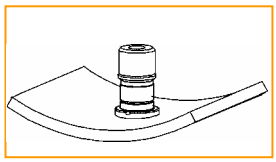
The Elcometer 110 and Elcometer 1920 adhesion testers provide a controlled increase in tension up to the breakpoint. These test parameters make the results more repeatable.

Other instruments, such as the Elcometer 106, require the operator to provide the necessary smooth increase by hand. This is not always easy especially when the force is quite high. However, for some coatings it does not make any significant difference to the results if the test is fast or slow.

SHAPE OF SURFACE

Not all test surfaces have large flat areas. Adhesion can be measured in quite a small space by using the Elcometer 108 and the Elcometer 1930.

To test on curved items, the dolly's axis should be at 90 degrees to the surface and the pull should be along this axis. This is possible with the Elcometer 108 and its range of curved dollies (right).



The Elcometer 1940 is also suitable because its pulling device (left) adjusts itself to stand perpendicular to the axis of the dolly (test element) before the stressing begins. Its dollies have only a flat base so those with a smaller diameter should be chosen for curved areas.

THE RIGHT ONE

Different adhesion testers can sometimes give various results on one sample; each has their own 'mode of failure'. It is best to select the same model of instrument as used in previous tests rather than compare readings from different ones. Otherwise, take this simple advice:

1. Follow the given test method and specification.
2. Consider the size and shape of the item and the stress that will be required.
3. Choose the appropriate adhesion tester.
4. Report what you tested with and how.

NEXT TIME we look at how the various adhesion tests are performed.

Elcometer's adhesion gauges are used as part of NASA's test procedures. There will be more about this and other applications in a later issue.