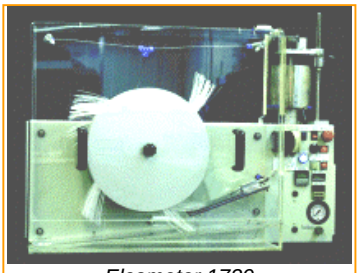
elconews e-zine
belgium
June 2005

Fiat evaluate Car-wash

Maurizio Corbella of Warwick Massa in Italy, reports on a major car manufacturer interested in purchasing laboratory test equipment.

Not only paint manufacturers but also suppliers of parts to the automotive business are affected when a motor manufacturer introduces a new specification such as a car-wash test.



Elcometer 1730 Car Wash Simulator

Fiat in Italy have been evaluating the Elcometer 1730 Car Wash Simulator and are satisfied with the results. Not only will they buy one, they will establish a new specification for the performance required for car parts used in their production assembly lines.

This is not just paint. It includes lights, bumpers (fenders) and trim. A new specification means suppliers will have to make certain tests and possibly buy a Car Wash Simulator for Quality Assurance.

The Simulator uses bristles similar to those in the big brushes in automatic car-washers. They are rotated and repeatedly move over a sample, which has water mixed with a detergent flowing on its surface. After a certain time, the change in Reflectance Haze value of the test surface is determined.

Two representatives of major paint manufacturers witnessed the trials by Fiat. One of them remarked: “It’s easier to use and to clean than our old one. And you can calibrate this version to a blank sample for repeatable testing.”

A capital purchase such as this is not decided in a hurry, especially when the local economy is uncertain. However, the technical trials must still be completed in advance of any purchasing decision.

The progress to a new specification is not delayed either so suppliers should take notice. At least, they should look at the features of the Elcometer 1730 Car Wash Simulator.

New stopwatch

The stopwatch Elcometer supplied to determine the viscosity of paint and other liquids is being replaced by another model (see picture).

The function of the new stopwatch remains the same; simply to measure how long a continuous stream of liquid flows from a viscosity cup.

The sales part number of the Elcometer 7300 Digital Stopwatch is still the same (K0007300M201).

The new stopwatch will be shipped as soon as the final stock of the previous version has been despatched.

Pretty colours and pigments

Paint, plastic, inks and dyes certainly contain pigments. They are used in the cosmetics industry, too.

When you think about it, colour mixing and matching is a part of the manufacture of lipstick, face powder and aftershave. Suppliers of these cosmetics, who need to make repeat orders, must maintain a product that looks consistent.

The traditional method of colour matching was to apply the product to skin and make a judgement. Unfortunately, perception is not constant, neither is natural skin.

This is where a spectrophotometer proves necessary. An Elcometer 6075/2 SP62 will measure and compare the sample’s colour to an agreed standard, which is stored in its memory, reporting a pass or fail.

In fact, the methods already used to measure the colour of paint and inks apply in the same way to cosmetics.

More gloss for less

Everybody likes a bargain so here is one for those looking to buy a glossmeter.

You can now buy a two-angle unit (20 and 60 degrees) for almost the old price of the single (60 degree) unit.

Reductions in the cost of the Elcometer 406 Mini Glossmeter have translated into a lower selling price.

product of the month

The Elcometer 3092 Sclerometer has been restyled yet its function remains the same. Use it to check the hardness of coatings, films and ‘soft’ surfaces.

Like a ballpoint pen, it is pressed against the sample and moved by hand over its surface.

The force on the tip is determined by a spring, which is adjustable. The test is repeated with more force until the surface is marked or destroyed. This setting can be used to compare the hardness of other samples.

There are three sizes of spherical tip and one 90deg diamond tip. The force is provided by 4 different springs. These items can be used in any combination.

The Elcometer 3092 Sclerometer hardness tester fits easily into the inspector’s pocket or briefcase.

coatings on site

Coatings on cast iron

Rodney Sandiford, Painting Consultant, advised how to measure coatings on pillars at London's St. Pancras Station.

The specification called for an Aluminium-loaded epoxy primer to be applied at 75 microns minimum onto Ultra High Pressure (UHP) water-jetted cast iron pillars. Then several millimetres of intumescent material were to go on top.

The first problem Rodney noted was the specification; it made the classic mistake of stating a 'minimum'. This means that if one reading is below this thickness, the whole job would be rejected. The 'modern' interpretation of this figure, he suggested, should be the '80% of Nominal thickness' as according to EN ISO 19840. This puts the target thickness, the Nominal, at 94 microns.

After some tests, Rodney discovered that if he calibrated his Elcometer 345 on a flat smooth steel plate, the correction factor required was 110 microns (according to method EN ISO 19840 Annex D). The uncorrected readings ranged from 300-350 microns. It is interesting that the correction value is greater than the specification of the paint.

This correction is due to the magnetic properties of the cast iron and to the original surface of the pillars. Water jetting removed the old coatings without changing the roughness of the original surface profile.

There are 20 such columns, each is 450mm diameter and they reach the roof.

HISTORY

The train shed at St. Pancras was built about 1865 and was an engineering wonder - the largest enclosed space that had been erected in the world: height of the arch above rail level is 105 feet (32m), length 690 feet (210m), and the single span width is 240 feet (73m). The structure used 9000 tons of iron (not steel).

Hard coatings

One of the traditional hard finishes is chrome plating. Because of health and safety problems associated with the process and its toxic waste, modern coatings are being used instead, especially for hardwearing surfaces.

In consumer industries, chrome is the thin shiny decorative trim on cars, steel furniture and motorcycle exhausts. Hard chrome plating is much thicker and is used on hydraulic rams for diggers and such.

The chrome plating process is popular because it is simple, versatile, and was relatively inexpensive. Now, because of new restrictions, its cost is rising and alternatives, such as some thermal spray coatings, are dropping in price, making them an attractive choice.

Measuring the thickness of thick hard chrome on steel is simple using an F probe. But the thin chrome is always on electroplated nickel, which has magnetic properties, making it un-measurable with an F probe.

Thermal spray coatings on steel are generally measured with an F probe. Sometimes, those coatings with cobalt or nickel retain the magnetic properties of these two metals and so readings with an F probe can be misleading. Always test a known sample to be sure.

coatings in the lab

Scrub resistance

How well a coating stays on the substrate is generally classed as its 'adhesion'. This is not quite the same as its resistance to being damaged by scrubbing or rubbing along the plane of its surface.

Think of it as this. There is a bond between the coating and the substrate, which may be quite strong. There are also bonds within the coating that provide cohesion between its constituents. If the cohesion is weak, a coating could be gradually rubbed away until it finally leaves the substrate.

An Elcometer 1720 Abrasion, Scrubbing and Washability Tester determines how well a coating resists being rubbed or scrubbed. This equipment can work wet or dry with a variety of attachments under a range of loads and at different speeds. Most of these variants are standard test methods.

EXAMPLE

The top picture (right) shows a coated sheet being tested with a 'Crockmeter'. A dry felt pad with a 400g weight is rubbing the sample for 500 cycles at 37 cycles per minute.

An Elcometer 401 Glossmeter with 60-degree optics (picture bottom, right) measures the change in gloss. In this case it decreased from 90 to 40 Gloss Units; a very clear result.

Measuring gloss after a Crockmeter test

Other samples can be tested under the same conditions and the results compared to determine if they are more durable or less than the original.

Improved Linear Abraser

A new Linear Abraser replaces the Elcometer 5700.

The new Elcometer 5750 Taber Linear Abraser can test virtually any size or shape of specimen.

Initially developed to evaluate Wear Resistance, this instrument can also be used for Scratch Resistance, colour transfer (commonly referred to as crocking or a Crockmeter test) and to perform Coin Scrape tests.

Different attachments with sharp or blunt points, with fine or coarse abrasives provide a range of tests. There is even a way of rubbing samples with a material of your choice to simulate what happens in real life, under controlled conditions.

The Elcometer 5750 Linear Abraser can be used for testing both wet and dry samples; it is a direct replacement for the Elcometer 5700.

elcometer e-zine is distributed by email.
Join the mailing list on our website or send an email to:
ezinelist@elcometer.com Subject: Subscribe

Mortar joint reinforcement

Metal wall ties hold a brick or block cladding close to the structure but there may be some more metalwork inside the wall itself. Or rather, there may be a problem if it is not there. A simple non-destructive test with an Elcometer P130 Wall Tie Locator will verify its presence.

A wall made of concrete blocks can shrink and crack especially around an opening for a window or door. If a cement-sand render is applied to decorate the surface, it will crack too. One way to avoid this problem is to include 'Mortar Bedding Reinforcement (MBR)' within the wall as it is being built.

MBR is stainless steel wire in a zig-zag form placed in the mortar between two courses of blocks or bricks. It adds lateral strength and minimises cracking above and below openings for windows and doors.

One customer, who applies render to walls, checks every wall for the presence of the MBR and only proceeds if it is in the wall. Experience has taught him that any cracking that develops is not due to his render being applied badly but to the cracks that form within the wall when it settles.

He uses an Elcometer P130 Wall Tie Locator, which responds to the metal MBR with a clear signal. So if there is no signal, no render is applied.

The cost of the equipment, he says, is less than that of repairing cracked render.

Concrete durability

One Construction association is organising a workshop.

There is a need in the construction industry to move beyond prescriptive specifications for the durability of concrete toward performance-based indicators. A workshop organised by RILEM will be examining some of the proposed methods of evaluation.

It is to be held in Spain at the Institute for Construction Science "Eduardo Torroja" in Madrid. It will take place on the 19-22 March 2006 and aims to bring together leading researchers in the field to promote dialogue. Most sessions will be of a workshop format with presentations and discussions.

There are two sessions related to the work of RILEM (see below) Committees: 'Non destructive evaluation of the covercrete' and 'Use of additives in concrete'. Progress in both areas should help the development of predictive models for the performance of structures, some of which can have lifetimes beyond 100 years.

WHAT IS RILEM?

RILEM is the French acronym for 'Réunion Internationale des Laboratoires et Experts des Matériaux, Systèmes de Constructions et Ouvrages'. It is a non profit-making, non-governmental technical association.

It aims to advance scientific knowledge related to construction materials, systems and structures and to encourage transfer and application of this knowledge worldwide. Elcometer are members of RILEM.

EN ISO 19840

"Paints and varnishes – Corrosion protection of steel structures by protective paint systems – Measurement of, and acceptance criteria for, the thickness of dry films on rough surfaces".

Here we look at the way readings should be collected and analysed. This standard method also has special calibration techniques, which we will ignore this time.

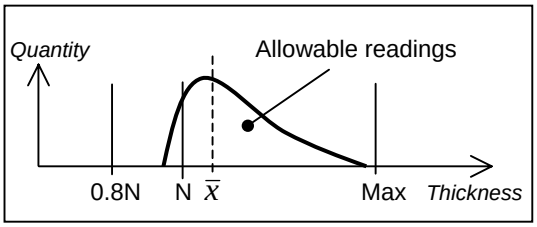
Readings of the thickness of the paint film should be taken according to a sampling plan. The number of readings depends on the size of the inspection area and they are taken at random points (see table).

SAMPLING PLAN

INSPECTION AREA	MINIMUM NUMBER OF MEASUREMENTS
Less than 1m²	5
1 - 3m²	10
3 - 10m²	15
10 - 30m²	20
30 - 100m²	30
Above 100 m²	Add 10 per 100m²

The readings should be analysed according to the graph below.

- Most of the readings should be above the Nominal Dry Film Thickness (N) so the average ($\bar{x}$) will be equal to or greater than N.
- No more than 20% of the readings in an area can be thinner than the Nominal (N) but not thinner than 80% of nominal (0.8N).
- All readings should be less than the maximum thickness (Max).



The thickness of the coating is acceptable when readings are within the curved part of the graph.

There is a provision for repeating a few readings; consult the Standard for details.

ALTERNATIVE PLAN

Annex B of EN ISO 19840 is a variation of the above procedure, subject to agreement by interested parties.

Say 5 thickness readings are taken in a 30mm circle and the average is calculated. The location of these little groups is according to the Sampling Plan above.

The thickness of the coating is classed as acceptable when the averages are analysed and they fit within the graph above.

In the next issue, we will look at how readings are collected for SSPC PA2.

Make a suggestion: editor@elcometer.com

product group focus: adhesion

In this issue, we look at how the test works and some of the parameters that can be measured.

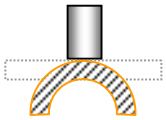
THE TEST

A Tensile Adhesion Tester will determine the bond of a coating on a substrate, or cohesion of the coating or cohesion of the substrate.

Paint on Medium Density Fibreboard (MDF)

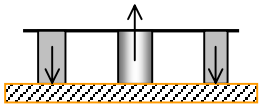
MATERIALS

Coating must be on a firm substrate, such as on metal, on concrete or on stiff wood products. Flexible or soft substrates will distort when under load and this may interfere with the bond, reducing the area of test. The substrate is then effectively peeled from under the dolly.



FOOTPRINT

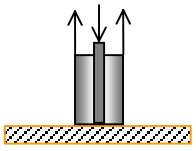
The tester needs to be supported by the sample to deliver the reactive force (Newton's 3rd Law of Motion). This means the choice of tester is limited by the size of the sample it can stand upon.



MODE

Elcometer models 106 109 110 1910 1920 1930 1940 1941 pull on the test stub (dolly) and deliver the reaction outside, away from it (*diagram above*).

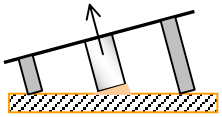
The Elcometer 108 pulls the dolly and delivers the reaction through a hole along its axis (*diag. right*).



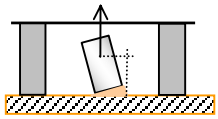
PULLING

Force is applied in 3 ways. A wheel or wrench turned by hand, by gas pressure or by hydraulic pressure by hand or pump. Some testers ensure the increase of force is at a slow uniform rate. Operators sometimes increase it in quick steps.

An important aspect of pulling is to provide a direct axial force. There must be no attempt to twist the dolly off the surface, nor to lever it off. The straighter the pull, the closer the test is to the 'tensile' required rather than to the easier 'peel'.



The Elcometer 1910 (etc.) PAT 'legs' adjust to be square to the dolly before doing any work. Other testers stay perpendicular to the surface so some leverage is possible.



But even when the incline is less than 5 degrees (<1% reduction in force), some tests show a break that is off-centre, as if a crack moved along the diameter of the dolly.


Testing close to the edge of a warped panel

The Elcometer 108 HATE avoids this problem (*see picture on left*) by concentrating the force and reaction within the area of the dolly.

DOES IT MATTER?

But do deviations from the ideal tensile test actually make a difference? The experts have not decided, having found different ways the dolly separates from the surface, the so-called 'mode of failure'. So it is important to record what equipment a test was done with and how.

There is much agreement that comparing the results from other adhesion test methods is unhelpful.

In practice, it means the test should be specified and the specification followed. At least, the equipment used for the test should be reported.

THE RESULTS

It is not enough to record the maximum stress (tensile adhesion). Standard methods require some analysis of the material remaining on the dolly.

There could be a break between layers of a coating system. One layer may be split, indicating the cohesion is less than the adhesion.

The system may break from the substrate. The cause of this may be inadequate preparation or even dust.

It is quite possible for the glue to break between the dolly and the surface of the coating; this does not constitute an adhesion value.

WHICH GLUE?

The adhesive used for the test can be that already supplied with the tester or chosen for a specific reason.

Some of them can react chemically with the coating and distort the result. Others may change the test conditions. For example on metal-spray, a low viscosity cyanoacrylate can seep into the pores and increase the result. The same can happen when an epoxy is heated in an oven to cure faster.

The cure characteristics of some adhesives preclude testing in particular environments, because of adverse temperature and humidity.

Not all adhesives are strong enough. The bond between a coating and a substrate can sometimes be stronger than any currently available glue products.

So consider the test conditions, nature of the coating, the expected adhesion value and even do a trial.

CUTTING

There are two interpretations of pull-off adhesion.

The standard ASTM D4541 requires an 'in situ' test. It accepts that the coating is held to the substrate. It also recognises that the coating adjacent to that under the dolly has some lateral bonding and will hold on to its neighbour when pulled. This ASTM standard method does not allow the coating to be separated by cutting around the dolly.

The ISO 4624 and BS EN 24624 standards require a tensile test over the area of the dolly. This means the surface must be separated from that adjacent, so a circular cutter is used around the dolly before testing. However, care is necessary to avoid introducing a crack that will run under the dolly when it is stressed.

Next time, we look at applications of the adhesion test.

Published for the benefit of our customers by Elcometer. Editor: John Podvoiskis, editor@elcometer.com • tel. +44 161 371 6000 • fax: +44 161 371 6010. We welcome your contributions.