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Going to Wembley

Simon Claydon, Qualtiy Manager for Enob Fire, tells us about Elcometer's role in their latest projects.

Wembley National Stadium, England is now nearing completion and will be one of the most spectacular football stadiums in the World. Enob Fire have been responsible for the 190,000m² of intumescent coatings used in the construction process.

Enob Fire have been established since 1990 and are industry leaders in intumescent coatings. Committed to research in advanced fire engineering, Enob Fire are able to offer a complete fire protection package including on and off site application of intumescent coatings, fire boarding ad all fire stopping requirements.

Operating a 100% quality control regime in accordance with the Steel Construction Industry standard SCI P160, the thickness of the coating must be precise in order to meet specification and provide the level of fire protection required.

Mr Claydon, Quality Manager for Enob Fire, tells us, 'When working with intumescent coatings, it's vital that the correct specifications are always met. We use several different Elcometer gauges to help us achieve this because of their accuracy, reliability and memory capacity. Keeping stringent records is important, so being able to easily download the data from the gauges to the PC is a big advantage for us as we can then access the data at a later date if required. In our latest projects we have been using the Elcometer 355 to check the coating thickness off-site during manufacture and the Elcometer 456 coating thickness gauges on-site to ensure our coatings are up to standard.'

K2 Building, London

Wembley National Stadium and the K2 building in London are just two of the prestigious sites that have utilised Enob Fire's services. Their reputation for quality and accuracy, with help from the range of Elcometer Coating Thickness Gauges, makes Enob Fire the industry leader they are today.

Elcometer balances up

The weighing range of the Elcometer 8700 balances has been increased to the following levels:

Elcometer 8720/1: 0 – 1010g (formally 0 – 810g)

Elcometer 8720/2: 0 – 10200g (formally 0 – 8100g)

The Elcometer 8720 balances are a low cost range offering extensive weighing functions. Each balance is supplied with a protective working cover and adjusting weight as well as 20 user programmable metric and imperial weighing units.

Underwater winner

Ship maintenance is a costly business. The cost of putting a ship into dry dock for repair and recoating in terms of both time and money are huge, so it is imperative that the ships not only are coated to the correct specification when in dry dock, but to clearly establish when they need to come in for maintenance.

Elcometer 211 Mechanical Coating Thickness Gauge.

Regular checks of the thickness of the hull coating are carried out to monitor the rate of corrosion while the vessel is still in service. This establishes the optimum time to remove the ship from service and carry out necessary works.

Measuring underwater requires the use a mechanical gauge. The extremely harsh, corrosive marine environment corrodes many of the gauges in a matter of hours, while the Elcometer 211 Coating Thickness Gauges lasts for days at a time. The gauge can also be used to measure the protective coatings of the inside of hulls carrying flammable cargo such as oil and gas.

The Elcometer 211 is commonly referred to as the "Banana Gauge". The "v" groove base and rubber feet make it easy to ensure the gauge is placed squarely on the surface being measured, making it easy to use in difficult underwater conditions. The clear, easy read scale with a wide reading range of up to 6mm / 250 mils, make this one of the most popular mechanical gauges in the world.

The Elcometer 211 is small, portable and has an accuracy of ±5%. The gauge is factory calibrated while also having the facility to be adjusted by the user. Able to be used in accordance with many standards, including ASTM, ISO and SSPC, the Elcometer 211 has proven to be the instrument of choice with many ship fleet operators. For more information on the Elcometer range of mechanical and digital coating thickness gauges, please visit our website www.elcometer.com

product of the month

Elcometer 5135 & 5155 Rotary Platform Abrasers

The Elcometer 5135 & 5155 Taber® Rotary Platform Abrasers are the latest versions of the industry standard in assessing the wear and durability of ceramics, plastics, textiles, metals, leather, rubber & painted, laquered and electroplated surfaces. Replacing the Elcometer 5130 & 5150, the new range offers advanced and improved features while still being easy to use & operator friendly.

For further information on the Elcometer 5135 & 5155 Rotary Platform Abrasers, or any of our other abrasion products, please visit our website www.elcometer.com or contact your local Elcometer distributor.

On reflection

Tanks that store petroleum oil above ground must meet many safety standards and regulations due to the highly explosive nature of their contents. European Directives stipulate that tanks must be protected from radiant heat as well as corrosion and they must continuously reflect more than 70% of incident heat.

Owners and operators of storage facilities require measuring equipment that can clearly display compliance. Unfortunately the only precise, direct measuring system for reflected heat is owned by NASA and is used for their space shuttles. A more practical solution for this application is the use of a reflectometer.

Reflectance is essentially the lightness of component of colour. It represents shades of grey from black to white. It is quite easy to measure reflectance with a simple, hand-held instrument.

The Elcometer 6013 Novo-Shade Reflectometer is the perfect choice for testing this coating. It is used to monitor the uniformity of the coating and highlight any deterioration. By measuring the reflectance on a regular basis, any deterioration in the coating can be detected early and rectified before an explosion occurs.

New lease of life

When new power transmission towers are galvanised, there is a life expectancy of 25 – 30 years. The life of these towers can be extended by another 15 years by the application of a new coating.

To apply the new coating, the surface is wire brushed to remove any loose materials, rust and other corrosion products and is then completely repainted. In several years, the towers will be coated again to extend the service life further. The life of the towers is directly related to the coating thickness. If the coating is applied too thinly, the towers will corrode more quickly.
While the maintenance team is working on one side of the tower, the power continues to flow on the other side. The cost of switching the power off (outage) is very high, so it is imperative that there are no early failures in the newly applied coating. The Elcometer range of destructive Paint Inspection Gauges (P.I.Gs), such as the Elcometer 121, are popular for this application because this quick, versatile method of paint inspection is accurate, portable and very easy to use. The built-in illuminated microscope and choice of cutters are ideal for use in the field to ensure the coating thickness has been applied to the required specification for maximum durability.

Why measure stress?

Alain Stévaert of Elcometer SPRL, discusses of the importance of stress measurement in coatings.

All organic coatings (paints, inks or glues) applied to a substrate are nearly always under stress as a result of film formation and variations in temperature and/or in relative humidity.

Above a certain value, which is determined by coating and substrate properties, the stress can affect the adhesion and cohesion of the coating, leading to irreversible damage. Internal stress can develop in an organic coating both during and after the film formation. During the drying process, solvent evaporation, chemical reaction or a combination of these factors causes the coating to contract. Since contraction is restrained by coating solidification and by film adhesion to the substrate, stresses develop in the film. Also, during the service life of a coating, significant hygrothermal stresses can also develop as a result of variation in relative humidity and temperature.

It is now proven that the presence of high stress in an organic coating may affect the durability and lead to detachment and cracking.

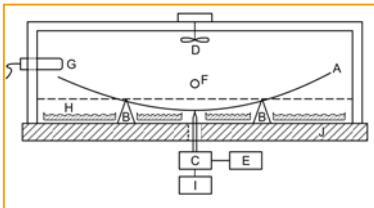
The coating formulation affects the magnitude of the stress and therefore it's durability. This makes it is necessary to have a valid and reliable technique which will enable determination of the stresses involved in different environments.

ELCOMETER 8300 CORI STRESSMETER

The Elcometer 8300 CoRI Stressmeter enables the determination of a number of coating mechanisms and properties including:

- Film formation (coalescence, solvent evaporation and cross-linking).
- CPVC (Critical Pigment Volume Concentration) and Tg (glass transition temperature.
- Internal and hygroscopic stresses.
- Influence of additives on coating properties (rheological, coalescing agents).
- Raw materials (binder, pigments, solvents) characteristics & their influence on the stress development.
- Influence of natural or accelerated weathering on coating durability.

The Elcometer 8300 is based on measuring the bending of a calibrated plate coated with the product being tested. Under pre-determined conditions, the deflection is measured by a micrometric sensor. The diagram shows a cross section of the Elcometer 8300 which has a programmable measuring period from 1 second to 99 hours and the ability to test under various temperature and humidity conditions.



A : Metallic substrate
B : Support with electrical connectors
C : Deflection measuring sensor
D : Fan
E : Connection to controller
F : Humidity measuring probe
G : Temperature measuring probe
H : Bath for humidity
I : Motor of deflection senor
J : Chamber base

concrete inspection

Testing coatings on concrete

In this 2 part series, we will look at testing concrete in the field.

Equipment for surveying concrete structures either immediately after construction or during the life of the structure, needs to be simple, portable and provide unambiguous results. On-site testing of concrete coatings has never been easier with the complete range of equipment available from Elcometer.

PREPARE THE SURFACE

Successful surface preparation for coating needs to consider the surface hardness, surface cleanliness and surface profile. The Elcometer 182 Digital Test Hammer is widely used to assess surface hardness. The spring loaded plunger strikes the surface at fixed and constant impact energy and the rebound value indicates if the concrete is at the desired hardness.

Elcometer 134CSN Test Kit

As concrete is porous, the presence of soluble salts on or in the surface can lead to a premature breakdown of both the concrete and the coating. Testing for chloride salts has always been necessary, but it is now possible to also test for nitrates and sulphates at the same time using the Elcometer 134CSN Test Kit. This test kit, complete in a portable, case contains titration tubes for chlorides, test strips for nitrates and colorimeter for sulphates. Calibration is directly in parts per million (ppm) so there is no need for reading conversion.

Surface profile affects the adhesion of the coating. The rougher the surface, the more paint is used to cover to the required thickness, resulting in better adhesion. Profile can be assessed using the same peak-to-valley height measurement used for blast-cleaned steel using an Elcometer 223 Digital Surface Profile Gauge.

MONITOR THE CLIMATE

All painting processes require temperature to be monitored for satisfactory curing. When the surface is within 3°C/5°F of the dewpoint temperature, moisture will be condensing on the surface and the conditions are not suitable for painting. The Elcometer 319 Dewpoint Meter incorporates all the needs for climatic condition monitoring in a single unit.

MOISTURE IN CONCRETE

Elcometer 7410

The moisture content of a concrete surface is critical for the performance of the coating, particularly when coating a recently poured surface. Excessive moisture in the structure causes failures due to condensation, blistering, delamination and movement leading to general deterioration and peeling. Non-invasive moisture meters calibrated specifically for use on concrete such as the Elcometer 7410 can be used to assess the surface prior to coating application.

Next month, we will discuss coating thickness and the use of covermeters, coating adhesion and coating porosity. Visit www.elcometer.com for further information on our product range.

standards news

WEEE regulations

From the end of May 2006, Elcometer Instruments Ltd will be a member of the GAMBICA B2B Compliance Scheme in accordance with the Waste Electronic and Electrical Equipment (WEEE) Regulations 2005.

Under this scheme B2B Compliance, operating as a Collective Compliance Scheme, will take responsibility for and support Elcometer in achieving compliance with the WEEE Directive.

This includes maintaining records of the member's and the scheme's recycled and/or recovered volumes of WEEE in a format approved by the Environment Agency for England and Wales. To this end Elcometer must provide weights and numbers of EEE (Electronic & Electrical Equipment) products placed on the market in the UK and EEE supplied to other member states where the customer is an end-user. (This does not include sales to distributors in the EU.)

Elcometer is encouraging all our Distributors in the EU to be registered as an importer or producer of EEE, as appropriate to local regulations for the Elcometer products that fall in to the category of electrical or electronic equipment.

It should be noted that many Elcometer products are mechanical and therefore do not come under the WEEE regulations such as Elcometer 106 Adhesion testers, Elcometer 211 Coating Thickness Gauges, Elcometer 123 Surface Profile Gauge and so on.

ASTM replacement standard

An ASTM ballot is in progress to withdraw two well known standards ASTM D 1186 and ASTM D 1400 and replace them with the new ASTM D 7091.

This change comes from the wish to replace *D1186: Test Method for Non-Destructive Measurement of Dry Film Thickness of Non-Magnetic Coatings Applied to a Ferrous Base*, and *D1400: Test Method for Non-Destructive Measurement of Dry Film Thickness of Non-Conductive Coatings Applied to a Non-Ferrous Metal Base* with a single standard.

The replacement standard will be titled *ASTM D 7091: Practice for Non-Destructive Measurement of Dry Film Thickness of Non-Magnetic Coatings Applied to Ferrous Metals and Non-Magnetic, Non-Conductive Coatings Applied to Non-Ferrous Metals*.

This Standard Practice will provide a new test method for measuring coating thickness that addresses both ferrous and non-ferrous substrates using magnetic gauges as well as ultrasonic gauges.

For more details about this standard, please visit www.astm.org.

Construction update

You can follow the progress of the new extension at Elcometer's production facility in Manchester, UK by visiting:
www.elcometer.com/uk_extension

Clean & rough surfaces

In this 3 part series, we will look at some methods to test how clean a surface is or how rough it is before a coating is applied. We will concentrate on structures and large items, such as ships and pipelines, because the specifications for coating these surfaces are very demanding. Light engineering and sheet metal work also have their own requirements.

Spraying paint on a steel bridge beam

High performance coatings are designed so their beneficial properties last for two decades. To achieve this performance, they must be used according to very specific requirements, part of which is the preparation of the surface before coating.

WHY CLEAN THE METAL SURFACE?

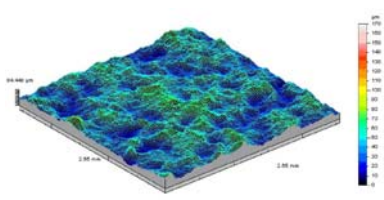
Many coatings must not be applied to a surface covered by dust, rust, salt, water, oil or some other contamination. A clean bare surface is required. Weakly adhering mill scale (black oxides etc. present on new steel) and any materials that can change over time must be removed too.

Methods of cleaning large or structural items include using an abrasive wheel, wire hand brush and blasting with water, grit, steel shot, ice, soda, nut shells, plastic, sponge or garnet. Smaller components are often washed in solvents but can also be shot blasted.

WHY ROUGHEN?

Roughening provides an 'anchor pattern' of peaks and valleys and magnifies the surface area, typically doubling it. As adhesion is measured as stress force per area, this means the bond between coating and substrate will be twice as strong as it would be on a similar smooth surface.

Roughening also provides friction and stops the coating from sliding (antigravity effect on a vertical surface). A coating on smooth glass can be removed quite easily with a scraper, but not so one on a surface like sandpaper. And because of the longer surface path over peaks and valleys, undermining of the coating is made more difficult. This helps prevent it being lifted off around some damage.



Map of shot blasting, thanks to Corus

CLEAN AND ROUGH

Often, the cleaning process is also the roughening process and the two are confused into one, though there is a clear difference. A surface can be both clean and rough at the same time, but being rough does not also mean it's clean and being clean does not mean it's rough.

Both parameters are important but they are independent. Each is checked in different ways, too, as we shall see later.

HOW FAR DO YOU GO?

If a coating of one or more thin layers is applied to a very rough surface, some of the coating will collect in the valleys leaving the peaks exposed or partly covered. In service, these peaks will corrode and the corrosion will continue under the coating, lifting it. So a thin coating needs a less rough (smoother) profile. And a thick coating is heavy and could slide if forced so it needs a grip such as that provided by a very rough profile. This means the roughness must be appropriate and checked before coating to confirm it is as specified.

The time taken to clean a surface is very important because it costs money. 'Perfectly clean' surfaces are not required very often and a reduction to a 'near white' quality can provide both adequate cleaning and roughness, satisfying the paint maker and the budget. These qualities of cleanliness are defined in Standards and the right level is written into the job specification.

CHEMICAL CONTAMINANTS

Even after the metal surface has been exposed by cleaning, it is possible some contaminants are still on it. The most significant of these is chloride, which can come from rock salt (used as road de-icer) and sea salt. Chloride is very reactive with metal and promotes corrosion. Sodium chloride (common salt) is hygroscopic, attracting moisture to form its own microclimate with 75% Relative Humidity. Under a coating, its solution can promote osmosis, drawing in more moisture through the coating to form a blister and to fuel the corrosion cell. Because we don't want chloride on our metal, we must be sure it has been removed.

This corrosion must be completely removed before repainting

Paint chemists have identified other salts that are unwelcome on steel. Industrial areas subject to acid rain often have sulphate on them. And those located near to agriculture can have nitrate from fertilizer. Both of these can be found by separate tests. Sometimes, the level of all three salts mixed with any others as one 'soup' is determined.

OTHER CONTAMINANTS

A general requirement before a coating is applied is that the surface must be free from any loose material such as dust. We take that to mean fine loose particles that have landed on the metal surface. Depending on the location, this could be sand from the dessert or dust from a dry road. It could be from the blast cleaning nearby, or general dust from within the building.

Some particles do not easily blow off, being weakly bonded to a surface. They could be micro drops of sprayed paint that dry before landing on an area that is not being painted. We use a simple test before painting these areas that records how few of such particles there are on the surface.

In the next issue of elconews e-zine we will look at the standards and the test equipment with which we control the quality of the surface before coating it.

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