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Autumn is upon us already and I hope you have all "summered well" and are now refreshed for the continuing battle against corrosion.

The last few weeks have been a very busy period for me including plenty of ICorr activity. For example, I have been able to attend two recent events related by the topic being discussed, pitting corrosion in stainless steel. The first of these was a North East Branch evening meeting held at Macaw Engineering in Newcastle where Jozef Solis presented his paper "Pitting Corrosion: Known Aspects and Remaining Challenges". The meeting was reasonably well attended, given that it took place in the holiday period, and the feedback that I got was that it was a good meeting and attendees are looking forward to future meetings in this area.

The EuroCorr 2015 Congress in Graz, Austria was held in the second week of September and the UK attendees was the fourth largest group by country of origin at this series of meeting. Regrettably I was unable to attend on this occasion but I can report that we were well represented by ICorr members.

One of the ICorr Training Scheme providers, ARL, have now moved in to their new multimillion-pound NDT and Inspection Training facility located in the Sheffield Business Park. I have been to see this new facility which is conveniently located near to the M1 motorway. The building was still being fitted out as a training and examination centre but I could easily see that ARL owners IMechE have made a significant investment in the future of training and ICorr Training Courses will be part of this future.

ICorr work with the Australian Corrosion Association continues to develop, albeit rather slowly. My plans to attend ACA’s 2015 Corrosion and Prevention Conference are well under way, this conference is being held in Adelaide in November and I have been invited to attend as President of the Institute of Corrosion. If there are any other ICorr members who are planning to attend, please let me know.

Closer to home the handover of the role of Managing Director of Correx from Bob Crundwell to Steve Barke was completed last month and I would like to take this opportunity on behalf of ICorr of thanking Bob for his work with Correx and of welcoming Steve to the job. The ICATS Scheme is progressing well and I know that further development of the scheme is required and that Steve is already making his mark.

For the immediate future there are some significant events which will take place in the next few weeks. These include the September meeting of Council, where amongst other items the planning for the AGM will be completed. The date booked for the AGM this year is Thursday 3rd December and the meeting will be held in conjunction with a Midlands Branch Half-Day Meeting in the Birmingham Council Chamber. Please note this date in your diaries.

We will also have a visit from the Science Council on the 3rd November to review our procedures for awarding Chartered Scientist status to ICorr members who make an application. I would encourage those of you with an interest in this scheme to visit the ICorr website and make your application.

As you can see, your Institute is very active and the above is just a snap shot of the activities that are in hand or are being planned. The Institute of Corrosion is a membership organisation and we need your involvement to develop the activities and to keep the organisation relevant to the members. Please get involved with your local branch or with any of the national events that are being organised for the corrosion community and if there is anything that you would like to see added to these plans please let me know and I will see what we can do.

John Fletcher  
President of the Institute of Corrosion
AN EVENING WITH BILL HEDGES

Bill has been in the corrosion industry for 28 years and is currently BP’s Upstream Engineering Technical Authority for corrosion. His career has been split equally between front line corrosion operations and central engineering teams. He has worked all over the world in environments ranging from offshore to desert, tropical to arctic, including assignments in Houston, Trinidad & Tobago and Alaska.

Bill has worked on a variety of challenging corrosion problems and is well known for bringing issues related to corrosion modelling and organic acid corrosion of mild steel back into focus for the research community in the O&G industry. He has authored 38 publications in electrochemistry and corrosion, three patents, and co-authored “The Use of Corrosion Inhibitors in O&G Production” 2004 by the European Federation of Corrosion (EFC). Bill holds a BSc in Chemistry and PhD in Electrochemistry from the University of Southampton, and completed a 1 year Postdoctoral Study at the University of Oxford. He is a member of ICorr (FiCorr), NACE(FNACE) and RSC(FRSC), CEng, CChem, CSci.

Corrosion management is a highly technical, multi-disciplinary subject which protects billions of dollars of equipment around the world. More importantly it prevents accidents which can have serious health, safety and environmental outcomes.

All corrosion engineers require a sound technical understanding of corrosion mechanisms and control methods. However, for a corrosion management program to be successful much more is needed.

Bill’s presentation will discuss the required 4P’s of a corrosion management system which relate to the People, Process, Plant and Performance of a successful corrosion program. This will include the basic requirements of a corrosion management program and will draw on examples from the oil and gas industry.

A NEW VENUE A NEW BEGINNING

After 26 years of holding it’s regular Winter/Spring programme of Technical Evening meetings at The Naval Club, Mayfair, increasing attendance figures mean that we have outgrown the facilities currently available. The London Branch Committee has decided that a change of venue is necessary.

Our first meeting of the new season will be held on the evening of Thursday 8th October 2015 at Imperial College, London, in South Kensington, SW7. It can be reached directly by an underground walkway from the nearby Tube Station.

Presentations will be made in the Skelton Building of the Civil Engineering Department, which offers excellent meeting facilities and state-of-the-art presentation equipment. Up to 100 members and guests can be accommodated in pleasant and comfortable surroundings.

Our tried and tested format of complimentary pre-presentation refreshments as well as post presentation drinks and sandwiches will be available in the Assembly Foyer adjacent to the Lecture Room. As usual, there will be no charge for these meetings. All ICorr Members, guests and visitors are most welcome.
LONDON BRANCH NEWS
A HIGHLY SUCCESSFUL INTERACTIVE SESSION

A two day workshop was held at the Royal Overseas League in London from the 10th and 11th of June 2015. With over 50 delegates attending each day the event was a great success with the delegates able to learn from world leaders in the field of Corrosion across a diverse range of industries. Although predominately oil and gas focused there were some excellent presentations on the civil and other energy industries.

The workshop, chaired by George Winning of Premier Oil and Vice Chair - Pat Stokes of Macaw Engineering, tried to answer the question of 'how do we share knowledge across industries and try and not to reinvent the wheel'. Sessions chaired by Andrew Duncan (Intertek), Don Harrop (CorroDon), Mike Surkein (ExxonMobil) and Alyn Jenkins (MI Swaco) presented diverse subjects such as aging asset management in oil and gas to inhibitor technology used in concrete. The discussions during the sessions were excellent with many of them running into the breaks for coffee and lunch.

With the focus on knowledge transfer the workshop welcomed around 15 students at various levels of their education who could share knowledge with the leading lights in corrosion asking questions and networking. One student, Tan Pathan from UCL gave an excellent presentation on fuel cells and how the materials of use can improve the efficiency of these devices. This demonstrated where the use of materials and coatings knowledge from other industries can be used to improve the knowledge in other sectors.

The skills gap was also raised and hopefully the event encouraged the students to continue their careers in engineering and in particular corrosion so we can have strong pool of resource for the future. Although not answering the question on how to improve knowledge transfer the attendees of the event did manage to share knowledge with a lot of people leaving the event with new ideas on how to make their jobs easier in the future.

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MIDLANDS BRANCH NEWS
EVENING MEETING, LEICESTER

On the 24th September 2015 the Midlands Branch held an evening meeting at the Hilton Hotel in Leicester kindly sponsored by Cathodic Protection Company Limited.


Many of the Midlands Branch members are involved in cathodic protection (CP) solutions for all types of infrastructure (concrete structures, buried pipelines, ports, offshore structures). Where impressed current CP solutions are used then at some point in their careers most practitioners will come across a system or power supply that has had a real or apparent lightning strike or electrical surge.

It was therefore with interest that members listened to an expert in lightning and surge protection, Robin Earl of Dehn. Robin described the basic principles of lightning protection, including the zoning of systems dependent on the proximity of equipment to external influences. As most CP facilities are installed outdoors then they are clearly at risk. Surges in the power supply system resulting in lightning discharge was another factor that was highlighted for consideration in the design of protection systems.

Robin Earl of Dehn presenting to CAir Midlands Members.
Robin also described that to properly protect around a CP system a protective ring of devices is needed, and that these should be selected to provide protection to incoming ac supplies, dc cabling to the structure and to the anodes and that this protection should include the test measurement cables connected to metallic structures. There was some discussion around this, as on reinforced concrete structures there can be multiple cables that are required to be protected, but often specifications don’t include provision for this.

An overview of different surge protection devices was presented, including the deficiencies with metal oxide varistors (MOV's), and how spark gap type devices operate in comparison.

Members agreed that it was good to get an expert presentation on this subject, which is often referred to in standards but is one that is not always understood.

Rob Holden of CPC Ltd then gave a presentation on another of those subjects that is often referred to in Specifications, but again often not fully understood in meaning, and that is CE Marking. Rob explained that different principles apply to the different parties in the supply chain (manufacturer, importer or distributor) but the CE mark ultimately signifies that the product conforms to all EU Directives or Regulations.

Rob went on to explain the experience of CPC Ltd in ensuring that their power supply and monitoring equipment could be CE marked, and that reliance on just using products that themselves are CE marked is not adequate. The four steps required were identified as; identifying the applicable directives and standards, designing and building products according to these, assessment of the product, before finally drawing up and keeping the declaration of conformity and associated technical documentation.

The product assessment was highlighted as a key step, Rob explained that in CPC’s case it had included EMC testing at a third party facility to demonstrate compliance to the various EMC regulations. Some discussion ensued as to the other products that could be used in CP systems that may, or should, require CE marking and again members agreed that the presentation was a very useful introduction into what goes behind a CE mark.

Branch chairman Ali Sharifi thanked both the speakers and also CPC Ltd. for their hospitality and support of Midlands Branch. The next Midlands Branch meeting will precede the ICorr AGM and be held at Birmingham Council Chambers on 3rd December 2015.
ABERDEEN BRANCH NEWS

PRESENTATION TO UNIVERSITIES – ABERDEEN

In September 2015, the Aberdeen branch took advantage of the induction week at the local Aberdeen Universities to give presentations to new and returning students. Presentations were given at the University of Aberdeen on Friday the 11th of September and at the Robert Gordon University on the 25th of September 2015 respectively.

The University Liaison officer introduced students at both Universities to the Institute of Corrosion covering its core objectives, the various regional branches, benefits of membership, how to apply for membership and a calendar of local Institute activities.

As part of the presentation, committee members Dr. Yunnan Gao and Dr. Abdulmotaleb Suleiman provided a brief introduction to corrosion, its control, various professional career options available to students in the field of corrosion, information on branch activities and how the Institute can assist students in continuous professional development.

Questions on membership, chartership and local events were asked after the presentation.

visit the Icorr website
www.icorr.org
MECHANISTIC STUDY OF COATING FAILURE USING LOCAL ELECTROCHEMICAL METHODS

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ABSTRACT

Although organic coatings play an important role in metallic corrosion protection, currently most of their applications are based mainly on empirical practice. The purpose of the current research is to identify the reasons behind organic coating degradation, and subsequent substrate corrosion in the absence of any physical coating defects. The studied system is a simplified epoxy-phenolic food can coating, deposited on common can substrates. Combining three powerful electrochemical techniques in the present work, has produced some insight to the changes taking place in the coating itself and also in the local environment before corrosion initiation. Electrochemical Impedance Spectroscopy (EIS) investigations have suggested that fundamental coating properties, such as coating capacitance can be used to monitor water absorption with time until failure. The coating thickness and the curing also appear to correlate well with these measurements. The coating barrier properties are strongly dependent on the coating curing, even though the derived absorbed water volumes are not significantly affected. Concurrent Local Electrochemical Impedance Spectroscopy (LEIS) measurements exhibited uniform impedance reduction with immersion, due to water absorption. The development of superficial coating swelling defects did not show substantial evidence of decreased coating performance, until a direct current connection was established with the metallic substrate. Last but not least, the Scanning Vibrating Electrode Technique (SVET) was employed, before and after corrosion initiation, to detect electrochemical activity in the electrolyte above the coating. Results under anodic polarisation, showed localised anodic currents around the corrosion site, while cathodic activity spreads on the remaining coating surface. From these results it is believed that the formation of corrosion products blocks and partially protects the corrosion site.

1. INTRODUCTION

Electrochemical Impedance Spectroscopy (EIS) is a powerful corrosion research tool, which allows the simulation and analysis of complex electrochemical systems, such as electrical circuits. EIS offers rapid, in-situ, and non-destructive testing even on highly resistive systems, like paints and membranes [1–3]. EIS is especially popular in the organic coating industry for corrosion evaluation. More specifically, for delamination effects detection, like blistering, and for assessing the coatings physical properties [4].

Early researchers have expressed the need to identify the mechanism through which coatings protect and degrade [5]. A seemingly simple coating, free of physical defects like pinholes, scratches, or cracks, can protect as a result of barrier effect [6] and adhesive action combination [7]. However, even today most coating research is based on empirical evidence, rather than theoretical mechanistic knowledge, using defective coatings for the purpose of simplifying the testing procedure [8,9].

Coating research published by Mayne et al. has proved the existence of a behavioural pattern between coating areas, depending on the chemical concentration of the electrolyte. Regions prone to failure were categorised as “D”. These areas showed coating resistance relative to the chloride content of the electrolyte; whereas, those regions which exhibited the opposite behaviour to the electrolyte resistance where labelled as “I” [10–12]. Further examination, suggested “D” areas are insufficiently cross-linked regions, as their micro-hardness degree was lower, compared to the “I” areas [12].

In this paper, the lacquer chosen for analysis was a simplified epoxy-phenolic, due to its clear and transparent composition. The substrate material was electrolytically coated steel sheet (ECCS). These coating systems, exhibit great adhesion, chemical and electrical resistivity, as they are formulated to internally protect cans in contact with aggressive conditions, by not allowing the corrosion species to reach the substrate, but also by preventing leaching of dissolved metallic traces back into the food [7,13–15]. Since, they do not contain any inhibiting additives to cause active protection; they are an excellent system for electrolyte diffusion studies.

Furthermore, humid condition tests, conducted by Morsch et al., have shown that these coatings can accommodate higher water volumes, when increasing their curing degree, by longer stoving times. The above effect has been attributed to the free volume increase between the polymer chains, as further curing introduces rigid gaps between the polymer network [16].

This article investigates, whether the same effects can be concluded for immersion studies, and if Mayne’s observations are still valid. Additionally, in order to improve understanding of these systems protection in a local scale, Localised Electrochemical Impedance Spectroscopy (LEIS) and the Scanning Vibrating Electrode Technique (SVET) were employed. Thus, corrosion initiation and the electrochemical phenomena taking place when a corrosion site has developed, can be monitored simultaneously [17,18].
The excitation amplitude used was 10mV vs OCP. The accuracy of the instrument has been described by Gamry [20] and the accepted measurements where within the instruments reliability range.

This epoxy-phenolic system exhibited three different coating behaviours, each simulated by a combination of different equivalent electrical circuits, as described on Figure 1. At the beginning of immersion the coatings exhibited instantly a highly capacitive behaviour similar to model A, described by a solution resistance (Rs) and a coating capacitance (Ccoat). However, as water gradually permeated through the coatings conductive pathways, such as less cross-linked regions [21], a resistive element manifested its appearance in the data (Model B), corresponding to the coating resistance (Rcoat). Additionally, the coating capacitance is now simulated more accurately using a constant phase element (CPE) instead of the pure capacitance [22]. When finally a connection between the substrate and the external electrolyte was established, fitting with the third model was more suitable, consisting of a second time constant to represent the substrate corrosion resistance (Rcorr) and the metallic double layer capacitance (CdL). Any samples exhibiting the third model behaviour from the beginning of immersion where discarded as failed, since a connection to the substrate was already present.

The coating capacitance was calculated, as follows:

\[ C_{coat} = \frac{\varepsilon_\varepsilon \cdot \varepsilon_\varepsilon \cdot A}{t} \]

where \( \varepsilon_\varepsilon \) is the dielectric constant of the coating, \( \varepsilon_\varepsilon \) the dielectric constant of void (8.85\times10^{-14} \text{ Farads/cm}),A the exposed area and \( t \) the coating thickness.

The coatings water content increase, \( C_{water} = 80.10 \), shifts the coating capacitance to higher values. Based on this observation, Brasher-Kingsbury equation can estimate the volume of absorbed electrolyte (\( \Phi_\varepsilon \)), by making a series of assumptions on the coating uniformity[23]:

\[ \Phi_\varepsilon = \frac{\log(C_t/C_o)}{\log C_{water}} \]  

### 2.3 Localised testing

LEIS measurements were conducted by combining a Solartron 1254 FRA and a PAR263A potentiostat with a Uniscan M370 Scanning Electrochemical Workstation. The applied AC voltage was introduced through the potentiostat and attenuated by the FRA. The amplitude of the measurements was 10mV at a stable 10kHz frequency, where the impedance signal represented mostly the coating behaviour and noise was minimized.

For the SVET testing, the same Uniscan Instrument was used on SVP370 mode. The probe was positioned 100 \( \mu \text{m} \) above the coating surface and its vibration amplitude was set as 30 \( \mu \text{m} \) with 80 Hz frequency, as resolution increases with smaller probe/surface distance, but also the signal is intensified with higher vibration amplitudes [24]. Finally, the samples in both techniques were fixed inside a glass cell that was filled with the electrolyte and sealed with a gasket.

### 3. RESULTS

#### 3.1 Coating Properties

##### 3.1.1 Coating thickness

Extended curing of the examined system, beyond 10 min, exhibited a slight swelling effect on the material thickness, as also seen by Morsch et al. This effect has been attributed to increased spacing between the polymer chains as the cross-linking degree increases[16]. The coating thickness, given in Figure 2, depended on the curing time and the deposition technique.

Two 30 min cured samples, produced by spin-coating at different speeds are presented below, as a comparison of the coating properties with thickness. EIS results showed, improved coating resistance and decreasing capacitance as the coating thickness (Figure 3.a). The water volume estimation is limited to 1 to 2% of the total coating volume, with thicker coatings absorbing slightly more. The time when a connection to the substrate was established is marked as a circular data point for each sample on Figure 3.a and 3.b. As expected, the thinner coating failed faster.

##### 3.1.2 Coating curing

Reconsidering Mayne’s findings on the relation between the curing degree and the coating performance[11], samples of different curing were examined with EIS. Increased curing appears to have a favourable effect on the coating properties (Figure 3.b). The 10 min cured sample failed faster than the 20 and 30 min samples, which remained at a highly resistive state (Model B). The absorbed water volume of the failed sample is rather unrealistic. However, the samples that retained their uniformity (20 and 30 min), even after prolonged immersion, exhibited only 2% water content by the end of the tests.

Increased cross-linking has improved coating resistance, as well the time required for coating failure, possibly as a result of larger “I” areas concentration across the coating surface, the higher the coating curing degree.

#### 3.2 LEIS

The same phenomena have also been demonstrated with Localised Impedance Spectroscopy on a 10 min cured sample. With immersion to the electrolyte, admittance plots appear to rise rapidly the first 6 hours of immersion due to water absorption (Figure 4), which is the same amount of time required for the coating capacitance to reach a stable state (Figure 3.b). When admittance is finally stabilised, the failing coating region...
is instantly evident, and remains active as deterioration proceeds. After 70h of immersion, the permittivity of the active region dissipates, and the admittance intensity is reassigned to neighbour sections of the coating (Figure 4).

Later sample examination, with Laser Scanning Confocal Microscopy (Figure 5), revealed the presence of overflowing, insoluble corrosion products on the defect site, which could be responsible for the corrosion site blocking taking place after 77h hour of immersion.

### 3.3 Scanning Vibrating Electrode Technique

The electrochemical mechanism through which coatings protect and fail is shown in the following SVET measurements, where a scratched coating sample is subjected to sequential anodic and cathodic polarisations. In Figure 6, the test results are shown, in European current convention, depicting as red the anodic sites and as blue the areas where the cathodic reaction is prevailing. The current values are relative to the overall map surface current rather than absolute positive/negative sites. In Figure 6.b, the metallic substrate is acting as a cathode to the system, and the whole extent of the defective region is clear and quantifiable. The coating itself appears slightly anodic relative to the substrate, due to its non-conductive nature.

When the polarisation direction is reversed (Figure 3.c), the defect does not exhibit a spread anodic action as when under cathodic polarisation. Instead, the scratched region is partly activated at the defect edges. The middle surface of the scratch, where corrosion should be dominating, because of the oxygen abundance has been effectively blocked by corrosion products, which hinder current exchange between the exposed metal and the environment.

### 4. DISCUSSION

The electrochemical evaluation conducted on this epoxy-phenolic system, has shown how the electrochemical properties of the coating material are directly linked to the coating cross-linking degree and the thickness of the examined film.

The immediate water absorption seen in all types of EIS samples, took place through the polymer network, which caused the saturation of all samples within 6h of immersion. However, corrosion did not seem to be depended on the level of saturation. Corrosion initiation was detected on different degree of water absorption on each sample. The amount of water level absorbed is appearing increased for thicker samples but not inducing faster sample degradation.
Coating resistance measurements, instead, give a more accurate prediction of the susceptibility of a coating to failure. Coating resistance is decreasing as water is being absorbed, and the system is moving from an infinite resistance state (capacitor) to a specific resistance state (depending on ion diffusion). The first stable resistance state is still orders of magnitudes higher than the final coating resistance, observed after the second time constant makes its appearance. Consequently, water permeation by itself is not sufficient to predict coating degradation. The coating capacitance and resistance are improving with longer curing, confirming Mayne’s work. Results suggest that corrosion is not only depended on water permeation but possibly on parameters, like the polymer-coating bonds breakage, triggered by the arrival of ions on the substrate or by substrate discontinuities, which are insufficiently adhering to the polymer. Further work on the effect of substrate heterogeneity and adhesion to the polymer is required to address questions like these.

5. CONCLUSIONS
This work has shown that:

- Areas of lower coating crosslinking in epoxy-phenolic coatings can act as corrosion initiation regions, or as described by Mayne et al., as “D” areas.

- EIS can evaluate the water volume absorbed with immersion, as long as the coating remains uniform and intact. However, the amount of contained water at the saturation state is not affected by the curing degree, in case of intact non-corroding coatings. Consequently, the presence of water in the coating is not destructive, unless ion permeation is also taking place.

- Capacitive coating behaviour, water absorption and coating failure can be monitored from the very early stages with LEIS, and the time needed to the saturated level is in good agreement with EIS tests.

- SVET technique measurements have proved that the coating is corroding locally, as soon as a direct contact to the substrate is available. However, the complexity of this system is increasing as corrosion products are build up.

6. ACKNOWLEDGEMENTS
Zoi Kefallinou would like to thank Dr Suzanne Morsch, Dr Stuart Smith and Dr Simon Gibbon, for the useful advice on the work conducted, and acknowledge AkzoNobel for the financial support and the permission to publish this paper.

7. REFERENCES

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A.C. Bacon Engineering Ltd of Hingham, Norfolk, who specialise in all types of steel structures and cladding, including agricultural buildings, now use Winn & Coales (Denso) Ltd’s Densostrip on grain stores with concrete crop-retaining walls.

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</tr>
<tr>
<td>Harrisons Engineering Lancashire Ltd</td>
<td>Judge Wilemy Mill, Longworth Road Billington, Clitheroe, Lancashire, BB7 9TP</td>
<td>T: 01254 823 993</td>
</tr>
<tr>
<td>HBS Protective Coatings Ltd</td>
<td>40 Mainbead Road, Belfast BT8 6SA</td>
<td>T: 028 907 08280</td>
</tr>
<tr>
<td>Hempel UK Ltd</td>
<td>Llanthanam Park, Cwmbran, Gwent, NP4 3XF</td>
<td>T: 01633 874 024</td>
</tr>
<tr>
<td>Harrington Industrial Services Ltd</td>
<td>Crown Works, Crown Road, Low Southwick, Sunderland SR5 2BS</td>
<td>T: 0191 516 0634</td>
</tr>
<tr>
<td>Hi-Tech Surface Treatment Ltd</td>
<td>Unit 8, Deacon Trading Estate, Chickenhall Lane, Eastleigh, Hants SO50 6RP</td>
<td>T: 023 806 11789</td>
</tr>
<tr>
<td>Hyspec Services Ltd</td>
<td>Unit 3 Meadowfield Industrial Estate, Cowdenbeath Industrial Estate, Burntisland, Fife, KY3 0LH</td>
<td>T: 01592 874 661</td>
</tr>
<tr>
<td>Industrial Coating Services</td>
<td>A1 House, Rolling Mill Street, Norton Canes, Cannock WS11 9UH</td>
<td>T: 0845 474 0007</td>
</tr>
<tr>
<td>International Energy Services Ltd</td>
<td>94 Awoollo, Ikoyi, Lagos State, Nigeria</td>
<td>T: 0146 516 536</td>
</tr>
<tr>
<td>Interserve Industrial</td>
<td>Unit 2, Olympic Park, Poole Hall Road Ellesmere Port, Cheshire, CH66 1ST</td>
<td>T: 0151 373 7660</td>
</tr>
<tr>
<td>Jack Tighe Coatings</td>
<td>Sandall Lane, Kirk Sandall, Doncaster, DN3 1QR</td>
<td>T: 01302 880 360</td>
</tr>
<tr>
<td>Jack Tighe Ltd</td>
<td>Redbourne Mere, Kirton Lindsey, Gainsborough, Lincs, DN21 4NW, UK</td>
<td>T: 01652 640 003</td>
</tr>
<tr>
<td>Company Name</td>
<td>Address</td>
<td>Phone Number</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>J Murphy &amp; Sons Ltd</td>
<td>Hiview House, Highgate Road, London NW5 1TN</td>
<td>T: 020 7267 4366</td>
</tr>
<tr>
<td>JWM Industrial Services Ltd</td>
<td>47 Barton Road, Stretford, Manchester, M32 9FA</td>
<td>T: 0161 2825329</td>
</tr>
<tr>
<td>JTL Fire Ltd</td>
<td>24 Cove Road, Farnborough, Hants, GU14 0EN</td>
<td>T: 01252 545741</td>
</tr>
<tr>
<td>J W Coatings Ltd</td>
<td>9 Prospect Road, Ossett, West Yorks, WF5 8AE</td>
<td>T: 01924 267022</td>
</tr>
<tr>
<td>Kaefer C&amp;D Ltd</td>
<td>Riverside House, Rolling Mill Road, Viking Industrial Estate, Jarrow, Tyne &amp; Wear, NE32 3DP</td>
<td>T: 0191 428700</td>
</tr>
<tr>
<td>K &amp; N Finishers (Southern) Ltd</td>
<td>Castle Trading Estate, Rotherham, S75 7UQ</td>
<td>T: 02380 869700</td>
</tr>
<tr>
<td>Kilnbridge Construction Services Ltd</td>
<td>McDermott House, South Crescent, Cody Road Business Park, London E16 4TL</td>
<td>T: 0207 511 1888</td>
</tr>
<tr>
<td>K P Coatings Ltd</td>
<td>Unit 4, James Park, Mahon Road, Portadown, Co Armagh, BT6 2EH</td>
<td>T: 02838 338151</td>
</tr>
<tr>
<td>Lanarkshire Welding Co.</td>
<td>82 John Street, Wishaw, Lanarkshire, ML2 7TQ</td>
<td>T: 01698 264271</td>
</tr>
<tr>
<td>Ledwood Protective Coatings Ltd</td>
<td>Waterloo Industrial Estate, Pembroke Dock, Pembroke, SA7 2J</td>
<td>T: 01646 623600</td>
</tr>
<tr>
<td>Livingstone Surface Treatments Ltd</td>
<td>Unit 4, The Energy Coast Business Park, Haile, Egremont, Cumbria, CA22 2NH</td>
<td>T: 01946 841191</td>
</tr>
<tr>
<td>Mabey Bridge Ltd</td>
<td>Station Road, Chespton, Monmouthshire NP16 SYL</td>
<td>T: 01291 623801</td>
</tr>
<tr>
<td>Maclean &amp; Speirs Blasting Ltd</td>
<td>Unit D, East Britham Farm, Darlith Road, Linwood, Paisley PA3 3TP</td>
<td>T: 01505 324777</td>
</tr>
<tr>
<td>Maclean &amp; Speirs Blasting Ltd</td>
<td>Unit D, East Britham Farm, Darlith Road, Linwood, Paisley PA3 3TP</td>
<td>T: 01505 324777</td>
</tr>
<tr>
<td>Maldon Painting Company Ltd</td>
<td>3 Spital Road, Maldon, Essex CM9 6EG</td>
<td>T: 07956597392</td>
</tr>
<tr>
<td>Mark Smith Inspection Services Ltd</td>
<td>14 Seaford Close, South Shields, Tyne &amp; Wear, NE34 7ER</td>
<td>T: 0191 456 9925</td>
</tr>
<tr>
<td>Miller Fabrications Ltd</td>
<td>Barrow Hill Works, Overtown Road, Wishaw, Llanarkshire, ML2 BEW</td>
<td>T: 01698 373770</td>
</tr>
<tr>
<td>MIS North East Ltd</td>
<td>Units 2, S5a Mill Hill, North West Ind Estate, Peterlee, SR8 2HR</td>
<td>T: 0191 514 2804</td>
</tr>
<tr>
<td>Moore Steel Developments Ltd</td>
<td>Station Road, Thornby, Peterborough PE6 QOE</td>
<td>T: 01733 270729</td>
</tr>
<tr>
<td>Murvic Contracts Ltd</td>
<td>Asknearn House, High Street, Askern, DNG 0AA</td>
<td>T: 01302 701122</td>
</tr>
<tr>
<td>New Image Contracts Ltd</td>
<td>Asknearn House, High Street, Askern, Doncaster, DNG 0AA</td>
<td>T: 01302 708070</td>
</tr>
<tr>
<td>N L Williams Group Ltd</td>
<td>Westside Industrial Estate, Jackson Street, St. Helens, Merseyside WA9 3AT</td>
<td>T: 01744 26526</td>
</tr>
<tr>
<td>Northern Protective</td>
<td>16 High Reach, Fairfield Industrial Estate, Bill Quay, Gateshead, Tyne &amp; Wear, NE10 0UR</td>
<td>T: 0191 438 5555</td>
</tr>
<tr>
<td>Offshore Marine Services Ltd</td>
<td>Brumby House, Jalan Bahasa, PO Box 80148, 87011, Lubaun F.T. Malaysia</td>
<td>T: +356214244410</td>
</tr>
<tr>
<td>Orrmac Coatings Ltd</td>
<td>Newton Chambers Road, Thorncliffe Park Estate, Chapeltown, Sheffield, S35 2PH</td>
<td>T: 0114 246 1237</td>
</tr>
<tr>
<td>Over Rail Services Ltd</td>
<td>Unit 1, Millhead Way, Purdy's Industrial Estate, Rochford, Essex, S54 1ND</td>
<td>T: 017976372866</td>
</tr>
<tr>
<td>Paintel Ltd</td>
<td>Trianon, Westover, Ivybridge, Devon, PL2 1HQ</td>
<td>T: 01752 719 701</td>
</tr>
<tr>
<td>Painting &amp; Labour Services Ltd</td>
<td>Unit 1, Queens Road, Immingham DN4 1QR</td>
<td>T: 01469 578105</td>
</tr>
<tr>
<td>PCM Nigeria Plc</td>
<td>99 Rivoc Road Trans Amadi, Port Harcourt, Rivers State, Nigeria</td>
<td>T: +2348055297828</td>
</tr>
<tr>
<td>P H Shotblasting &amp; Spraying Services</td>
<td>43a Drumraine Road, Castlecaulfield, Dungannon, Co Tyrone, BT70 3NY</td>
<td>T: 028 8776 7722</td>
</tr>
<tr>
<td>Pipeline Induction Heating</td>
<td>The Pipeline Centre, Farrington Road, Rosendale Rd Industrial Estate, Burnley BB11 5SW</td>
<td>T: 01282 415323</td>
</tr>
<tr>
<td>Port Painters Limited</td>
<td>Unit 3, Ringside Business, Hoel-Y-Rhosog, Cardiff, CF3 2EWx</td>
<td>T: 02920 777070</td>
</tr>
<tr>
<td>Possilpark Shotblasting Co Ltd</td>
<td>Dalmarnock Works, 73 Dunn Street, Glasgow, G40 3PE</td>
<td>T: 0141 556 6221</td>
</tr>
<tr>
<td>Prestec UK Ltd</td>
<td>168 Birmingham Road, Shenstone Wood End Staffs WS514 ONX</td>
<td>T: 0121 308 8001</td>
</tr>
<tr>
<td>Pro Steel Engineering Ltd</td>
<td>48a Severnbridge Industrial Estate, Symondscliffe Way, Caldicot, Monmouthshire, NP26 SPW</td>
<td>T: 01291 424949</td>
</tr>
<tr>
<td>Radleigh Metal Coatings Ltd</td>
<td>Unit 30, Central Trading Estate, Cable Street, Wolverhampton, WV2 2HX</td>
<td>T: 01902 870606</td>
</tr>
</tbody>
</table>

**HAVE YOU REMEMBERED TO PAY YOUR 2015/2016 SUBSCRIPTION?**
Ripblast & Co Ltd
Oakwood Industrial Estate, Harling Road, Snetterton, Norfolk, NR16 2JU
T: 01953 888200

R.L.P. Painting Contractors Ltd
Unit 1 Grange Lane, Balby, Doncaster DN4 9BB
T: 01302 853077

RMF Construction Services Ltd
Unit 2, Oughton Road, Birmingham, B12 0DF
T: 0121 440 7970

SCA Group Ltd
Woolsbridge Ind. Park, Three Legged Cross, Dorset, BH21 6FA
T: 01202 820820

Severn River Crossing Plc
Bridge Access Road, Aust, South Gloucestershire, BS35 4BD
T: 01454 633351

Sherwin-Williams Protective & Marine Coatings
Tower Works, Kestor Street, Bolton, Lancs. BL2 2AL
T: +44 (0)1204 521771

Shirley Industrial Painters & Decorators Ltd
Grand Union House, Bridge Walk, Acock’s Green, Birmingham, B27 6SN
T: 0121 706 4000

Shutdown Maintenance Services Ltd
Kingsnorth Industrial, Hoo, Rochester, Kent, ME3 9ND
T: 01634 256969

Sitecote Ltd
33 Kielder Close, Ashton in Makerfield, Wigna, WN4 0JE
T: 07714678719

Solent Protective Coatings Ltd
Tredgar Wharf, Marine Parade, Southampton, Hants, SO14 5JF
T: 02380 221480

South Staffs Protective Coatings Ltd
Bloomfield Road, Tipton, West Midlands, DY4 9EE
T: 0121 522 2373

Southern Coating Contractors Ltd
Malmsbury House, 227 Shirley Road, Shirley, Southampton, SO15 3HT
T: 0238 0702276

Specialist Blasting Services Ltd
Smiths Quay, Hazel Road, Woolston, SO19 7GB
T: 023 80438901

Specialist Painting Group Ltd
Unit 3 Proser House, Astore Park, Padholme Road East, Fenge, Peterborough, PE1 5XL
T: 01773 309500

Stainless Restoration Ltd
Unit M1, Adamson Industrial Estate, Croft Street, Hyde, Cheshire, SK14 1EE
T: 0161 3686191

Stamford Construction Limited
Barham Court Business Centre, Teston, Maidstone, Kent MW18 5BZ
T: 07912037033

Standish Metal Treatment Ltd
Potter Place, West Pinmo, Skernersdale, Lancs, WN8 9PS, UK
T: 01695 455977

Stobbarts Ltd
Tarn Howe, Lakes Road, Deswent Howe Industrial Estate, Workington, Cumbria CA14 3YP
T: 01900 870780

Story Contracting Ltd
Burgh Road Industrial Estate, Carlisle, Cumbria CA2 7NA
T: 07730 764414

Stream Marine Training Ltd
Kintyre House, St Andrews Crescent, West Campus, Glasgow International Airport, Paisley, PA3 2TQ
T: 0141 212 8777

Tees Valley Coatings
Riverside Park Road, Middlesborough, Cleveland TS2 1UL
T: 01642 228141

Surface Engineers (Manchester) Ltd
Globe Industrial Park, Off Astley Street, Dukinfield, Cheshire, SK16 4QZ
T: 0161 330 9224

Surface Technik (Oldhill) Ltd
Roveren Works, Deepdale Lane, Lower Comal, Dudley, DY3 2AF
T: 01384 457610

TEMA Engineering Ltd
5-6 Curran Road, Cardiff, CF10 5DF, UK
T: 020920 344556

Thompson Project Management Ltd
Newacre, Athey Road, Carlow, Republic Of Ireland
T: 0353 599131624

Tinsley Special Products
Enterprise House, Durham Lane, Eaglescliffe, Stockton-on-Tees TS16 0PS
T: 01642 784279

T I Protective Coatings
Unit 6, Lodge Bank, Crown Lane, Horwich, Bolton, Lancs, BL6 5HU
T: 01204 468080

Torishima Service Solutions Europe Ltd
Sunniyside Works, Castlehern Road Coatbridge ML5 2DJ
T: 0123642390

Transvac Systems Ltd
Monsal House, 1 Bramble way, Alfreton, Derbyshire, DE55 4RH
T: 01773 831100

Underhill Engineering Ltd
Plymbridge Road, Estover, Plymouth, PL6 7LX
T: 01752 752480

Vale Protective Coatings Ltd
Building 152 - Langar North Industrial Estate, Harby Road, Langar, NG13 9HY
T: 01949 869784

Walker Construction (UK) Ltd
Park Farm Road, Folkestone, Kent, CT19 5DY
T: 01303 851111

Wardle Painters Ltd
Unit 5, Wimborne Building, Atlantic Way, Barry Docks, Glamorgan, CF63 3RA, UK
T: 01446 748620

Wescott Coatings & Training Services Ltd
9b/9c Tyne Point, Shaftsbury Avenue, Simonside Industrial Estate, Jarrow, Tyne & Wear, NE32 3UP
T: 0191 497 5550

W G Beaumont & Son
Beaumont House, 8 Bernard Road, Romford RM7 0HX
T: 01708 749202

William Hare Ltd
Brandisholme House, Brandlisholme Road, Burs, Lancs, BL8 1JL, UK
T: 0161 609 0000

Wood Group Industrial Services Limited
Kirkstone House, St Omers Road, Western Riverside Route, Gateshead, Wear, NE11 9EZ
T: 0191 4932600

Xervon Palmers Ltd
331 Charles Street, Royston, Glasgow G21 2QA
T: 0141 5534040

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Email: enquiries@squareone.co.uk
DIARY DATES 2015

Thursday 8th October 2015
London Branch Event
People, Process, Plant and Performance the 4 p’s of Corrosion Management
To be held at Imperial College,
London, SW7 2AZ.
Speaker: Bill Hedges, BP.

Monday 12th – Thursday 15th October 2015
Corrosion Control in Industry, Structures and Plants
Suitable for Corrosion Engineers, Architects, Structural Engineers, Maintenance Engineers, Inspectors, Insurance Assessors and Corrosion Engineers.
Venue: Amsterdam Details from Colin Britton, FICorr, MRSC, Corrosion Engineering Consultancy and Training Courses The Butts, Station Road, Kimbolton,
Cambridgeshire, England,
Tel: +44 (0)1480 860943 Mobile: 0774 8270801 Email: cbrit79727@aol.com

Monday 12th – Friday 16th October 2015
Mobility Oil & Gas Petroleum Engineering Consultancy & Technical Training Services
Upcoming Course Contact: +442030867082 or training@mobilityoilandgas.com
Mobility Oil and Gas is accredited by the British Accreditation Council for Independent Further and Higher Education as a Short Course Provider.

Tuesday 20th – Friday 23rd October 2015
Corrosion Control in the Oil and Gas Industry
http://mobilityoilandgas.com/corrosion-control-in-the-oil-and-gas-industry/ For details of courses, please see information below:
Mobility Oil & Gas Petroleum Engineering Consultancy & Technical Training Services Upcoming Course
Contact: +442030867082 or training@mobilityoilandgas.com
Mobility Oil and Gas is accredited by the British Accreditation Council for Independent Further and Higher Education as a Short Course Provider.

Tuesday 21st October 2015
Aberdeen Branch Meeting
Venue: Palm Court Hotel,
81 Seaford Road,
Aberdeen AB15 7XY,
United Kingdom,
18:00 – 19:30
Presenter: JD Demor (Corrpro)
Topic: Field Joint Coating Process – Where are we?

Thursday 12th November 2015
London Branch Event:
Youth Engineers Program, Presentations
Evening to be held at ROSL,
SW1A 1LR,
London.

Tuesday 24th November 2015
Aberdeen Branch Meeting
Venue: Palm Court Hotel,
81 Seaford Road,
Aberdeen AB15 7XY,
United Kingdom,
18:00 – 19:30
Presenter: Billy Morrison
Topic: Corrosion Engineering – Adding Value

Wednesday 25th November 2015
Aberdeen Branch Event
Venue: Palm Court Hotel,
81 Seaford Road,
Aberdeen AB15 7XY,
United Kingdom,
18:00 – 19:30
Host: Dave Gibson (Preserv)
Topic: Industrial Visit to Preserv-Welding and Subsea Engineering

Thursday 10th December 2015
London Branch Event
London Branch Christmas Lunch
To be held at ROLSL,
SW1A 1LR,
London
After Dinner Speaker: David Gunson, Former Air Traffic Controller.

Tuesday 26th January 2016
Aberdeen Branch Meeting
Venue: Palm Court Hotel,
81 Seaford Road,
Aberdeen AB15 7XY,
United Kingdom,
18:00 – 19:30
Presenter: Donald Chapman (IMC)
Topic: Advancements in Non-metallic Reinforcement of Structures

Thursday 11th February 2016
London Branch Event:
Jozef Solcis, Macaw Engineering
To be held at Imperial College,
London, SW7 2AZ.

Tuesday 16th February 2016
Aberdeen Branch Meeting
Venue: Palm Court Hotel,
81 Seaford Road,
Aberdeen AB15 7XY,
United Kingdom,
18:00 – 19:30
Presenter: Speaker TBC
Topic: TBC

Thursday 16th March 2016
London Branch Event:
Jim Glynn, Beanny
London Branch Chair Talk
To be held at Imperial College,
London, SW7 2AZ.

Tuesday 22nd March 2016
Aberdeen Branch Meeting
Venue: Palm Court Hotel,
81 Seaford Road,
Aberdeen AB15 7XY,
United Kingdom,
18:00 – 19:30
Presenter: Speaker TBC
Topic: TBC

Tuesday 26th March 2016
Aberdeen Branch Meeting
Venue: Palm Court Hotel,
81 Seaford Road,
Aberdeen AB15 7XY,
United Kingdom,
18:00 – 19:30
Presenter: Speaker TBC
Topic: TBC

Thursday 14th April 2016
London Branch Event:
Elizabeth Hillier, DNV
To be held at Imperial College,
London, SW7 2AZ.

Tuesday 19th April 2016
Aberdeen Branch Meeting
Venue: Palm Court Hotel,
81 Seaford Road,
Aberdeen AB15 7XY,
United Kingdom,
18:00 – 19:30
Speaker: Raoul Kattan (Salinah)
Topic: The challenges of designing and complying with a ship’s coating specification.

Tuesday 17th – Friday 20th May 2016
CEOCOR 2016 Congress
The CEOCOR 2016 Congress takes place in Ljubljana, Slovenia.
Contact Brian Wyatt for more information: brianwyatt@controlcorrosion.co.uk or visit http://ceocor.eu and the Marine Corrosion Forum at www.marinecorrosionforum.org

Tuesday 31st May 2016
Aberdeen Branch Meeting
Venue: Palm Court Hotel,
81 Seaford Road,
Aberdeen AB15 7XY,
United Kingdom,
18:00 – 19:30
Speaker: Speaker TBC
Topic: TBC

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London Branch publish a monthly Newsletter; to be included on the circulation list please contact Sarah Vasey sarah.vasey@akzonobel.com