Approved Courses

- Painting Inspector Levels 1, 2 & 3
- Pipeline Coatings Inspector Level 2
- Cathodic protection of re-inforced concrete structures Levels 1 & 2
- Insulation Inspector Level 2
- Hot Dip Galvanising Inspector
- Fire Proofing Inspector Level 2
- Cathodic protection of buried and submerged structures Levels 1 & 2

For further information or administrative details, costs and bookings for courses and examinations or detailed information packages free of charge, please contact:

Martin Dawson or David Betts on:
Tel: +44 (0)1709 560459 Fax: +44 (0)1709 557705
Email: enquiries@ruanetpo.com
Internet: http://www.ruanetpo.com

Technical and eligibility enquiries can be made direct to Dave Griffiths the ICorr Scheme Manager on:
Tel: +44 (0)1709 550999

Ruane & T P O’Neill Argyll-Ruane Ltd.
Meadowbank Road, Rotherham S61 2NF, United Kingdom

Reader Enquiry Service

For further information on any of the products and services featured in this edition of Corrosion Management, please write the appropriate Reader Enquiry Service number(s) in the spaces below.

For further information on any of the items featured in this edition of Corrosion Management, please write the appropriate Reader Enquiry Service number(s) in the spaces below.

Name: ___________________________ Position: ___________________________
Company: ___________________________
Address: ___________________________
_________________________ ___________________________
Postcode: ___________________________
Tel: ___________________________ Fax: ___________________________
Email: ___________________________
CONTENTS

Institute News
The President Writes
22nd Annual Luncheon
London Branch goes to Twickenham
Obituary – Professor Robert Barry Waterhouse
Yorkshire Branch Post Christmas Sunday Lunch
The History of the Institute
London Branch Evening
Technical Topics No.29

Technical Article
Corrosion protection of Zn-Al-Mg coated steel with and without plastic deformation in chloride containing environment

Company News
Aptex Ltd
The Surface World Show 2011
Metallisation Ltd
Belzona Boat Race
Michael Smith Engineers Ltd
BETE Ltd
Winn & Coales (Denso) Ltd
Winn & Coales International Ltd

Sustaining Members
ICATS Registered Companies
Diary and Branch Contacts
The President Writes

First let me wish you all a happy and healthy New Year and to those who were adversely affected by the cold and snow (I couldn’t get my car out of the road for 10 days) let us hope for some warmer weather soon.

You will, I am sure, be pleased to know that the ICorr office move on the 7th went reasonably smoothly and by the end of a long and tiring day pretty much everything was in, up and running. Thanks go to Denise Aldous and David Deacon for all the advance work that enabled it to happen that well. Our new contact details are elsewhere in this journal and of course on the website.

One thing that the move has brought to my attention is the fantastic library of journals, conference proceedings and books that we have and which is available to members. A recent enquiry to the office for a copy of a paper given at an ICorr conference was turned around in less than an hour with the paper emailed back to the enquirer. More of this in the future.

On 22nd December there was an article in the Daily Telegraph headlined "Major flaws found in UK oil rigs" it referenced a 29 page Health and Safety Executive report entitled External Corrosion Management which can be downloaded free from the HSE website. The report does not paint a pretty picture! Two things struck me very strongly. First was the pictures of corroded items ‘in situ’ they were far worse than I had expected from the text and reinforced the newspaper article which I had wrongly assumed was exaggerating. Secondly, and to me more fundamental, was the complete absence of any reference to ICorr anywhere in the report, other institutes are mentioned but not us, is our profile really that low? This will no doubt be a topic for the next Council meeting on 26th January.

Another newspaper article last month alerted me to a further corrosion problem. Researchers at the Dalhousie University in Canada have isolated a previously unknown strain of bacteria and named it Halomonas titanicae. The bacteria are helping the famous ship to “decompose”. The work is reported in The International Journal of Systematic and Evolutionary Microbiology. Halomonas is a genus of halophilic Proteobacteria that thrives in sodium chloride solutions, seawater to you and I. Apparently “the bacteria could pose a new threat to the exterior of ships and underwater metal structures such as oil rigs”. Clearly there is an opportunity for some research to ensure that existing protection systems remain effective in the presence of this new threat. While Halomonas titanicae threatens to make fast work of its namesake, the researchers believe it has the potential to help eliminate unwanted waste from the ocean floor in a natural and eco-friendly way. This could be useful in the disposal of old ships, platforms and pipelines that have been cleaned of toxins. The bacteria grow in “rusticles”, icicle like growths of corrosion product that then break down into fine particulates and disperse.

22ND ANNUAL LUNCHEON

Building on last year’s change of venue, this year’s London Branch Christmas Luncheon on 2nd December was again an outstanding event. Held at the elegant Club of the Royal Over-Seas League in the heart of St James’, guests were welcomed with free luncheon refreshments. This year, there were sixteen tables of ten places booked. Unfortunately due to sudden adverse weather conditions, around fifty were unable to travel.

Never-the-less, Mike Allen, the Co-ordinator had done a superb job and everything went like clockwork. The menu was well received and many of the begging servings for absent friends were quickly consumed on their behalf. Jim Glynn had organised a lavish array of prizes for the raffle and assisted by other members, raised much needed additional funds for the Institute.

We were honored this year by a number of eminent and influential guests. These included the new President of ICorr, Dr Bob Crundwell and the President of the NACE, Dr Chris Fowler. Chris is only the second Brit ever to serve as the President of NACE International. There were also four Past Presidents of ICorr present. During his brief speech, Bob took the opportunity of presenting Trevor Osborne with his Chain of Office as the newly elected Vice President. Bob also outlined the changes to ICorr HQ and was sure that ICorr had a long, valuable and growing future ahead of it as a unique organisation in the Corrosion Field. He finally thanked London Branch for their continued and much appreciated support of the Institute.

No expense was spared in gaining the services of a celebrity speaker. Ann Widdecombe had been well received last year and this year’s guest speaker was Brian Sewell, the art critic of the Evening News, television programme maker and well known tv personality. His main thrust was explaining the symbolism of many of various fruit in the paintings of the Old Masters. Brian had many examples to display as part of his unique presentation.

Once again a great time had been had by all those able to attend and Mike has already started organising next year’s event.

John O’Shea
LONDON BRANCH GOES TO TWICKENHAM

Once more our annual pilgrimage to the Varsity Match proved a popular and most enjoyable day. As usual, we gathered at the Naval Club for sandwiches and a variety of liquid refreshments to fortify everyone for the forthcoming venture to Twickenham. This also was an excellent opportunity for many old friends to become re-acquainted and a very amicable bunch of 40 boarded the coach at noon. Our drive, Brian Banks, and his stewardess Sue, entertained us with a site seeing tour of London’s West End, before dropping us off within a few minutes’ walk of the grounds. Derrick Hoskins added to the distraction during the trip by introducing London Branch’s unique sweep that proved most popular and generated much debate.

Dr Mick Ball, the Event Organiser, had obtained a bank of excellent seating with easy access and great visibility. As always the match was exciting with many future Internationals on display. Although Cambridge excelled on a few occasions, Oxford were able to dominate for most of an action packed match which also included the now obligatory streaker. The match finished with a score of 21 - 10 to Oxford.

This result provided 3 winners of the sweepstake and the massive winnings were soon transformed into liquid refreshments. On our return to the Naval Club, lashings of heart warming chili and rice were served up. This made a fitting end to a most enjoyable occasion. In the time honored practice, a round of applause thanked Mick and Derrick for a most pleasurable Event.

John O’Shea

The 40th Annual Corrosion Engineering and Control Course
4 - 8 April 2011

The 40th Annual Corrosion Engineering and Control Course has been designed for professionals and recently appointed graduates working in the field of corrosion prevention.

Guided by world leaders in the field, you will explore principles, protection strategies and the industrial applications of corrosion and its control.

The course runs over five days and covers a wide range of industry-relevant topics. You can register for the full five-day course or select individual days.

For further information and a course brochure, please call, email, or visit our website.

For an informal discussion about The 40th Annual Corrosion Engineering and Control Course, call +44 (0)161 306 2218 or email shortcourses-materials@manchester.ac.uk

For more information, visit www.manchester.ac.uk/materials/shortcourses
OBITUARY

PROFESSOR ROBERT BARRY WATERHOUSE
JP, MA, PHD, C.ENG, FIMMM, FICorr, FRSA

'Bob' began his metallurgical career at the Woolwich Arsenal just before the beginning of the Second World War. Somewhat later in the 1940's he was admitted to take the Natural Sciences Tripos at Cambridge and eventually gained a 1st Class Honours degree in Metallurgy. He decided to continue his studies and took advice from U.R.Evans about a suitable subject for research. The subject of 'fretting' was suggested, and consequently after working in the Department of Colloid Science at Cambridge for three years Bob successfully submitted a PhD thesis in 1955. The title of the thesis was 'Mechanical Aspects of Friction Processes which include 'Fretting'. He became the fourth member of staff recruited to the recently formed Department of Metallurgy at Nottingham in the 1956-57 session. Bob taught crystallography to the undergraduates and set up a research group which worked on fretting wear, fatigue and corrosion. In the late 1950's Bob was appointed as Warden of Wortley Hall, a student hall of residence at Nottingham. This added responsibility did not prevent him from maintaining his research and teaching activities. His reputation grew in the fields of fatigue, wear and corrosion as he began to publish his research findings, particularly as it was realised that a significant number of failures in aeroengines, automobiles, nuclear power generation and general engineering were occurring through fatigue failures taking place at low levels of stress. This was due to crack initiation occurring at sites where relatively small (~50 µm amplitude) movements between surfaces were taking place, i.e. fretting. Potential sites for failures were to be found in for example, wire rope applications in mining, cranes, suspension bridges and hawser for offshore rigs, where it has become necessary to involve appropriate lubricants and/or regular maintenance or replacement schedules. Oxides produced under corrosive conditions can act as abrasive debris on certain metals and alloys and then promote greater fretting wear rates. Also where a thin oxide protects a more reactive alloy, fretting may remove it and thus promote more accelerated rates of corrosion.

In 1972 Bob wrote a textbook on Fretting Corrosion and then in 1981 he published a second volume on Fretting Fatigue. Both of these books are still frequently referenced in current papers as they provide an understanding of the subject as well as give advice on the prevention of fretting by making use of engineering design together with appropriate choice of materials and surface processing. Bob was promoted to Reader and then later on he was made Professor in recognition of his publications in this field of research. With the introduction of surgical replacements of hip joints in the late 1970s it was realised that fretting was a major factor in promoting their early failure in service in the body. Bob helped to introduce interactive research between the Medical School and the Faculty of Engineering at Nottingham in this field. His reputation had spread worldwide and was a frequent invited speaker in Japan and the USA on fretting. Bob wrote an international review on Fretting Fatigue and was a joint editor of the proceedings of several international conferences. Many workers came to Nottingham to carry out research with Bob, particularly those from Japan and China. An opportunity came to set up a fruitful exchange for personnel in the mid 1980's with the Shanghai Research Institute for Metals and Nottingham which was jointly financed by the Royal Society and the Chinese Academy of Sciences.

Over a period of thirty years Bob was an extremely popular Warden of Wortley Hall and this brought him into contact with a very wide range of people who graduated from Nottingham. This allowed him to build up a circle of friends throughout the world from many professions and backgrounds. He had a keen interest in the arts, being particularly active as a watercolour artist, never failing to exhibit in the University’s Salon each year. For many years he was a JP on the Nottingham and Sheffield benches and also a Prison Visitor.

After retiring from the Nottingham in 1989, Bob lived in Dore near Sheffield. He continued to work on fretting problems both at Nottingham and the University of Sheffield. His visits to Nottingham continued to stimulate work in fretting amongst younger colleagues and this lead on to the Rolls-Royce UTC group on splines and drives continuing to maintain a significant interest in the subject.

Bob Waterhouse passed away suddenly on 4th October, aged 88 years, leaving a brother Norman and nephews Nigel and Colin and Keith.

By Sam Harris and Peter Boden

YORKSHIRE BRANCH POST CHRISTMAS SUNDAY LUNCH

A small select group met for our annual Post Xmas lunch which was held in a private room at The Brooklands Restaurant in Barnsley. Our 2010 lunch was held here and the quality of the food and superb value for money still remained.

Only 7 of us could make lunch this year due to work constraints and other commitments but we more than made up for it by the jovial topical discussions that took place.

We chose from the set 3 course menu with the roast Sea Bream taking top slot amongst the diners with treacle tart and clotted cream the favourite dessert. It was suggested that we hold more regular Sunday lunches throughout the coming year to allow more opportunities for our membership to meet up. That is the official proposal... other reasons maybe some sly covert wine tasting session to assess the corrosive influence of vino on glass! Apparently drinking the wine retards the corrosion of the glass...apparently! Hic... Hic! We all proposed that if we put on too much weight then trips to the gym next door may be a compulsory part of the day! And on that departing comment we all look forward to the next lunch meet in the not too distant future.
THE HISTORY OF THE INSTITUTE

THE FINAL PART THE NEW MILLENNIUM AND WHERE ARE WE GOING 2000- 2010 - AND BEYOND

by David Deacon

This is the final section of the brief summary of the history of the Institute, which I started to prepare in 2009 for the 50th Anniversary, held at the Thames Barrier on the 21st May 2009 and requested by our Past President Prof Paul Lambert.

For those members who have read the previous sections, I have taken us from the formation of BACE, launched on the 21st May 1959 and I have briefly discussed the major issues and developments, on a decade, by decade basis. These have covered the merger between BACE/ICorr Tech and CAPA with the change of name to the Institute of Corrosion Science and Technology, the major development and expansion during the 70’s with the joint venture with NACE and when that broke up, the formation of the Corrosion Engineering Division and the final change in name to our present title, which occurred in the 1990’s.

In the last section in Issue 95 of Corrosion Management I covered the links across the decades with the changes of the magazine and the offices, as well as the UK Corrosion Conferences and Exhibitions.

As the new millennium started, significant developments occurred at the time of the Robert Edyvean and John O’Shea Presidencies, when they achieved what was previously thought to be the impossible, they persuaded Council and the Banks to enable us to purchase our own building, Corrosion House, in Leighton Buzzard.

The purchase of the building and the associated major conferences in Edinburgh-2001 and Cardiff-2002, respectively caused considerable difficulties with the Institute’s finances and indeed times were hard, all the permanent staff had to be made redundant and a contracted out Administration was put in place. In addition it was considered important to undertake some activities for industry and on advice from our then auditors, Baker Tilley, we formed a wholly owned subsidiary Correx Ltd, which was charged with the responsibility of generating funds to build and permanently strengthen the Institute’s finances for our future.

The two main initial objectives of Correx Ltd, was to put in place a much needed training and qualification package for Industrial Coating Applicators, developed by the training Governing Board, Chaired by Roger Hudson, which would provide a much needed professional qualification in industry and provide finances for the Institute through this new commercial/industrial initiative.

The second objective was to re-launch the Correx exhibition and associated National Conference.

The first of these conferences was held in 2009 in conjunction with the well established coating exhibition Surface World at the NEC Birmingham and this will continue in 2011 and 2013.

The ICATS programme was welcomed by Government Departments, including the Highways Agency, who were the main sponsors of the scheme and it was also supported by the CITB, Network Rail and the Environment Agency and now launched, it has the potential to become a major industry qualification over the next decade and into the future.

It was also decided just before the commencement of the recession, that property values would drop, particularly within the Leighton Buzzard area and so Corrosion House was marketed and sold to sitting tenants in 2008 at well above the market value and all of the outstanding mortgage debts were repaid to the bank, producing a significant surplus for our Institute, and grateful thanks must go to the O’Shea/Edyvean initiative.

I would like to thank all those members who have provided me with archived records, photographs and personal mementos as well as all those who have sent me thanks for these brief recollections.

LONDON BRANCH EVENING

Jim Solomon of Buro Happold Ltd. Cutty Sark, launched in 1870, was a prestigious tea clipper with an impressive turn of speed and is the only remaining example of its class. It was interesting to learn that it only lasted about 7 years as a tea clipper, taking about 100 days for the voyage to China; its demise was brought about by the opening of the Suez Canal and advances in steam power, after which the ship was ‘relegated’ to general cargo duties. In the 1950s it was wallowing in the Thames as a museum to seamen who served in the two World Wars. Weighing in at about 1,000 tons, it was completely dismantled when it was decided upon restoration and Jim explained the difficulties involved with the mixed construction materials of wrought iron and timber – mostly teak and elm. Clearly, with an undertaking of this nature, the use of coatings played an important role for preservation, and several types were tested before the final decision was made. There was emphasis on the difficulties presented by chloride contamination of structure components, the whole overall process being very time consuming, challenging and expensive. The project is due to be completed in early 2012 and will be 95% Cutty Sark. In the not too distant future, the whole ship will be lifted to its final display position and doubtless this will be a news item at the time.

Geoff White
Technical Topics No 29:
CHARTERSHIP AND CATHODIC PROTECTION

by Technical Secretary, Douglas J Mills

Only one more TT to go until the 30th! The latter will correspond with the 100th edition of CM when I expect to do a review of all previous TTs. But for this one I thought I’d return to more obviously technical matters and discuss a few advances/developments in CP, both academic and practical. But before that I will mention the situation regarding our ability to offer Registration to the two most relevant bodies in the corrosion field viz the Science Council and the Engineering Council. Re the latter, at present we can achieve Chartership for our members through the SEE (Society of Environmental Engineers). The immediate past President, Paul Lambert and myself negotiated with SEE that individuals who are ICorr members no longer have to become members of the SEE. So it would be good if the uptake on this could be higher. Becoming CEng, IEng or Eng Tech is a definite indication that you have “made it” in the profession. So get applying! Regarding the Science Council, they have expressed some concern about us continuing as a Licencing Body, one reason being the small numbers taking this up. Luckily another past President, Stuart Lyon has taken on the task of sorting this out and to quote SL “It is ICorr’s intention to retain its licence and to seek to increase in CSci registration organically”. Now let me turn to Cathodic Protection. Back in TT No 7 (July/Aug 06), I discussed this but mainly in relation to pipelines. Off course there are many other structures which can be cathodically protected, examples being North Sea oil rig platforms, ship’s hulls and rebar in concrete. What is required for CP to be effective (as I keep reminding my students!) is a conducting environment. So just connecting the body of the car to the negative terminal of the battery does not ensure protection! There has been some interesting work done on CP in academia in this area. In the past year I have examined two theses from University of Manchester: one looked at the effect of cathodic protection on epoxy paint coatings. The potential will tend to drive positive ions through the coating and it was found that ions move at different rates depending on their hydrated size and valency. So potassium, normally a larger ion than sodium, actually moves more quickly through the film because the hydrated potassium ion is smaller than the hydrated sodium ion. This has ramifications for the rate at which alkali can form (and alkali is generally bad for coatings as it can degrade the coating resistance and /or lead to lack of adhesion). Divalent ions in the form of zinc were also tested and showed much slower rates. This may be why sea water (significant levels of Ca++ and Mg++ ions) is normally less bad as regards coating deadhesion compared with say the equivalent concentration of NaCl. The other thesis involved an extended examination of conditions and morphologies of the calcareous films that occur on steel in sea water when protected by anodes. This work showed that the extent and nature of hydroxides and carbonates that built up on the surface of the steel was affected inter-alia by the level of CP. As an example when the steel was under-protected, magnesium hydroxide formed prior to calcium carbonate. The work also clearly showed the benefit of anti-corrosion pigments, particularly when used with a sacrificial zinc anode. Hopefully these pieces of work will see the light of day before long as publications in the open literature. There are also exciting new practical developments in CP. A novel treatment to protect concrete combines a brief pit re-alkalisation process and low maintenance galvanic protection. Protection mainly results from a high pH, not a negative steel potential shift. In practice the hybrid treatment involves finding the steel, installing zinc anodes, applying a very high current for one week and then connecting the anodes to the steel. What the latter does is move the corroding areas from the steel to the zinc. Another recent development using controlled CP, is a treatment to mitigate Accelerated Low Water Corrosion (ALWC). This is a particularly aggressive form of microbiologically-induced localised corrosion (see picture). Essentially the process works by electrochemically depositing calcium carbonate (CaCO3) and magnesium hydroxide (Mg(OH)2) films on the surface. The process uses just the seawater (and electricity) to generate the necessary active agents. The treatment needs close control and comprises three optimised stages: cleaning, sterilisation and coating. These are typically carried out sequentially. The process is now commercially available. Finally we will look at where “CP” broke down with a picture taken of a galvanised M-Way gantry. This started life in 1977 so a good long time ago. Both this and the ALWC shot would be good examples for the vulture lectures! Any comments on this month’s TT please contact me at the usual address Douglas@harrbridge.freeeserve.co.uk

Thanks are due to Rob Poulton for M-Way gantry picture and to Barry Lamb for the other picture and for providing information on the ALWC mitigation method.
CORROSION PROTECTION OF Zn-Al-Mg COATED STEEL WITH AND WITHOUT PLASTIC DEFORMATION IN CHLORIDE CONTAINING ENVIRONMENT

Susanne Schuerz, Christian Doppler Laboratory of Localized Corrosion, University of Leoben, Austria
Gerald H. Luckeneder, voestalpine Stahl GmbH, Austria
Martin Fleischanderl, voestalpine Stahl GmbH, Austria
Anna Elisabeth Raab, voestalpine Stahl GmbH, Austria
Gregor Mori, Christian Doppler Laboratory of Localized Corrosion, University of Leoben, Austria.

Summary

Recent studies have shown the excellent corrosion resistance of zinc alloy coatings for steel sheets with additional aluminium and magnesium. The influence of the alloying elements on the corrosion mechanism is an important topic for many research groups worldwide. This work focuses on the corrosion resistance of a specific Zn-Al-Mg alloy coating (ZM) in standard salt spray test. Analysis of the sample cross-sections by SEM and EDS showed that on ZM coated steel a well adherent Al-rich protecting layer can be formed next to the steel substrate in a short period of time, which protects the steel substrate against corrosive attack. By the means of X-ray diffraction this Al-rich protecting layer could be identified as zinc aluminium carbonate hydroxide, Zn₃Al₂(CO₃)₁ₓ(OH)₂₋ₓ · 4 H₂O.

Corrosion tests on plastically deformed ZM coated samples were carried out. For this purpose the ZM samples were subsequently strained to 5%, 10% and 15% plastic deformation, respectively, and exposed to a standard salt spray test. Analysis of the sample surface and cross-sections before exposure showed that the plastic deformation causes cracks in the ZM coating that penetrate through to the steel substrate. Analysis of the sample surface and cross-sections after exposure showed that these cracks do not significantly influence the corrosion progress as an Al-rich layer can form upon the steel substrate on both unstressed and plastically strained samples. The time to first red rust on plastically deformed ZM coated samples decreased slightly compared to samples without any plastic deformation.

Additional investigations on the influence of cracks in the Al-rich protection layer on the corrosion resistance showed that such cracks can closed during exposure to salt spray thereby limiting the extent of corrosion.

1. Introduction

Hot-dip galvanised steel sheet is one of the most important raw materials for the automotive, building and household appliance industries due to its enhanced corrosion resistance compared to non-galvanised cold rolled steel. Further improvement of the corrosion resistance can be achieved by alloying. The addition of aluminium and magnesium was found to influence the corrosion resistance of the coating system in a positive way and thus several zinc aluminium magnesium alloy coatings have been developed in Japan [1,2,3,4] and Europe [5,6,7,8] over several years. The aluminium and magnesium content in these zinc based coatings varies from 0.2 to 11.0 wt.% and 0.1 to 3.0 wt.%, respectively, for Japanese coating systems. European developments comprise a minor content of alloying elements with 0.4-2.0 wt.% aluminium and 1.0-2.0 wt.% magnesium.

The reason for the enhanced corrosion resistance of the coating systems mentioned above has not yet been definitely clarified. Various explanations for the mechanisms leading to improved corrosion resistance of zinc-aluminium-magnesium coatings can be found in the literature. The corrosion resistance of the Japanese coating systems was studied e.g. by Tanaka et al. [2], Nishimura et al. [3], Tsujimura et al. [9] and Yamamoto et al. [10].

Tanaka et al. [2] investigated the corrosion behaviour of a zinc alloy coating consisting of 11 wt.% Al, 3 wt.% Mg and 0.2 wt.% Si. They attributed the enhanced corrosion resistance of this coating system to a corrosion product layer consisting of basic zinc chloride, ZnCl₂ · 4 Zn(OH)₂, which is able to suppress the oxygen reduction. Since magnesium is included in the zinc chloride, it can exist for a long time in a stable form. Nishimura et al. [3] investigated a coating system containing Zn + 0.2 wt.% Al + 0.5 wt.% Mg exposed to a cyclic corrosion test. They found that this coating system forms a very compact corrosion product layer consisting of large amounts of basic zinc chloride, ZnCl₂ · 4 Zn(OH)₂, and only a small amount of zinc oxide, ZnO. The densely packed corrosion products hinder the oxygen diffusion and hence improve the corrosion resistance.

Tsujimura et al. [9] analysed the corrosion behaviour of a zinc alloy coating consisting of 6 wt.% Al and 3 wt.% Mg exposed to a cyclic corrosion test including alternating periods of salt spraying, drying and humidity. The enhanced corrosion resistance is supposed to be caused by two factors: In the early stages of corrosion the entire surface is covered with a thin protective layer of zinc hydroxychloride containing Mg. As corrosion proceeds most of Mg on the surface is removed, while a considerable amount of Al remains on the specimen by forming a stable Zn-Al corrosion products containing Mg which suppress corrosion of the residual coating layer and hence the steel substrate.

Yamamoto et al. [10] evaluated the corrosion resistance at the cut-edge portion of pre-painted hot-dip galvanised Zn + 6 wt.% Al + 3 wt.% Mg alloy coated steel sheet in a salt spray test. During exposure a fine corrosion product layer containing Mg is formed on the cut edge portion which suppresses reduction of dissolved oxygen and therefore confirms the superior corrosion resistance.

Investigation of artificial rust particles synthesised from aqueous solutions dissolving ZnCl₂, AlCl₃, and MgCl₂ was carried out by Ishikawa et al. [11,12,13,14]. The formed rust consists of mixed hydroxychlorides of Zn(II), Al(III) and Mg(II) [Zn(II)₆Al(III)₃Mg(II)₂]((2w+3x+2y)+(OH) 2w+3x+2y-zClz·n H₂O and appears in form of plate particles. Their ability to agglomerate in the form of a dense, compact layer is suggested to be the main reason for the enhanced corrosion resistance of Zn-Al-Mg alloy coating systems. In recent studies [15,16,17] the corrosion resistance of a zn-al-mg alloy coating consisting of 2.0 wt.% Al and 2.0 wt.% Mg and produced by voestalpine Stahl GmbH exposed to salt spray test according to DIN EN ISO 9227 was investigated. This Zn-Al-Mg-coating (subsequently called ZM) showed enhanced corrosion protection properties compared to conventional hot dip galvanised steel sheet (HDG) with a comparable
coating thickness. A cross sectional analysis of the corroded ZM specimen indicated the formation of a dense, stable aluminium-enriched protection layer next to the steel substrate which is responsible for the enhanced corrosion protection properties. In this study the protecting aluminium rich layer was analysed by means of XRD. In addition the influence of plastic deformation on the corrosion performance of ZM coated steel sheet is investigated.

2. Experimental
2.1 Materials and sample preparation
For this study steel panels with an alloy coating consisting of Zn + 2.0 wt.-% Al + 2.0 wt.-% Mg (ZM) produced via hot-dip galvanising on a large scale plant at voest Alpine Stahl GmbH in Linz, Austria, were used. The average coating thickness per side was about 50 g/m². The steel substrate was a DX54 low carbon steel.

Plastic deformation of the samples was carried out by using a tensile testing machine. The advantage of this method is that the samples keep their flat form and are suitable for use in the salt spray chamber without the risk of solution pooling on the surfaces as would occur if the plastic deformation was achieved by bending the samples. Furthermore by using the tensile test machine a controlled level of plastic deformation can be obtained and the corrosion results can be easily compared to that of the non-deformed panels. Strips measuring 400 mm x 600mm were cut out of the industrially coated steel sheet and strained to 5%, 10% and 15% of plastic deformation, respectively. The centre of the strips was cut out and exposed to salt spray test. In this investigation the influence of cracks in the metallic ZM coating caused by plastic deformation is evaluated.

In a further investigation test samples (400mm x 60mm) were firstly exposed to salt spray test for 500 h to allow for the Al-rich protection layer to form. The samples were then strained to 5%, 10% and 15% plastic deformation, respectively, and again exposed to salt spray test. In this part of the study the influence of cracks in the Al-rich protecting layer caused by plastic deformation is investigated. A schematic drawing of the sample cut after the plastic deformation step is shown in Figure 1.

2.2 Corrosion testing
The corrosion resistance of plastically deformed and non-deformed ZM-coated samples in salt spray test according to DIN EN ISO 9227 was studied. Before exposure the samples went through an alkaline cleaning step (Ridoline C72W, pH 13.60°C). As specified in the standard a 5 wt.% sodium chloride solution, regulated top pH 6.71 by adding sodium hydroxide, was sprayed via nozzles into an Erichsen salt spray chamber at a constant temperature of 34.5°C ± 0.5°C. The test panels were arranged on a plastic sample holder at an angle of 20° to vertical. The volume of the sprayed salt solution was measured once a week by using a cone (diameter 100 mm, which corresponds to a collecting area of 80 cm²) on a measuring cylinder collecting a defined fraction of the salt solution for a period of 24 hours. During the entire test the volume of the collected solution was 39 ml ± 3.5 ml / 24 h, which conformed to standards. The total test duration was 1000 hours. After the corrosion testing the panels were rinsed with deionised water and air dried.

2.3 Characterisation of corroded samples
Prior the investigation of the plastically deformed ZM coated samples the aluminium rich protecting layer formed on the non-deformed samples when exposed to salt spray test was characterised by XRD. For this purpose a ZM coated sample which was scraped off carefully to expose the underlying Al-rich layer was further characterised by XRD to determine the chemical composition. For this purpose a ZM coated sample which was exposed to salt spray test for 900 h was used. The surface white corrosion products were scraped off carefully to expose the underlying Al-rich layer for the XRD analysis. The X-Ray diffraction response is shown in Figure 4.

Miscellaneous zinc corrosion products like zinc hydroxychloride and zinc hydroxy carbonate can be identified on the sample surface. This implies that some residual white corrosion products remain on the sample. The Al-rich layer can be identified as zinc aluminium hydroxy carbonate, Zn₅Al₃(OH)₆(CO₃)₄·H₂O, being assigned by three peaks, in Figure 4. These findings correlate with those of Tsujimura et al [9], who exposed a zinc alloy coating consisting of 6 wt.% Al and 3 wt.% Mg to a cyclic corrosion test and also detected a zinc aluminium hydroxy carbonate species. However they also assumed that this species also contained a significant amount of magnesium, which is contrary to our findings.

3. Results and discussion
3.1 Samples without plastic deformation
Figure 2 shows ZM coated steel sheet without plastic deformation after different times of exposure to salt spray test. The sample surface is covered slightly with white corrosion products. Red rust cannot be detected after 1000 h of exposure to salt spray test. It should be noted that conventional hot-dip galvanised steel sheet with a similar coating thickness of about 7μm exhibits signs of attack of the steel substrate after only 100 h of exposure to salt spray test. The reason for the enhanced corrosion performance of the ZM coating compared to the conventional hot-dip coating is the formation of an aluminium rich protection layer, which is formed upon the steel substrate even after short exposure times. The Al-rich layer inhibits a corrosive attack of the underlying steel. An SEM micrograph and an EDS spectrum of that particular layer is shown in Figure 3. The Al-rich layer was further characterised by XRD to determine the chemical composition. For this purpose a ZM coated sample which was exposed to salt spray test for 900 h was used. The surface white corrosion products were scraped off carefully to expose the underlying Al-rich layer for the XRD analysis. The X-Ray diffraction response is shown in Figure 4.

Figure 5 shows SEM micrographs of the cross section and the surface of ZM coated steel sheet after straining to 5%, 10% and 15% of plastic deformation, respectively. It is seen that even after a plastic deformation of 5% cracks are clearly evident. The cracks do not yet reach the steel substrate and possess a maximum width of 1μm.
For samples strained to 10% plastic deformation the number of cracks in the metallic coating increases considerably. Also the width of the cracks detected increases with the level of plastic deformation. They possess a maximum width of a few microns and have propagated to the steel substrate. On samples strained to 15% plastic deformation a further increase in the number of cracks can be observed. There exist some very broad cracks which are surrounded by regions with only narrow cracks. In some cases the cracks reach the steel substrate. In all cases the cracks occur preferentially in the intermetallic \( \text{MgZn}_2 \) phase since this phase is known to be very brittle [18].

Figure 6 shows photographs of the strained ZM coated samples after different exposure periods to salt spray test. Even though the metallic coating already possesses cracks which reach the underlying steel substrate the first appearance of red rust is not observed until relatively long exposure times. On samples which were strained to 15% plastic deformation red rust is not observed until 700 h of exposure to salt spray test. On samples with a level of plastic deformation of 5% and 10%, respectively, red rust appears after an exposure times of 800 h. Despite the large number of cracks the metallic coating still provides high corrosion resistance and is able to protect the steel substrate against corrosive attack for a relatively long period of time.

In this study the influence of cracks in the coating on the corrosion behaviour was also investigated by analysing sample cross-sections with SEM and EDS. Figure 7 shows SEM micrographs and EDS spectra of plastically deformed ZM coated specimen after 100 h exposure to salt spray test. The corrosion behaviour is quite similar for all the different levels of plastic deformation and comparable to that of the unstrained ZM coating. Previous studies [15,16] of the corrosion behaviour of ZM coated steel without plastic deformation showed that during the exposure to salt spray test \( \text{MgZn}_2 \) corrodes preferentially. This is also the case for plastically deformed ZM coated samples. Given that most cracks can be found in the intermetallic \( \text{MgZn}_2 \) phase, this might be the reason why the cracks do not seem to unduly influence the corrosion behaviour of the coating. Since the crack-rich \( \text{MgZn}_2 \) regions corrode preferentially the Al-rich layer is formed even after a short period of exposure thereby preventing attack of the underlying steel substrate.

Figure 8 shows an SEM micrograph of a ZM coated steel sample which was strained to 10% plastic deformation and exposed to salt spray test.
spray test for 600 h. The EDS analysis suggests that cracks in the metallic ZM coating may close during exposure as Al-rich corrosion products fill the cracks. Even after short exposure times most cracks appear closed by this mechanism and the Al-rich protective layer acts in the same way as it does for samples without plastic deformation. Hence attack of the steel substrate is retarded since the dense, compact Al-rich layer is formed.

3.3 Plastic deformation after corrosive exposure

In the previous section the influence of cracks in the metallic ZM coating on corrosion behaviour was investigated. In this section the influence of cracks in the Al-rich protection layer on corrosion behaviour is evaluated. For this purpose the ZM coated steel samples were exposed to salt spray test for 500 h prior plastic deformation. After they were exposed to salt spray until the first appearance of red rust.

Figure 9 shows SEM micrographs of a sample cross section after 500 h exposure to salt spray test and subsequent plastic deformation. Some residual metallic ZM coating can be found in the form of zinc dendrites. However almost all the metallic ZM coated is corroded and the Al-rich layer covers the steel substrate. The plastic deformation of the corroded ZM samples induces a large number of cracks in the Al-rich layer even when the magnitude of plastic deformation is low. At high deformation levels the Al-rich layer is seen to partially flake off.

Figure 10 shows the plastically deformed and corroded ZM coated samples before and after exposure to salt spray for different times where it was noted that white surface corrosion products flake off during the deformation process. ZM samples which were strained to 5% plastic deformation show the first appearance of red rust after 300 h of exposure. Although the plastic deformation produces many cracks in the Al-rich protection layer, it is still able to provide a sufficient corrosion protection to inhibit the corrosive attack of the steel substrate. Given the fact that the sample was pre-exposed to the salt spray environment for 500 h prior to deformation the samples withstand a total exposure period of 800 h. In the case of samples strained to 10% or 15% plastic deformation the first appearance of red rust is seen at 200 h, indicating resistance to red rust formation of a total of 700 h.

This shows that samples with both plastic deformation before and after exposure show similar times to red rust. Even if the Al-rich
The slight decrease in red rust resistance for plastically deformed samples (before and after exposure) compared to samples without plastic deformation might be due to mechanical effects, notably a thinning of the metallic ZM coating. It is postulated that during plastic deformation the dimensions of the steel substrate change, as does the dimension of the coating. In effect when the steel is stretched the overall volume must remain the same hence the thickness of the substrate and coating must decrease slightly. Thus there is a small change in the availability of coating to sacrificially protect the steel.

4. Conclusion

ZM coated steel without plastic deformation exposed to salt spray test shows enhanced corrosion resistance compared to conventional hot-dip galvanized steel due to the formation of a dense, compact Al-rich layer. Using XRD this protecting layer was identified as zinc aluminium hydroxycarbonate, Zn₆Al₂(OH)₁₆CO₃·₄H₂O.

ZM coated samples which were strained to 5%, 10% and 15% of plastic deformation, respectively, show cracks of varying size and depth depending upon the degree of deformation. These cracks are associated with the brittle inter-metallic MgZn² phase. However these cracks can close during the subsequent exposure to salt spray due to the formation of a dense, compact Al-rich protective layer. The formation of this layer gives rise to corrosion protection of up to 700-800 h. The influence of cracks in the Al-rich layer was studied using ZM coated samples which were exposed to salt spray test for 500 h prior to the plastic deformation. In this case the cracks in the Al-rich layer can close and the first appearance of red rust is retarded. The total time (500 h exposure time after plastic deformation) until the first appearance of red rust was also about 700-800 h. The slight decline in red rust resistance of plastically deformed samples (before and after corrosive exposure) compared to samples without any plastic deformation might be caused by a small reduction in metallic ZM coating thickness.

Figure 7. SEM micrographs and EDS spectra of ZM coated steel with a defined plastic deformation after 100 h exposure to salt spray test; (a) slight corrosive attack, (b) heavy corrosive attack.

Figure 8. SEM micrograph and EDS spectra of ZM coated steel strained to 10% of plastic deformation after 600 h exposure to salt spray test.

Figure 9. SEM micrographs of corroded ZM coated steel samples after defined plastic deformation; (a) 5% of plastic deformation, (b) 10% of plastic deformation, (c) 15% of plastic deformation.
5. References


[8] O. Bendick, M. Keller, M. Meurer, E. Nabefeld-Arnold, S. Zeiinger(ZMgEcoProtect® - neue Beschichtung für einen hochwertigen KorrosionschutzTysenkrupp techforum, 1/2008, pp. 16-21


METALLOGRAPHIC LAB EQUIPMENT PRODUCER APPOINTS APTEX LTD TO DISTRIBUTE IN THE UK

Major metallographic laboratory equipment producer, ATM GmbH has appointed Aptex Ltd to distribute its range of sample preparation equipment and consumables in the UK.

The ATM range includes precision and abrasive cut-off machines, mounting presses, grinding, polishing and etching machines and hardness testers. Ancillary products include image analysis hardware and software and microscopes. Available as single machines or as combined elements, such as Systemautomat, which automates the grinding and polishing processes of the specimen preparation process, all ATM equipment has been designed for building into integrated laboratory systems.

Says Aptex Managing Director, Steve Bradley, “We specialise in sample preparation, image capture and analysis for the metallurgical and materials industries. Being appointed to distribute ATM’s equipment gives us an extended and total supply capability for independent laboratories and for in-house laboratories at materials producers and processors. Preparation equipment is the ideal complement to our existing ranges of Akasel material polishing and grinding products and Clemex Technologies’ computerised image analysis systems.”

Key to the new supply capability are the ATM ‘Brillant’ wet abrasive, sectioning and cut-off machines, produced either as standard machines or custom built. They are available in a range of sizes including machines for small and precision parts, thin section cutting or precise serial sectioning and with manual or automatic cutting feeds. Computerised controls allow for networking with laboratory PC’s and for cutting parameters to be stored and recalled as required.

Several machines have unique wheel movements for difficult to cut parts, geometries or materials. All machines are built to high quality and international standards and are constructed from welded steel and powder coated aluminium plate.

For further information from: Aptex Limited, P.O. Box 14337, Solihull, West Midlands B93 3DW. Telephone: 01564 206393 Fax: 0870 4790595 Website: www.aptex.co.uk

SURFACE WORLD & CORREX 2011

The UK’s only international showcase for the product finishing, surface engineering and corrosion control markets - SURFACE WORLD & CORREX 2011 - will take place at the NEC, Birmingham, from Tuesday 1st to Thursday 3rd November 2011.

Held every two years, this dual event provides you with a major opportunity to promote your latest products and services to potential buyers from around the globe.

Stands are realistically priced to suit any marketing budget, so book your place now before your competitors beat you to it!

visit the Icorr website www.icorr.org
Surface World 2011 will run alongside Correx - the national corrosion conference and exhibition.

Correx 2011 will be a major event in the UK corrosion industry - aimed at everyone interested in coatings and cathodic protection: engineers, specifiers and practitioners.

Conferences, workshops, courses and seminars will run in tandem with the exhibitions.

It’s the finish that helps sell your product - come and see the UK’s only international showcase for the product finishing, surface engineering and for the first time the corrosion control markets. All the leading surface finishing suppliers all under one roof over 3 days.

All this will ensure that Surface World 2011 with Correx 2011 will be the biggest event in the surface treatment, coatings and finishing industry for many years.

For more information contact Nigel Bean on:
Tel: +44 (0)1442 826826
E-mail: nigelbean1@aol.com
or visit the website at:
www.surfaceworldshow.com

FREE ENTRY
www.surfaceworldshow.com
METALLISATION HAS LAUNCHED A NEW DURABLE NON-SLIP COATING

Metallisation Ltd has launched a new durable non-slip coating. 28E ARCTEC coating is ideal for use on steel floors, decks and panels across diverse industries, from train steps to oil platforms.

Untreated these steel surfaces can become very slippery, especially in wet conditions, and are prone to corrosion. To ensure safe walking and industrial operating conditions, vital to personal safety and corporate productivity, 28E ARCTEC coating provides a durable non-slip anti corrosion coating.

Traditionally, steel structures are hot dip galvanised, or painted, to protect against corrosion. The disadvantage of hot dip galvanising is that the surface can become slippery and it does not easily accept paint without the need for special primers. Painting this type of surface, which is sometimes applied with grit inclusions, also has its disadvantages. The surfaces can degrade quickly in heavy use, resulting in corrosion and an increased slip hazard.

Many large steel structures, including oil platforms, refineries and bridges, have been routinely protected against corrosion by thermal spray aluminium (TSA), zinc or an alloy of the two. While providing unrivalled corrosion protection in very aggressive corrosive environments, pure TSA is not durable enough to prevent long term wear on floor plates. Ideally, steel structures need a durable coating that protects against both slip and corrosion and that’s exactly what the new Metallisation 28E ARCTEC coating does.

28E ARCTEC coating is a thermally sprayed coating that can be applied with a rough texture and has excellent non-slip properties, while being extremely hard and resistant to wear. The new coating provides:

- A suitable level of grip, to avoid personal slips or industrial skidding
- Comparable corrosion protection to aluminium, as used in aggressive environments
- Easy application by a long-standing process, covered by international standards

The resultant coating is corrosion resistant and because of its durability, site owners can be confident that once applied, they can forget rust or slipping for many years.

To prove the durability of this heavy duty coating, Metallisation has completed many tests in the development of 28E ARCTEC wire and coating. These included non-slip, durability and corrosion testing.

28E ARCTEC coatings have been tested for non-slip and durability using a Pendulum Coefficient of Friction (CoF) tester, in accordance with independent British Standards and UK Health and Safety Executive (HSE) guidelines. These guidelines suggest that a floor coating with a Pendulum Test Value (PTV) greater than 36 will have a low slip potential in pedestrian areas. To test the coatings the plates were sprayed to produce a surface texture that would wear well, but not too rough for pedestrian surfaces. If the surface has too much grip in pedestrian areas it can cause a trip hazard.

To prove the durability of the coating, the coated plates were walked on by a standard shoe on a robotic walking machine. The plate was rotated after each step to simulate walking in a straight line and around corners. The PTV was checked before walking and again after 250,000, 500,000, 750,000 and 1 million steps. Both sealed and unsealed plates were tested in wet and dry conditions.

The Pendulum Test Values obtained in accordance with BS7976-2:2002, highlighted significant results. The unsealed plates initial wet PTV was 75 and after 1 million steps it had reduced to 41. Whereas the sealed plate’s initial wet PTV was 66 and after 1 million steps it had only reduced to 58. Testing in dry conditions achieved similar results, with a dry PTV of 80 down to 64 for unsealed plates and 72 down to just 68 on the sealed plates.

The 28E ARCTEC coating has also undergone a range of accelerated corrosion testing. This offers a comparison of the performance between the new coating and 99.5% aluminium. An independent research laboratory undertook two tests: Galvanic corrosion tests for one week and neutral salt spray corrosion tests for 1,000 hours.

The salt spray tests were performed in accordance with ASTM B117. The test results confirmed that the corrosion protection offered by 28E ARCTEC coating was comparable to 99.5% aluminium. These results give the confidence that the new coating will provide the same high standard of corrosion protection that aluminium has been doing around the world for several decades.

A recent example of the 28E ARCTEC coating in use can be seen on a twin-platform, offshore LNG platform installation, which has an inter-connecting bridge. Following extensive evaluation of non-slip coatings, 28E ARCTEC wire was chosen as the preferred coating to be applied to the bridge deck surface, because of its non-slip durability and corrosion protection.

28E ARCTEC coating was also chosen to treat the ramps used by forklift trucks to load and unload containers. The ramps can be very slippery in wet conditions and are often salt treated in winter. After one year there has been no visible rusting of the steel substrate. Feedback from the forklift operators report a higher level of confidence when climbing the ramp and confirmation that they managed to safely and successfully load all lorries in wet conditions.

In addition to supplying the new 28E ARCTEC wire, Metallisation offers a complete range of thermal spray equipment to apply the finished coating.

<table>
<thead>
<tr>
<th>Cycles Completed</th>
<th>Un-sealed sample</th>
<th>Sealed sample (epoxy)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pendulum Test Value Dry</td>
<td>Pendulum Test Value Wet</td>
</tr>
<tr>
<td>Initial</td>
<td>80</td>
<td>75</td>
</tr>
<tr>
<td>250,000</td>
<td>66</td>
<td>50</td>
</tr>
<tr>
<td>500,000</td>
<td>65</td>
<td>49</td>
</tr>
<tr>
<td>750,000</td>
<td>64</td>
<td>43</td>
</tr>
<tr>
<td>1,000,000</td>
<td>64</td>
<td>41</td>
</tr>
</tbody>
</table>

For more information on the new 28E ARCTEC wire and coating contact Stuart Milton, Sales and Marketing Manager, +44 (0) 1384 252 464 or visit www.m metallisation.com
BELZONI BOAT RACE KICK STARTS 2011

On Thursday 6th January 2011, leading protective coating and polymer repair composite solution provider Belzona Polymerics demonstrated the outstanding performance of their waterproofing products. Belzona Polymerics displayed their confidence by coating a ‘Belzona Cardboard Boat’ in their water based, weather proofing products and despite the wintery conditions set it a sail across the lake at Ripley Castle, Harrogate.

Belzona’s highly trained engineers designed and created the ‘Belzona Cardboard Boat’ to prove that the water based roofing membrane was completely waterproof and would not breakdown under immersion in water. The frame was built using cardboard boxes; the joints were then bandaged over using Belzona SuperWrap resins and reinforcing sheet to give the boat some rigidity. The boat was then fully coated using Belzona 3111 (Flexible Membrane), a solvent free microporous coating primarily used for the long term repair and protection of all types of roofs.

The ‘Belzona Cardboard Boat’ successfully sailed across the lake leaving its competitor (an uncoated replica) to completely collapse and sink to the bed of the lake. The Belzona water based products were selected to demonstrate the products versatility and ability to resist water whilst offering a ‘breathable’ coating. The system is not only suitable for use on pitched and sloped roofs but is also effective on roofs subject to ponding.

Belzona is not just a product manufacturer but can provide a complete supply and apply package through its contracting network specifically created to provide clients with direct access to Belzona quality products, specialist application services, inspection services and supervision from a single source. It is Belzona’s mission to meet specialist repair and maintenance needs in its target industries and markets worldwide.

For further information from: Belzona Polymerics Limited, Claro Road, Harrogate, HG1 4DS
Tel: 01423 567641  Fax: 01423 505967  Website: www.belzona.com

SELF-PRIMING, MAG-DRIVE PUMP RANGE EXTENDED

The Finish Thompson SP series of magnetic drive, self-priming centrifugal pumps have been extended following the addition of two new models which results in a significantly increased performance envelope across the range. The SP10 and SP22 pumps provide maximum flow rates of 12 m$^3$/hr and 45 m$^3$/hr respectively and maximum discharge heads of 13 metres and 37 metres.

Available from MICHAEL SMITH ENGINEERS FTI SP pumps provide a fast, powerful, yet economical performance with optimum versatility and because of their innovative design and corrosion-resistant materials are able to withstand the rigours of the most challenging applications.

SP pumps combine deep lift capabilities (up to 7.6 metres) and fast priming (5.5 metres in 90 seconds) with the important advantages of magnetic drive technology, such as no seals to replace, no leaks and the capability to run-dry without damage.

As well as their superior lift and high working pressure capabilities, they are ideally suited to handling fluids with high specific gravities up to 1.8, such as sulphuric acid, phosphoric acid and sodium and potassium hydroxide. Reliable, low-maintenance and safe operation is also assured thanks to the SP Series magnetic drive technology.

The pumps are available in a choice of Polypropylene or PVDF which results in a tough and durable, corrosion resistant pump. Maximum operating temperatures are 82°C for the polypropylene version and 104°C for the PVDF version.

SP Series pumps can be mounted to most standard motors, while NPT or BSP threads, adjustable flanges or union connections make it easy to connect to most process systems resulting in reduced installation cost and time.

Typical applications include sump emptying, transferring from underground storage tanks and tanker trucks, pumping in systems that are liable to have trapped or entrained air or in process systems where run-dry protection is needed.

For further information from: Michael Smith Engineers Ltd, Oaks Road, Woking, Surrey, GU21 6PH, U.K.
Tel: FREEPHONE 0800 316 7891  Fax: 01483 723110  Website: www.michael-smith-engineers.co.uk
THE CHEMICALS DON’T WORK… OR DO THEY?

THE SITUATION

Imagine the following. Poor, non-effective cleaning is occurring in a pre-treatment plant and this is resulting in quality control rejects or worse still, customer complaints. The actual root cause of the problem is due to worn, clogged or poorly aligned nozzles, but this is unknown at the time.

THE WRONG DIAGNOSIS AND THE CONSEQUENCES

It is decided that the problem must be something to do with the chemicals being used. Perhaps a new batch is being used just before the problems started? So the problem is “remedied” by either increasing the flow rate or increasing the concentration of chemical cleaner used and this seems to solve the problem for while. The nozzle of course continues to ware or becomes even more clogged, so the problem re-occurs some time afterwards. The operating costs have increased as chemical usage has increased, and quite literally, money is being poured (or sprayed) away. Also, the chemical supplier is probably taking some flak unfairly!

THE SOLUTION

Whilst it may seem logical to blame a poor batch of chemicals it would perhaps have been advisable to look at the spray set-up / nozzles as well. Nozzles actually wear out far quicker than most people think, particularly if the manufacturing quality of the nozzle is not to a high enough standard. However, it’s often the case that the down-time and inconvenience associated with checking and replacing a nozzle arrays deters many maintenance managers from checking this equipment.

The main reason for a plant maintenance manager being dissuaded from doing a nozzle audit is the length of time and effort required. The nozzles need to be taken out, put back in and then re-aligned, which is of course all down time.

Also, the thought of replacing nozzles in a pre-treatment tunnel is not the most pleasant way to spend a day. This being the case it can be tempting to blame the chemicals for the problem instead of tackling the possible root cause. At the very least there is a strong temptation to put off investigating the condition of the nozzles.

If left unchecked, this situation can lead to the real cause of the problems going undiagnosed for considerable lengths of time and possibly leading to more serious problems later. If a problem with the chemicals is incorrectly suggested then increasing chemical flow rates or concentrations may be a temporary “solution” to the problem, even if it’s actually a nozzle problem. However, this “solution” will provide false validation of the erroneous diagnosis and hence the real issue will remain unaddressed. However, the reality may be that if the sheer hassle and effort involved is putting maintenance managers off checking their nozzle array. So how can this hassle be reduced? Some simple tips might include.

COLOUR CODING

Spotting the difference between a 45° spray and 55° spray tip is almost impossible at the best of times. If you have been sent the wrong product or they have somehow been mixed up in your store room, when would you spot the error?

For most the honest answer is “When it’s too late” i.e. when spraying starts. But what if the different spray tips and nozzles where made from different coloured plastics? It’s a very simple idea but one that can really make a difference.

UP-GRADE TO A QUICK RELEASE TIPS SYSTEM

Often it’s just the nozzle tip that needs replacing, although most nozzles will then require re-aligning. For example, quick tip release system nozzles are available allowing nozzles tips to be snapped in and out at the exact same angle so there is no need for re-alignment. This dramatically reduces the time and hassle of changing over nozzles.

Good practice is to have a complete spare set of tips and nozzle holders that are always maintained in top condition. These can then be quickly snapped into place. The old set can then be checked, cleaned and any worn ones can be re-ordered so that the spare set is ready to be reused.

CALL IN EXPERT HELP

Whilst it’s unlikely that a nozzle supplier will be one of your key business relationships it is still worth cultivating a good dialogue. The nozzle business is specialist and wide ranging and offers a tremendous amount of expertise to be tapped into. If you find the right company they should be more than happy to share that expertise with you. It is in their interests to help you, after all if they help solve a problem for you then when will you buy your nozzles from? Also, ask your nozzle supplier if they can offer any advice on the upstream elements of the spray system. For example, a good supplier will generally have expert advice on, or in some cases can even supply, complete riser systems and pipe work. It’s worth asking the question as, again. It’s in their interests to help with some ‘free’ engineering help.

BUY A QUALITY PRODUCT TO BEGIN WITH

Nozzles are one of those components that really are not worth skimping on. The cost of the chemicals being sprayed far out weights the cost of the nozzle. Even a small degradation on performance quickly eliminates any price differential between the cheaper products and the quality products. Nozzles are a relatively low cost component but if they do go wrong the knock-on costs can be high, so why take that risk to shave off a few pence?

Nozzle and spraying system specialists BETE Ltd offer over 20,000 different ‘nozzle’ products and this combined with their specialist technical knowledge, means they can provide the best solution and quickly. For example, they understand that manufacturers may need a replacement nozzle fast and thanks to their investment in state-of-the-art order processing and warehouse management technology they can deliver the next day, or even the same day if it’s really urgent. Also, no minimum order values are required, so if you only need one nozzle, BETE will deliver ONE nozzle!

BETE nozzles are used extensively across a wide range of industries for numerous applications. For example; cleaning processing machinery, screen washing, cooling hot gases, extinguishing fires, neutralising micron-size pollutants, coating delicate electronics, and applying colours and flavourings.
DENSOCLAD SYSTEM CHOSEN FOR DOW CORNING CHEMICALS PROCESS PIPES

Blastpride (Holdings) Ltd of Cardiff are protecting thirty pipe lengths for a UK Dow Corning Chemicals plant with a Winn & Coales Densoclad system. The 20 inch diameter pipe lengths, which will be buried, are in six and eight metre lengths.

The pipes are first shot blasted to SA 2.5 50-75 profile and then spray coated with Denso primer. This is then followed with the application by a wrapping machine of Densoclad 50 Tape followed by a pvc outerwrap.

Densoclad Tape is specifically designed for giving maximum corrosion protection to buried or immersed pipes and fittings and has outstanding resistance to cathodic disbanding. Earlier this year Winn & Coales launched an improved version which particularly aids a 55% overlap of the tape by printing details as a guide to follow in overlapping. This speeds up application, improved accuracy and reduces wastage.

DENSO PROTECTS TIE BARS AT NEW LOCH RYAN PORT

Stena Line has made a £50m investment in creating the new port on Loch Ryan, north of Cairnryan, for its Scotland to Belfast route. Including new ferries, Stena’s total investment for the route is £200m.

The main contractors for the Cairnryan contract, Belfast based McLaughlin and Harvey Ltd, have been using Winn & Coales Denso Tape SA PVC to provide a dual wrap protection to the 60 tie bars used in the construction of the port’s sheet piled walls. Macalloy Ltd, the supplier of the tie bars, applied the Denso dual wrap at its Sheffield works prior to sending them to the site, where McLaughlin and Harvey applied additional Denso Tape to the couplings which were installed in situ.

WINN & COALES INTERNATIONAL LTD MEET THE QUEEN

On Monday the 19th of July, Executive Directors of Winn and Coales International Ltd; Brian Dunsterville and Chris Winn attended a special reception at Buckingham Palace to meet Her Majesty, The Queen. This special occasion was in honour of the company’s latest achievement; winning a prestigious Queen’s Awards for Enterprise.

Leading manufacturers of anti-corrosion and sealing products, Winn and Coales International won the award for International Trade. This award recognises the substantial growth in sales across the globe, despite the worst recession for forty years. This result is a direct reflection of the quality, hardwork and dedication that all the staff at Winn and Coales International group put into the products and services they offer to their clients.

“I am extremely proud of the consistent innovation that Winn and Coales International Ltd demonstrates. Receiving the Queens Award and meeting Her Majesty The Queen was a privilege and a career highlight.” Brian Dunsterville - Executive Director.

For further information from:
Winn & Coales (Denso) Ltd,
Chapel Road, London SE27 OTR Tel: 020 8670 7511
Fax: 020 8761 2456 e-mail: mail@denso.net
Website: www.denso.net
CATHODIC PROTECTION CONSULTANCY SERVICES

CORROSION CONTROL
3 Ivy Court, Acton Trussell, Staffordshire ST17 0SN
Tel: 01785 711560 Fax: 01785 711561
Email: brianwyatt@controlcorrosion.co.uk
www.controlcorrosion.co.uk

CUMBERLAND CATHODIC PROTECTION LTD
GO2 & GO3 The Bridgewater Complex, Canal Street, Bootle L20 9AH
Tel: 0151 5500015 Fax: 0151 5500016

PRO-TECH CP LTD
76A Gardner Road, Formby, Merseyside L37 8DQ
Tel: 07717 487632 Fax: 01704 380194
Email: pmsmith@protechcp.com
www.protechcp.com

CATHODIC PROTECTION AND MONITORING

BAC CORROSION CONTROL LTD
Cathodic Protection and Pin Brazing Products & Services
Stafford Park 11, Telford, Shropshire, TF3 3AY UK
sales@bacgroup.com www.bacgroup.com
Tel: +44 (0) 1952 290321 Fax: +44 (0) 1952 290326

CONCRETE REPAIRS LTD
Cathite House, 23A Willow Lane,
Mitcham, Surrey CR4 4TU
Tel. 020 8288 4848
www.concrete-repairs.co.uk

CATHODIC PROTECTION CO LIMITED
55 YEARS OF EXCELLENCE
• Transformer Rectifiers CP Materials & Design
• "ELGARD" MMO Mesh anode licensed supplier,
• "CUPRION" Marine Anti Fouling
"THE ONE STOP CP SHOP"
Venture Way, Groatham, Lincolnshire NG31 7XS
Tel: +44 (0) 1476 590666 Fax: +44 (0) 1476 570605
Email: cpc@cathodic.co.uk www.cathodic.co.uk

CORROCELL LIMITED
17 South Meade, Maghull, Liverpool L31 8EG
Tel: 0151 249 8461 Fax: 087087 92585
Email: dp@corrocell.co.uk

Corrosion Control Services Ltd.
SPECIALISTS IN CATHODIC PROTECTION
6 Hollinswood Court, Stafford Park 1, Telford,
Shropshire TF3 3DE
Tel: 01952 230900 Fax: 01952 230906
Web: www.freyssinet.co.uk

CORROSION CONTROL PRODUCTS
Leaders in the Cathodic Protection Industry – Since 1957

INTERPROVINCIAL CORROSION CONTROL COMPANY LIMITED
930 Sheldon Court, Burlington, Ontario, Canada L7T 5K6
TEL: 1-905-634-7751 FAX: 1-905-333-4313
e-mail: contact@Rustrol.com
Website: www.Rustrol.com

CORROSION SERVICE COMPANY EUROPE LTD.
Asset Integrity Engineering
59–60 Thames Street, Windsor, Berkshire SL4 6BA
Tel: +44 (0) 1753 272119 Fax: +44 (0) 1753 272120
Email: sales@corrosionservice.co.uk
www.corrosionservice.co.uk

CORRPRO COMPANIES EUROPE LTD
Corrosion Engineering, Cathodic Protection,
Corrosion Monitoring
Cathodic Protection House, 4 Mill Court,
The Sawmills, Durley, Southampton SO32 2EJ
Tel: +44 (0) 1489 861980 Fax: +44 (o) 1489 861981
Email: ccel@corrpro.co.uk

DEEPWATER
Offshore Corrosion Control
Deepwater EU Ltd.
3 Huxley Road, Surrey Research Park, Guildford GU2 7RE
Tel: +44 (0) 1483 600482 www.stoprust.co.uk

Hockway has 30 years global experience supplying energy, utility and civil sector Operators and EPC Contractors with a bespoke range of cathodic protection systems
• Consultancy
• Engineering
• Manufacturing
• Turnkey Projects
• System health checks

Reader Enquiry: CM002
Reader Enquiry: CM010
Reader Enquiry: CM056
Reader Enquiry: CM056
Reader Enquiry: CM101
SUSTAINING MEMBERS

VolkerLaser Ltd
Henwick Mill, Martley Road,
Worcester WR2 6RG
Tel: 01905 742750  Fax: 01905 742751
Email: enquiries@laser-group.co.uk  Website: www.laser-group.co.uk

REMCO SYSTEMS LTD
Unit 7 Great Barr Business Park, Baltimore Road,
Great Barr, Birmingham B42 1DY
Tel: 0121 358 0007  Fax: 0121 358 8128
Email: phil@remcosystems.co.uk  www.remcosystems.co.uk

SILVION LIMITED
The Brambles, Grantham Road, Old Somerby,
Grantham, Lincs, NG33 4AB, UK
Tel: 01476 590932  Mob: 07872 857310
Email: sales@silvion.co.uk; rbritton@silvion.co.uk  Web: www.silvion.co.uk

MME GROUP
Materiaal Metingen Europe B.V, Rietdekkerstraat 16,
PO Box 4222, 2980 GE Ridderkerk, The Netherlands
Tel: +31 (0) 180 482 828  Fax: +31 (0) 180 462 240
Email: info@mme-group.com  www.mme-group.com

North East Corrosion Engineers Ltd
West Pitmitian Business Centre Foveran,
Ellon, Aberdeenshire
Tel: +44 (0) 1358 788116  Fax: +44 (0) 1358 789828
Email: sales@neceltd.com  www.neceltd.com

PENSPEN & GreyStar
CORROSION ENGINEERING AND CATHODIC PROTECTION FIELD SERVICES
Contact: David Eyre 0208 334 2700
e-mail d.eyre@penspen.com
or Peter Sinclair 01606 833 805
e-mail p.sinclair@greystaruk.com

R & R Corrosion Ltd
5 Broomiesburn Road,
Broomiesburn Industrial Estate, Ellon, Aberdeenshire AB41 9RD
Tel: 01358 729644  Fax: 01358 729655
Email: info@rrcorrosion.com  www.rrcorrosion.com
Reader Enquiry: CM102

MCPS LIMITED
Manufacturers of Aluminium, Magnesium and Zinc Marine and Offshore Sacrificial Anodes
Tel: +44 (0) 0191 4274573  Fax: +44 (0)0191 4274607
Email: sales@mcpsltd.co.uk  www.mcpsltd.co.uk

SILVION LIMITED
The Brambles, Grantham Road, Old Somerby,
Grantham, Lincs, NG33 4AB, UK
Tel: 01476 590932  Mob: 07872 857310
Email: sales@silvion.co.uk; rbritton@silvion.co.uk  Web: www.silvion.co.uk

TELEDYNE CORMON LTD
26-28 Decoy Road, Worthing West Sussex BN14 8ND
Tel: 01903 703603  Fax: 01903 854854
www.cormon.com

Reader Enquiry: CM008
COATING APPLICATORS

ALFRED BAGNALL & SON LTD
6 Manor Lane, Shipley, W.Yorks BD18 3RD
Tel: 01274 714800 Fax: 01274 530171
Email: info@bagnalls.co.uk
Website: www.bagnalls.co.uk

ALLTASK LTD
Alltask House, Commissioners Road, Medway City Estate, Strood, Rochester Kent ME2 4EJ
Tel: 01634 298000 Fax: 01634 298001
Website: www.alltask.co.uk

APB CONSTRUCTION (UK) LTD
Unit 3 Bramley Way, Hellaby Industrial Estate
Hellaby, Rotherham South Yorkshire S66 8QB
Tel: 01709 541000 Fax: 01709 541411
Email: gary.bentham@apbcon.co.uk

APB GROUP LIMITED
Ryandra House, Ryandra Business Park, Brookhouse Way, Cheadle, Stoke on Trent ST10 1SR
Tel: 01538 755377 Fax: 01538 755010

COASTAL PRESERVATION SERVICES LTD
Old Hambledon Racecourse, Wallops Wood Sheardley Lane, Droxford, Hampshire SO32 3QY
Tel: 01489 878845 Fax: 01489 878846
Email: coastal.preservation@btinternet.com
Website: www.coastalpreservation.com

CORROCOAT CORROSIONEERING
- Specialists in anti-corrosion engineering and corrosion protection
- Fast, efficient and economical solutions to corrosion-related problems
- Combining engineering skills and coating excellence for long term solutions
- Repair and refurbishment for components from pumps, pipes and valves through to tanks and vessels
- On-site teams and workshop-based facilities

DYER & BUTLER LTD
Mead House, Station Road, Nursling, Southampton, Hampshire SO16 0AH
Tel: 02380 742222 Fax: 02380 742200
Email: enquiries@dyerandbutler.co.uk
Website: www.dyerandbutler.co.uk

COATING APPLICATORS

F A CLOVER & SON LTD
INDUSTRIAL PAINTING CONTRACTORS SINCE 1917
Tel: 020 89486321 Fax: 020 89487307
Email: ian@cloverpainting.com

FAIRHURST WARD ABBOTS LTD
225 London Road, Greenhithe, Kent DA9 9RR
Tel: +44 (0)1322 387 000 Fax: +44 (0)1322 370235
Email: works@fwadart.co.uk Website: fwagroup.co.uk

GABRE (UK) LTD
9 Holme Road, Curraghmulfkin, Dromore, Tyrone BT78 3BX
Tel: 02882897950 Fax: 02882898303

GALCO STEEL LTD
HOT DIP GALVINIZERS & STEEL FABRICATORS
Tel: 01 4506671 Fax: 01 4566213
Email: info@galcosteel.ie

GARDWELL COATINGS LIMITED
Ellough Road, Beccles, Suffolk, NR34 7TE
Tel: 01502 712793 / 717200 Fax: 01502 711636
Email: sales@gardwellcoatings.co.uk Website: www.gardwellcoatings.co.uk

GEMINI CORROSION SERVICES LTD
Spurryhilloch Industrial Estate, Broomhill Road, Stonehaven A839 2NH
Tel: 01569 765488 Fax: 01569 766315

Hankinson
PAINTING GROUP Blasting & Protective Coatings Division
- Blasting
- Scaffolding and encapsulation
- ISO9001 and NHSS19A accredited
- ISO14001 accredited
- Award winning safety and training standards
- National coverage

Reader Enquiry: CM015
COATING APPLICATORS

SHUTDOWN MAINTENANCE SERVICES LIMITED
Tel: 01634 256969  Fax: 01634 256616
Email: smsttd@btconnect.com
Website: www.shutdownmaintenanceservices.co.uk

SITE COAT SERVICES LTD
Unit 11, Old Wharf Road, Grantham, Lincolnshire NG31 7AA
Tel: 01476 577 473  Fax: 01476 577 642
Website: www.sitecoat.com

SPECIALISED COATINGS LTD
Mile Cross Works, Gibbet Street, Halifax, West Yorkshire, HX1 4JQ
Tel: 01422 356752  Fax: 01422 344558

TEES VALLEY COATINGS LIMITED
Unit 26, Dawson Wharf, Riverside Park Road, Middlesbrough TS2 1UT
Tel: 01642 228141
Email: sales@teesvalleycoatings.co.uk
Website: www.teesvalleycoatings.com

WALKER CONSTRUCTION (UK) LIMITED
Park Farm Road, Folkestone, Kent CT19 5DY
Tel: 01303 851111  Fax: 01303 259439
Email: admin@walter-construction.co.uk

WATSON STEEL STRUCTURES LTD
Lostock Lane, Lostock, Bolton BL6 4BL
Tel: 01204 699999  Fax: 01204 694543
Email: dave.swift@watsonsteel.co.uk

WEDGE GROUP GALVANIZING LTD
Stafford Street, Willenhall, West Midlands WV13 1RZ
Tel: 0845 271 6082
Email: info@wedge-galv.co.uk
Website: www.wedge-galv.co.uk

W G BEAUMONT & SON LTD
INDUSTRIAL PAINTING CONTRACTORS
Unit L1, Chadwell Heath Industrial Park, Kemp Road, Dagenham RM8 1SL
Tel: 020 85908523  Fax: 020 85909885
Email: tom.costello@wgbeaumont.co.uk

WILLIAM HARE LTD
Brandleholme House, Brandleholme Road, Bury BL8 1JJ
Tel: 0161 609 0000  Fax: 0161 609 0468
Email: jeff.grundy@hare.co.uk  www.williamhare.co.uk

CONSULTANTS TESTING AND INSPECTION

ATKINS LTD
Woodcote Grove, Ashley Road, Epsom, Surrey KT18 5BW
Tel: 01372 726140  Fax: 01372 740055
Email: iain.wesley@atkinsglobal.com
CARBOLINE
Offshore and Onshore protection, Waste water treatment plants, Specialist pipeline treatments, Environmentally friendly products
Tel: 07712 768411 Fax: 01475 529893 www.carboline-europe.com

CORROCOAT
CORROSIONEERING
- Extensive range of high technology coating systems and composites
- Specific range of coating systems
- Focus on R&D and technical support
- Low VOC levels with little or no solvent content for reduced atmospheric pollution
- Effective single coat solutions available
- Increasingly specified as the industry standard

CHEMCO INTERNATIONAL LTD
Units 3a & 3b, East Shawhead Industrial Estate, Coatbridge, Lanarkshire ML5 4LY
Tel: 01236 606060 Fax: 01236 606070

COUNTER CORROSION LTD
Formulators and Applicators of Customised Protective Coating and Lining Systems for Steel and Concrete
Tel: 01924 468559/380002 Fax: 01924 458019

HEMPEL PAINTS LTD
Llantarnam Industrial Park
CWMBRAN
Gwent NP44 3XF
Tel: 01633 874024 Fax: 01633 489012
Email: sales@hempelem.co.uk www.hempelem.com

INTERNATIONAL PAINT LIMITED
Stoneygate Lane, Felling, Gateshead, Tyne & Wear NE10 0JY
Tel: 0191 469 6111 Fax: 0191 496 0676
Email: simon.daly@internationalpaint.com
Website: www.international-pc.com

JOTUN PAINTS (EUROPE) LTD.
Stather Road, Flixborough, Scunthorpe, North Lincolnshire DN15 8RR
Tel: 01724 400 125 Fax: 01724 400 100
Email: decpaints@jotun.co.uk www.jotun.co.uk

LEIGHS PAINTS
MANUFACTURE AND SUPPLY OF SPECIALISED COATINGS
Tower Works, Kestor Street, Bolton BL2 2AL
Tel: 01204 521771 Fax: 01204 382115
www.leighspaints.co.uk

PPG PROTECTIVE & MARINE COATINGS
Micro House, Station Approach, Wood Street North, Alfreton, Derbyshire, DE55 7JR
Tel: +44 (0) 1773 837300 Fax: +44 (0) 1773 837302
Email: pmcsalesuk@ppg.com www.sigmacoatings.com/protective

SPENCER COATINGS LTD
Froghall Terrace, Aberdeen, AB24 3JN
Tel: 01224 788400 Fax: 01224 648116
Website: www.spencercoatings.co.uk

SPECIALTY POLYMER COATINGS INC
64 Tudor Avenue
Worcester Park
Surrey KT4 8TX
Tel: 020 8337 4953 Fax: 020 8337 4953
Website: www.spc-net.com

WIN & COALES (DENSEO) LTD
Dunne House, Chapleul Road, London SE27 0TR
Tel: 0208 670 7511 Fax: 0208 761 2456 Email: mail@denso.net Web: www.denso.net
A Member of Winn & Coales International
Established in 1883 - Over 125 Years Service to Industry

Reader Enquiry: CM015

Reader Enquiry: CM015

Reader Enquiry: CM015

Reader Enquiry: CM015
<table>
<thead>
<tr>
<th>Name</th>
<th>Address</th>
<th>Telephone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alltask Limited</td>
<td>Alltask House, Commissioners Road, Strood,</td>
<td>01634 298000</td>
</tr>
<tr>
<td></td>
<td>Kent, ME2 4E</td>
<td></td>
</tr>
<tr>
<td>Alfred Bagnall &amp; Sons</td>
<td>6 Manor Lane, Shipley, West Yorkshire, BD18</td>
<td>01302 853259</td>
</tr>
<tr>
<td></td>
<td>3RD</td>
<td></td>
</tr>
<tr>
<td>APB Construction (UK)</td>
<td>Unit 3, Bramley Way, Hellaby Industrial</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Estate, Hellaby, Rotherham, S. Yorkshire,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S66 8QB</td>
<td>01709 541000</td>
</tr>
<tr>
<td>APB Group Limited</td>
<td>Ryandra House, Ryandra Business Park,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Brookhouse Way, Chaddle, Staffs, ST10 1SR</td>
<td>01538 755377</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Armourcote Surface Technology Plc</td>
<td>15/17 Colvilles Place, Kelvin Industrial</td>
<td>01355 248223</td>
</tr>
<tr>
<td></td>
<td>Estate, East Kilbride, Scotland, G75 0PZ</td>
<td></td>
</tr>
<tr>
<td>Austin Hayes Ltd</td>
<td>Carlton Works, Cemetery Road, Yeadon,</td>
<td>0113 250 2255</td>
</tr>
<tr>
<td></td>
<td>Leeds, LS19 7BD, UK</td>
<td></td>
</tr>
<tr>
<td>Beever Limited</td>
<td>Little Coldharbour farm, Tong Lane,</td>
<td>01892 890045</td>
</tr>
<tr>
<td></td>
<td>Lamburthert, Kent, TN3 8AD, UK</td>
<td></td>
</tr>
<tr>
<td>Briton Fabricators Ltd</td>
<td>Watnall Road, Hucknall, Notts, NG15 6EP</td>
<td>0115 963 2901</td>
</tr>
<tr>
<td>Cameron Limited</td>
<td>Queen Street, Stourton, Leeds, LS10 1SB, UK</td>
<td>0113 276 4389</td>
</tr>
<tr>
<td>Cape Industrial Services</td>
<td>Cape House, 3 Red Hall Avenue, Paragon</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Business Village, Wakefield, WF1 2UL</td>
<td>01224 215800</td>
</tr>
<tr>
<td>Cleveland Bridge UK Ltd</td>
<td>Cleveland House, Yarm Road, Darlington,</td>
<td>01325 502345</td>
</tr>
<tr>
<td></td>
<td>DL1 4DE</td>
<td></td>
</tr>
<tr>
<td>Coating Services Ltd</td>
<td>Partington Street, Mumps Bridge, Oldham,</td>
<td>0161 665 1998</td>
</tr>
<tr>
<td></td>
<td>OL1 3RU, UK</td>
<td></td>
</tr>
<tr>
<td>Coollis Engineering Railway Contracts</td>
<td>Salcombe Road, Meadow Lane Industrial Estate,</td>
<td>01773 833255</td>
</tr>
<tr>
<td></td>
<td>Alfreton, Derbyshire, DE55 7RG</td>
<td></td>
</tr>
<tr>
<td>Community Clean</td>
<td>11 Old Forge Road, Ferndown Industrial Estate,</td>
<td>0845 6850133</td>
</tr>
<tr>
<td></td>
<td>Ferndown, Wimborne, Dorset, BH21 7RR, UK</td>
<td></td>
</tr>
<tr>
<td>Concrete TS Ltd</td>
<td>Unit B2 (2), Moss Industrial Estate, Leigh,</td>
<td>01942 261909</td>
</tr>
<tr>
<td></td>
<td>Lancs, WN7 3PT, UK</td>
<td></td>
</tr>
<tr>
<td>Corrocoat</td>
<td>Forster Street, Leeds, LS10 1PW</td>
<td>01132760760</td>
</tr>
<tr>
<td>Denholm Industrial</td>
<td>21 Boden Street, Glasgow, G40 3PU</td>
<td>0141 445 3939</td>
</tr>
<tr>
<td>Dyer &amp; Butler Ltd (Rail)</td>
<td>Mead House, Station Road, Nursling,</td>
<td>02380 667549</td>
</tr>
<tr>
<td></td>
<td>Southampton, SO16 0AH, UK</td>
<td></td>
</tr>
<tr>
<td>F A Clover &amp; Son Ltd</td>
<td>Bardolph Road, Richmond, TW9 2LH</td>
<td>0208 948 6321</td>
</tr>
<tr>
<td>Forth Estuary Transport Authority</td>
<td>Forth Road Bridge, Administration Office</td>
<td></td>
</tr>
<tr>
<td></td>
<td>South Queensferry, EH30 9SF</td>
<td>0131 319 1699</td>
</tr>
<tr>
<td>Harrisons Engineering Lancashire Ltd</td>
<td>Judge Wilney Mill, Longworth Road</td>
<td>01254 823993</td>
</tr>
<tr>
<td></td>
<td>Billington, Clitheroe, Lancashire, BB7 9TP</td>
<td></td>
</tr>
<tr>
<td>H&amp;H Painting Contractors Ltd</td>
<td>4 Hamilton Gardens, Mutley, Plymouth, PL4 6PQ</td>
<td>07837 382619</td>
</tr>
<tr>
<td>Hyspec Services Ltd</td>
<td>Unit 3 Meadowfield Industrial Estate, Cowdenbeath Road, Burntisland, Fife, KY3 0LH</td>
<td>01592 874661</td>
</tr>
<tr>
<td>Industrial Coating Services</td>
<td>5 Danesbury Crescent, Kingsstanding,</td>
<td>0121 384 2266</td>
</tr>
<tr>
<td></td>
<td>Birmingham, B44 0QP</td>
<td></td>
</tr>
<tr>
<td>Industrial Painting</td>
<td>48-49 RCM Business Centres, Sandbeds Trading Estate, Dewsbury Road, Ossett, WF5 9ND</td>
<td>01924 272606</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interserve Industrial</td>
<td>Unit 2, Olympic Park, Poole Hall Road</td>
<td>0151 3737660</td>
</tr>
<tr>
<td></td>
<td>Ellesmere Port, Cheshire, CH66 1ST</td>
<td></td>
</tr>
<tr>
<td>Jack Tighe Coatings</td>
<td>Sandall Lane, Kirk Sandall, Doncaster, DN3</td>
<td>01302 880360</td>
</tr>
<tr>
<td></td>
<td>1QR</td>
<td></td>
</tr>
<tr>
<td>Jack Tighe Ltd</td>
<td>Redbourne Mere, Kirton Lindsey, Gainsborough,</td>
<td>01652 640003</td>
</tr>
<tr>
<td></td>
<td>Lincs, DN21 4NW, UK</td>
<td></td>
</tr>
<tr>
<td>Lanarkshire Welding Co.</td>
<td>82 John Street, Wishaw, Lanarkshire, ML2 7TQ</td>
<td>01698 264271</td>
</tr>
<tr>
<td>Company Name</td>
<td>Address</td>
<td>Telephone</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Maclean and Speirs</td>
<td>Unit D, East Fulton Farm, Darluith Road, Linwood, PA3 3TP</td>
<td>01505 324777</td>
</tr>
<tr>
<td>Merseyside Coatings Ltd</td>
<td>Pickerings Road, Halebank Industrial Estate, Widnes, Cheshire, WA8 BXW</td>
<td>0151 423 6166</td>
</tr>
<tr>
<td>Northern Protective</td>
<td>16 High Reach, Fairfield Industrial Estate, Bill Quay, Gateshead, Tyne &amp; Wear, NE10 0UR</td>
<td>0191 438 5555</td>
</tr>
<tr>
<td>Nusteel Structures</td>
<td>Lympne Industrial Estate, Lympne, Hythe, Kent, CT21 4LR</td>
<td>01303 268112</td>
</tr>
<tr>
<td>P&amp;R Engineering Ltd</td>
<td>Unit 50/51 Cable Street, Wolverhampton, WV2 2HX</td>
<td>01902 870637</td>
</tr>
<tr>
<td>Paintel Ltd</td>
<td>26 St George’s Road, Saltash, Cornwall, PL12 6EH</td>
<td>07730 691227</td>
</tr>
<tr>
<td>Palmers Ltd</td>
<td>1120 Elliot Court, Herald Avenue, Coventry Business Park, Coventry, CV5 6UB</td>
<td>02476 710294</td>
</tr>
<tr>
<td>Port Painters Limited</td>
<td>Unit 3, Ringside Business, Hoel-Y-Rhosog Cardiff, CF3 2EWx</td>
<td>02920 777070</td>
</tr>
<tr>
<td>Pyeroy Limited</td>
<td>Kirkstone House, St Omers Road, Western Riverside Route, Gateshead, Wear, NE11 9EZ</td>
<td>0191 4932600</td>
</tr>
<tr>
<td>Roy Hankinson Limited</td>
<td>Alexander House, Monks Ferry, Birkenhead Wirral, CH41 5LH</td>
<td>0870 7892020</td>
</tr>
<tr>
<td>Rowecord Engineering</td>
<td>Neptune Works, Usk Way, Newport, South Wales, NP20 2SS</td>
<td>01633 250511</td>
</tr>
<tr>
<td>Shutdown Maintenance Services Ltd</td>
<td>Kingsnorth Industrial, Hoo, Rochester, Kent, ME3 9ND</td>
<td>01634 256969</td>
</tr>
<tr>
<td>Site Coat Services Ltd</td>
<td>Unit 11 Old Wharf, Grantham Lincs, NG31 7AA</td>
<td>01476 577473</td>
</tr>
<tr>
<td>South Staffs Protective Coatings Ltd</td>
<td>Bloomfield Road, Tipton, West Midlands, DY4 9EE</td>
<td>0121 522 2373</td>
</tr>
<tr>
<td>Strada Contractors Ltd</td>
<td>Unit 9, Portmouth Enterprise, Quarratmeraine Road, Portmouth, PO3 5QT</td>
<td>02392 666109</td>
</tr>
<tr>
<td>Supablast Nationwide</td>
<td>Jubilee Estate, Gorsey Lane, Coleshill, Birmingham, B46 1JU</td>
<td>01675 464446</td>
</tr>
<tr>
<td>T I Protective Coatings</td>
<td>Unit 6, Lodge Bank, Crown Lane, Horwich, Bolton, Lancs, BL6 SHY</td>
<td>01204 468808</td>
</tr>
<tr>
<td>Walker Construction</td>
<td>Park Farm Road, Folkestone, DA9 9RR</td>
<td>01322 387000</td>
</tr>
<tr>
<td>Wardle Painters Ltd</td>
<td>Unit 5, Wimborne Building, Atlantic Way, Barry Docks, Glamorgan, CF63 3RA, UK</td>
<td>01446 748620</td>
</tr>
<tr>
<td>William Hare Ltd</td>
<td>Bransholme House, Bransholme Road, Bury, Lancs, BL8 1JJ, UK</td>
<td>0161 609 0000</td>
</tr>
<tr>
<td>Abrasion Ltd</td>
<td>1 Montague House, 74 Bryantwood Road, London, N77BB</td>
<td>07949 130168</td>
</tr>
<tr>
<td>ENC (Yorkshire) Ltd</td>
<td>Unit 3B Rotherham Road, Dinnington Sheffield, S25 3RF</td>
<td>01909 567860</td>
</tr>
<tr>
<td>Fairhurst Ward Abbots</td>
<td>225 London Road, Greenhithe, Kent, DA9 9RR</td>
<td>01322 387000</td>
</tr>
<tr>
<td>Gemini Corrosion</td>
<td>Broomhill Road, Spurryhilllock Industrial, Stonehaven, Aberdeenshire, AB39 2NH</td>
<td>01569 765488</td>
</tr>
<tr>
<td>JPV (Painters) Ltd</td>
<td>Unit 8 Prospect Way, Hutton Industrial Estate, Brentwood, Essex, CM13 1XA, UK</td>
<td>01277 201515</td>
</tr>
<tr>
<td>Matatec Ship Repairers</td>
<td>MacGregor House, Seaton Delaval Tyne &amp; Wear, NE25 OPT</td>
<td>0191 2379900</td>
</tr>
<tr>
<td>P C Richardson &amp; Co</td>
<td>Courville House, Ellerbeck Court, Stokesley Business Park, Stokesley, TS9 5PT, UK</td>
<td>01642 714791</td>
</tr>
<tr>
<td>Standish Metal</td>
<td>Potter Place, West Pimbo, Skelmersdale, Lancs, WN8 9PW, UK</td>
<td>01695 455977</td>
</tr>
<tr>
<td>T&amp;T Coatings Ltd</td>
<td>Snowdon House, Snowdon Road, Middlesborough, TS2 1DY, UK</td>
<td>01642 247972</td>
</tr>
<tr>
<td>W G Beaumont &amp; Son</td>
<td>Unit L1, Chadwell Heath Industrial, Kemp Road, Dagenham, RM8 1SL</td>
<td>0208 590 8523</td>
</tr>
</tbody>
</table>
ICATS REGISTERED COMPANIES

Abbey Gritblasting Services
Unit 13, Clapton Commercial Park, Clapton, Woodbridge, Suffolk, IP12 3TP
T: 0191 262 0510

Barrier Ltd
Stephenson Street, Wallsend, Tyne & Wear, NE28 6UE, UK
T: 0191 262 0510

Carrodus Contractors Limited
Unit 134, Medway Enterprise Centre, Enterprise Close, Strood, Kent, ME2 4SY
T: 01634 271786

Coastground Ltd
Morton Peto Road, Gapton Hall Industrial, Great Yarmouth, Norfolk, NR31 0LT
T: 01493 650455

Celtic Painting Consultancy Ltd
Rosedale, Carellicken Lane, Langstone, Newport, Gwent, NP18 2JZ
T: 01633 400194

Coastline Preservation Ltd
Tredgar Wharf, Marine Parade, Southhampton, Hants, SO14 5JF
T: 02380 221480

E & P Painting Contractors
Rossfield Road, Rossmore Trading Estate, Ellesmere Port, Cheshire, CH65 3AW
T: 0151 9558141

Forward Protective
Vernon Street, Shirebrook, Mansfield, Notts, NG20 8SS
T: 01623 748323

GABRE (UK) LTD
9 Holme Road, Dromore, Omagh Co Tyrone, BT78 3BX
T: 02882 897950

G W Burton Ltd
New Court, Wooldalling, Norwich, Norfolk, NR11 6SA
T: 01263 584203

GPS Services & Distribution Ltd
Alexandra Business Park, Riverside South, Pallion, Sunderland, Tyne & Wear, SR4 6UG
T: 01753 654123

GCS Painting Contractors Ltd
61 Portland Road, Selston, Nottingham, NG16 6AS
T: 01773 860983

H & S Decorating
Administration Building, Forth Road Bridge, South Queensferry, Edinburgh, EH30 9SF
T: 01753 654123

Hempel UK Ltd
Llantarnam Park, Cwmbran, Gwent, NP44 3XF
T: 01633 874024

Hill Price Associates Ltd
Hill Price Associates Ltd, 3 Prospect Place, The Maritime Quarter, Swansea, SA1 1QP
T: 01792 544255

Leighs Paints
Tower Works, Kestor Street, Bolton, Lancs, BL2 2AZ
T: 01698 264271

Malakoff Limited
North Ness, Lerwick, Shetland, ZE1 0LZ, UK
T: 01595 695544

Matthew James Services
Unit 4, Shibdon Business, Cowen Road, Blaydon, Newcastle-Upon-Tyne, NE21 5TX
T: 0191 414 5700

Metal Coning UK Ltd
Randles Road, Knowsley Business Park, Heswall, Merseyside, L34 9HX
T: 0151 5492449

MIS Services Ltd
Unit 12 Laurence Industrial, Eastwoodbury Lane, Southend-On-Sea, Essex, SS2 6RH
T: 01702 520400

Offshore Marine Services Ltd
Brumby House, Jalan Bahasa, PO Box 80148, 87011 Lubuan F.T. Malaysia
T: +603456214244410

Opus Industrial Services
Ethan House, Royce Avenue, Cowden Industrial, Estate,Billingham, TS23 4BX, UK
T: 01642 371850

Orrmac Coatings Ltd
Newton Chambers Road, Thorncliffe Park Estate, Chapeltown, Sheffield, S35 2PH
T: 0114 246 1237

Prize Spraying
Easdale, Carlton Colville, Lowestoft, Suffolk, NR33 8WL
T: 01502 564437

R.A Materials & Foundries
Unit 19, Heysham Business Park, Middleton Road, Heysham, Lancs, LA3 3PP
T: 01606 723426

R.L.P. Painting
Heathfield House, Old Bawtry Road, Finningley, Doncaster, DN9 3DD, UK
T: 01302 772222

Steel Protection Consultancy Ltd.
7a High Street Mews, High Street, Leighton Buzzard, Beds, LU7 1EA, UK
T: 01525 852500

Sussex Blast Cleaning
Unit 35-37 Station Road, Hailsham, East Sussex, BN27 2ER
T: 01323 849229

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

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

The Renovate Services Co.
Amlwch Industrial Estate, Anglesey, LL68 9BQ
T: 01407 831331

Watson Steel Structures
Lostock Lane, Lostock, Bolton, BL6 4BL
T: 01204 699999
DIARY DATES 2010/11

27th February - 1st March 2011
Corrosion UAE 2011 Abu Dhabi
Co-hosted by NACE UAE Section, this event is
promising to be an excellent event covering both
the technical and strategic issues prevalent in the
industry.
You can find more here at www.
theenergyexchange.co.uk/corrosionuae

10th March 2011
London Branch Meeting
Speaker: Sean Corr: ‘Modern developments in
aviation corrosion protection’.
Venue: Naval Club, 38 Hill Street, London W1
17.30 for 18.15 start

14th April 2011
London Branch AGM 18.00
London Branch Meeting at 18.15
Speaker: ICorr President Bob Crundwell
‘Corrosion engineers – mice or men?’
Venue: Naval Club, 38 Hill Street, London W1
17.30 for 18.00 start

5th May 2011
London Branch
Sustaining Members’ Evening

19th May 2011
Corrosion Engineering Division (CED)
Working Day/Seminar
Venue: The National Physical Laboratory (NPL),
Tedddington
We are looking for offers of lectures on novel
corrosion prevention technologies, please contact
Nick Smart nick.smart@serco.com or Douglas Mills
douglas@harbridge.freeerve.co.uk
Full details for this event will be in the next
issue of Corrosion Management magazine.

1st June 2011
London Branch Golf Day
Venue: Silvermere G.C., Surrey
Team applications to: Mike Moffat at:
Michaemofft@aol.com or Derek Hoskins at:
Dhoshkins@Waitrose.com
Arrangements have been made for special rates at
the nearby Hilton Hotel for teams wishing to stay
over and make an evening of it.

1st - 3rd November 2011
Fray International Symposium
Venue: Hilton Cancun, Cancun, Mexico
Honoring the distinguished work and lifetime
achievements of Prof. Derek Fray. The symposium
will be based in the equally important three
topical areas: principles, technologies and industrial
practice with special emphasis to a globally sought
clean environment of 21 century.
For further details contact Dr. Florian Kongoli
Email: fkongoli@flogen.com
www.flogen.com/FraySymposium

SHORT COURSES

7-9 March 2011
Corrosion Control in the Oil and Gas
Industry, Amsterdam
Details from Colin Britton, Tel: 01480 860943,
Fax: 01480 860943, Email: cbrit79727@aol.com
www.cfpa.com

4th - 8th April 2011
The 40th Annual Corrosion
Engineering and Control Course
For an informal discussion about The 40th Annual
Corrosion Engineering and Control Course,
call +44 (0)161 306 2218 or email
shortcourses-materials@manchester.ac.uk
For more information, visit
www.manchester.ac.uk/materials/shortcourses

BRANCH CONTACT DIRECTORY

ABERDEEN:
Frances Blackburn (Secretary)
Tel: 01224 243360
Email: ICorrABZ@gmail.com

DUBLIN:
Martha Hidalgo (Secretary)
Tel: +353 01 4027945

Terry Hinds (Chairman)
Tel: 01456 667 77
Fax: 01456 662 13
Email: info@galcosteel.ie

NORTH EAST:
Brendan Fitzsimmons
Tel: 0191 493 2600

LONDON:
Brian Goldie (Chairman)
Tel: 0208 644 9977
Email: BrianPCE@aol.com
Geoff White (Secretary)
Tel: 01728 602289
Email: geoff.white237@btinternet.com

MIDLANDS BRANCH:
Ross Fielding (Chairman)
Tel: 01476 590666
Email: ross.fielding@cathodic.co.uk

NORTH WEST:
Jane Lomas,
AMTEC Marine Corrosion
Tel: 01928 734996
Email: amteccorrosion@gmail.com

YORKSHIRE:
Nigel Peterson-White
Tel: 01422 356752
Email: nigel@specialisedcoatings.co.uk
Young ICorr Chairman:
Oliver Lewis
Email: oliver.lewis@shu.ac.uk

CSD Division:
Nick Stevens
Tel: 0161306362

CED Division:
Nick Smart
Tel: 01635 280385

Details of all Branch activities, dates and venues can be found at www.icorr.org