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No sooner is the 50th anniversary of the Institute behind us than I find myself celebrating another two. The first is the realisation that, as of the 1st August, I will have been with my current employer for twenty years. Two decades of rust and degradation, or at least trying to prevent it. The second, less personal and more impressive, is the 75th anniversary of the Queensway Tunnel in Liverpool which was celebrated on the 19th July. Fifteen thousand people braved the weather and Keith Chegwin to join in the celebrations and walk through the two-plus miles of temporarily closed tunnel from Liverpool to Birkenhead, then literally ferried back across the Mersey. Anyone caught singing a la Jerry Marsden was severely punished. The modest £5 charge all went to Claire House, a local children’s hospice.

The dear old Queensway Tunnel was designed by one, Sir Basil Mott. 55 years later he was posthumously partnered with the equally deceased Sir Murdoch MacDonald, precisely the time I joined the newly formed Mott MacDonald. Some of my earliest dry sprayed concrete repairs were carried out in Queensway, quite appropriate given much of the lining was, and still is, protected with an inch of Whitley Moran’s original gunite. Inevitably, I risked irritating my otherwise understanding wife and confusing the other walkers by incessantly pointing at various parts of the tunnel and expounding personally fascinating facts about its maintenance. Do feel free to remind me of this the next time you hear me questioning the sanity of train spotters or chuckling at the apparent pointlessness of people who collect bus registration numbers. I fully acknowledge I appeared just as potty to those who quite reasonably see tunnels as a convenient route from A to B. Anyone out there who is seriously into tunnels (I’ve got it down to one a week now) it is possible to arrange a visit to theinvert and various other interesting places courtesy of Merseytravel, details available via their website.

I was going to include a photo of myself on the Queensway Tunnel walk but decided instead to use one of me with some rust in Cyprus (I’m the one on the left). I know how much you all like some rusty metalwork to admire. I was out there talking to their bridge people about the inspection and maintenance of the local bridge stock. Nice place, lovely people and great rust courtesy of a hot, salty maritime environment – you can’t beat it. So I’m thinking of starting a specialist tour company, something along the lines of Tunnels and Rust, with tunnel walks in the summer and rust safaris around the Med in the winter. Anyone interested in investing their pension pot in this venture should leave a note behind the third wash basin along in the continental style unisex washroom at Manchester Victoria Station, together with a four figure non-returnable good-will deposit. This time next year we’ll be millionaires.

Letter to the Editor

N.A.C.E: Nice American Corrosion Experts

Following on from David Deacon’s excellent Part 3 article in the Corrosion Management of May/June 2009, I want to describe a slightly bizarre event involving NACE in the U.K.

Several years ago when NACE was holding courses at Low Edges Sheffield, my late friend and former teacher at Newton Heath, Moston and John Dalton Colleges, Ray Stott was appointed a coating consultant at CAPCIS Manchester.

One day he answered a telephone call from a painting contractor. The gist of the call was he had heard of the NACE courses, what was the cost? Ray told him it was ‘eighty five’ per module. The contractor said the cost of £850 was very attractive, and he would be sending several of his coating team to enrol. Then Ray had to ‘break the bad news’ that the modules cost £850 each.

Was this the same historical era when coating manufacturers had to ‘lend’ steel wet film thickness gages, to improve the quality of application? My conclusions are that any attitudes and practices have moved on with the aid of excellent training courses provided in partnership between our Institute and reputable commercial organisations It also supports the truism that we all live on the memory of others!

Barry Windsor.
North West Branch

David Deacon Apologises that the latest section on our history was not finished in time for publication in this issue but will be in the next edition.
Technical Topics No 21: “Need for Co-ordination in Corrosion Research”
by Technical Secretary, Douglas J Mills

First I’d just like to go back to last month’s article. Due to a technical error (I will not apportion blame but let us say it was 50-50!) the picture mentioned in the article did not appear. This was the building on the Calke Abbey estate that seemed in need of a bit of TLC from paint and corrosion experts. So I enclose the picture here. Also as I was scanning through my files I found another couple of examples of corrosion: not as spectacular as some of the Vulture lectures examples (for those who do not remember these Michael Clark used to go around in the 80s and 90s giving lectures to inter-alia metallurgical societies (always very well attended) showing amusing and in some cases spectacular examples of corrosion): but interesting none the less. Both were taken a couple of years ago in the vicinity of the Grwyne fawr reservoir (1790 feet above sea level) in the Black Mountains. The picture of the selective corrosion of the barbed wire could be an illustration of the effect stress has on accelerating corrosion. If one assumes that the thickness of galvanizing on the wire is similar throughout, the reason could be that the stress level is higher where it has been twisted which is why these areas tend to lose their galvanizing first (I am happy to hear alternative explanations!) The other picture showing breakdown of the coating is just a typical example where I would suggest the maintenance schedule could be improved (the reservoir was inaugurated in 1923) . I suppose my approach would be to monitor coating systems like this intermittently using electrochemical methods and repaint them BEFORE they got to that stage. However the main thrust of what I wanted to talk about today relates to a paper that appeared at Eurocorr recently in the microbial session (an area that I must confess that I have not covered in a TT yet, partly because I have no first hand experience of it (although I know Phil Munn reckons it can play a major role in some types of failures in domestic water systems and about ten years ago I did present a paper on the subject at the Bath conference for Robert Edyvean (luckily the questions were not too severe!)). My latest boss at CEST is also interested in the topic. So I might pluck up the courage to review the subject at the Bath conference (in a future TT ), Anyway the recent Eurocorr paper was about Accelerated Low Water Corrosion (ALWC) (ref.) which is apparently a quite severe problem and is some way from being totally solved. The author Mr Christie stated that there was a crying need for a coordinated research and explained what he meant by this. Below is a slightly edited version of what he said “What is needed are corroborated and peer-reviewed answers to the remaining un-anwered scientific questions. Work has already been done by the engineering fraternity. But to complete the bigger picture, scientists need to get in on the act. One scenario is that answers already exist and the fragments of scientific and microbiological information just need pulling together? To progress this would require some, if not all, of the following: a strong individual, group, or organisation to propel the project; identification of relevant stakeholders: lobbying of the relevant research organizations and lobbying governments or agencies for funding. Additionally requests for sponsorship; identification of contributors; collation and examination of every piece of information, study and research available globally on the science to date; existing knowledge and experience; multi-disciplinary and multi-national input; and strong leadership would be needed. Depending on the outcome, further scientific research may be needed This could require additional funding, organisation and particularly time to conduct field and laboratory studies. Time is of the essence: the longer the delay the longer the present risks (in the case of ALWC these are to the global shipping infrastructure), will remain and the longer we will continue to provide solutions that could be improved on or even be superseded by new and more efficient ones if only we understood the complete picture. Corrosion in general is estimated to cost industry worldwide 150 billion US dollars per annum in lost time, repairs and replacement. So let us work together to do the best we can to keep the ALWC contribution to this figure as low as our capabilities will allow”. Strong stuff and as I say pretty relevant in quite a number of areas that I can think of (stress corrosion cracking of nuclear boiler tubes, cathodic protection of pipelines, rebar corrosion etc). And probably you readers can think of others!

As usual any comments are welcome and should be sent to: Douglas@harrbridge.freeserve.co.uk
Surface World 2009 will run alongside Correx - the national corrosion conference and exhibition, which will be re-launched in 2009.

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The UK Corrosion Conference, so successful and popular during the 1980’s and ‘90’s is being integrated with the re-launched Correx 2009 Exhibition at the NEC Birmingham on the 27th - 29th October 2009.

The two themes of the Conference are, Protective Coatings for Steelwork and Cathodic Protection for Corrosion Control. There are a series of alternating, “stand alone” conference sessions and workshops, so any delegate who attends will be able to “pick and mix” between the events and also visit both the Correx Exhibition and the Surface World Exhibition, which are adjacent to the conference and workshop rooms.

As stated in previous issues the coatings themes for the Coatings Conference, sessions cover Steel Bridges, Steel Framed Buildings and Steel Structures with particular reference to immersed structures. The well known speakers and Chairmen of these sessions are drawn from a range of experts and specialists in their fields, which covers the broad spectrum of surface preparation and long life coatings, from specifications and the initial placing of painting contracts, with insurance backed guarantees and quality control, through to satisfactory completion of the contract.

There are also a range of papers, which cover various aspects of surface preparation, coating types and application as well as papers that will cover both successes and failures, giving the reasons for the cause or causes and identifying the high cost of repairs where the specification coating system or application was defective.

There will also be three hour coating workshops for delegates to attend and these will alternate with the cathodic protection conference sessions. The coating workshops will cover the ICATS applicator qualification, introducing the new specialist modules on blast cleaning and spray application and will cover the way in which Lloyds will be auditing the scheme on a national basis. The ICATS key skills sector will also be outlined by David Eyre, the scheme Co-ordinator.

During this event there will also be a detailed presentation on the new, “No Blame”, Insurance Backed Guarantee Scheme, which will be available for Specifiers and structure owners when ICATS registered companies and qualified operatives are used on major projects.

A second coating workshop will be held on inspection instrumentation and testing of coatings and this will cover the use and misuse of equipment for surface preparation, ambient conditions, coating application, both wet and dry film properties, together with a range of other instruments, which provide the armoury for the competent and experienced coating inspectors.

The Cathodic Protection Conference Sessions will be launched on Day Two by a plenary lecture from the Institute’s President, Professor Paul Lambert. Papers on CP will also be presented on bridge protection, protection of immersed structures, pipeline monitoring, pipeline AC mitigation and in particular the use of cathodic protection on offshore wind farm structures.

The workshops on Cathodic Protection, which will be held in conference Room 2 will include one session on the UK Mirror Group (WG 3 offshore), a second one will cover steel in concrete, in particular the methodology and the third CP workshop will cover the new Institute’s level 1 qualification. There will also be workshops organised by the newly formed Corrosion Engineering Division coatings and cathodic protection workgroups. Full details of the individual workshops and the full conference programme, together with Titles, Chairmen, Speakers and timings will be published in the next issue.

The conference organising committee have arranged a very flexible structure for delegates to register for half day workshops or conference sessions, full days can combine both conference sessions and workshops and there are also two and three day registration packages so delegates will be able to take in all of the Coatings and CP presentations, participate in the workshops and visit the numerous stands exhibiting the latest coatings, surface preparation, instrumentation, CP design and equipment displays.

The cost of the conference is outlined on the detailed registration form but the organising committee have kept the three, day full registration to £225.00 for members and £250.00 for non-members. Those delegates who only want to register for just one or two days will be pleased to know that the one day registration has been kept to £95.00 for members, £120.00 for non-members and the two day registration fee is £175.00 for members and £200.00 for non members.

The re-launch of this combined UK Corrosion Conference and Correx Exhibition in conjunction with the successful Surface World Exhibition, is being widely circulated through numerous national and international engineering magazines and journals so it is likely that many non-members will be attending, opening up the opportunity for networking outside the conference and workshop sessions and hopefully we can persuade them to join the Institute to appreciate the increasing number of benefits, which membership of ICorr provides, in understanding the protection of steelwork.

We look forward to seeing you all there.

David H Deacon
Conference Committee Chairman
Mayfair Walk

This year, the London Branch guided walking tour was in Mayfair, specifically the Portland Estate. There was the usual excellent gathering and the tour began with a bloody start at Marble Arch, a place known as Tyburn, the site of the three legged gallows and a place of public execution where crowds gathered to witness the gruesome sight. We moved on past Tony Blair’s house before stopping off for a welcome drink at a local pub. The group photo was taken in front of the memorial to Raoul Wallenburg who attempted to rescue several thousand Jews from German-occupied Budapest in 1944 during World War II. We then moved on past the house that Madonna shared with Guy before finishing up at the Naval Club for lashings of hot chilli and a refreshing drink and where our Blue Badge Guide Ingrid Wallenborg was formally thanked by London Branch for an interesting evening.

Golf Day

The London Branch Golf Day was held again at Silvermere and again the weather was kind, but mercifully not as hot as previous years. The morning Texas Scramble for the Denso Cup was won by the team from Coastal Preservation Services comprising Darren Richardson, Neil Gritton, Tony Rance and Andrew Sheppard. The afternoon contest for the Len Townsend Memorial Trophy was also won by Coast Preservation Services. In second place and receiving the ICorr Shield was the Doornbos Equipment second team of Steve Buxton, Clive Reynolds, Carl Proctor and Chris Woodward. The Ameron Tray for the best individual score was won by Steve Buxton. The longest drive was hit by David Heal and Neil Gritton was nearest the pin. The main trophies will be presented formally at the London Branch meeting at the Naval Club on Thursday 1st October.

Sadly we only had 11 teams entering this year but a good day seemed to be had by all. Thanks go to Mike Moffat for organising the day, Jim Glynn for running the raffle and to Dawn White for assessing the scores so efficiently.
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ELECTROCHEMICAL AND MECHANICAL BEHAVIOUR OF SIMILAR FSW LAP JOINTS

Presented at ASST 2009 Conference, 12-14 May 2009, Leiden, Netherlands

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2 Alenia Aeronautica SpA, Viale dell’Aeronautica snc, Pomigliano D’Arco, Naples, Italy.

*giyanelli.castagnola@unina.it

Abstract: This work describes both the mechanical and corrosion behaviour of similar Friction Stir Welding (FSW) lap joints made from AA2024 and AA6056, all in form of rolled sheet. The lap configuration produces various micro-structural zones, namely: (i) classical thermo mechanically affected zone (TMAZ), (ii) heat affected zone (HAZ), and (iii) nugget zone. In addition, the effects of heating using three different weld speeds were also investigated. Static mechanical tests were carried out providing information about static strengths and failure modes. Optical observation was used in investigating macroscopically weld and welding defects. The corrosion behaviour of such joints was investigated by electrochemical dc techniques (open circuit potential (O.C.P.) monitoring and anodic polarization) using a capillary electrochemical cell, with a resolution of 0.5mm. In order to confirm results obtained by local measurements, global gel visualization tests were also performed on the same specimens. After exposure to aggressive gel environments micrographs were taken on corroded areas. The best mechanical and electrochemical performance was observed when the weld speed is low. In AA6056 failure occurs in weld along the mixing area, while in the case of welding AA2024 it occurs mainly in the lower plate.

Keywords: Friction Stir Welding, lap joint, mechanical characterization, microcell, corrosion.

1. Introduction

Friction stir welding was invented at The Welding Institute (TWI) of UK in 1991 [1] as a solid-state joining technique, and it was initially applied to aluminium alloys. During the FSW process, the material undergoes intense plastic deformation at elevated temperatures, resulting in the generation of fine and equiaxed recrystallized grains (Figure 1). The fine microstructure obtained in friction stir welds produces good mechanical properties [2].

2. Experimental

Materials

Al alloys investigated are AA 2024 and AA 6056 all in the form of rolled sheet. The nominal chemical compositions are reported in Table 1 and Table 2 [16].

![Table 1 - Nominal chemical composition of AA 2024 alloy.](image)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Fe</th>
<th>Cu</th>
<th>Mn</th>
<th>Mg</th>
<th>Cr</th>
<th>Zn</th>
<th>Al</th>
<th>Ti</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.15</td>
<td>0.20</td>
<td>3.1</td>
<td>4.2</td>
<td>0.16</td>
<td>0.5</td>
<td>1.2</td>
<td>1.5</td>
</tr>
<tr>
<td>2</td>
<td>0.10</td>
<td>0.5</td>
<td>0.15</td>
<td>0.25</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

![Table 2 - Nominal chemical composition of AA 6056 alloy.](image)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Fe</th>
<th>Cu</th>
<th>Mn</th>
<th>Mg</th>
<th>Cr</th>
<th>Zn</th>
<th>Al</th>
<th>Ti</th>
<th>Zr</th>
<th>Nb</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.70</td>
<td>0.60</td>
<td>0.5</td>
<td>1.1</td>
<td>0.4</td>
<td>1.0</td>
<td>0.0</td>
<td>1.2</td>
<td>0.25</td>
<td>0.2</td>
</tr>
<tr>
<td>2</td>
<td>0.15</td>
<td>0.25</td>
<td>0.1</td>
<td>0.5</td>
<td>0.1</td>
<td>0.7</td>
<td>0.1</td>
<td>0.3</td>
<td>0.7</td>
<td>0.1</td>
</tr>
</tbody>
</table>

![Table 3 - Tool characteristics.](image)

<table>
<thead>
<tr>
<th>Tool Shape</th>
<th>Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taper [°]</td>
<td>10°</td>
</tr>
<tr>
<td>Pin base diameter [d]</td>
<td>6.80 mm</td>
</tr>
<tr>
<td>Pin height [h]</td>
<td>3.70 mm</td>
</tr>
<tr>
<td>Shoulder diameter [D]</td>
<td>13.60 mm</td>
</tr>
</tbody>
</table>

The materials welded in this study were supplied by Alenia Aeronautica SpA in the form of sheets with dimensions of 500 mm x 150 mm. The latter were obtained using a smooth tool mounted on a Dormac milling machine, as given in Table 3.

The joints investigated were coupled as follows: laminated AA 2024 over laminated AA 2024; laminated AA 6056 over laminated AA 6056. In aeronautical applications the initial temper for the AA of skin and stringer is that of natural aging. The weldability of all joints has been validated and the main process parameters adopted are reported in Table 4. The configuration used for welding joints is shown in Figure 2. Electrochemical tests were carried out in aerated 3.5% wt aqueous solution of NaCl at room temperature.
Table 4 - Process parameters adopted.

<table>
<thead>
<tr>
<th>Joint</th>
<th>Upper plate</th>
<th>Lower plate</th>
<th>Weld speed (mm/min)</th>
<th>Tilt angle</th>
<th>Rotation speed (RPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>La</td>
<td>AA</td>
<td>AA</td>
<td>2024</td>
<td>500 clockwise</td>
<td></td>
</tr>
<tr>
<td>Lb</td>
<td>(2.76)</td>
<td>AA</td>
<td>2024</td>
<td>500 clockwise</td>
<td></td>
</tr>
<tr>
<td>Le</td>
<td>mm (min)</td>
<td>AA</td>
<td>2024</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Ld</td>
<td>AA</td>
<td>AA</td>
<td>6056</td>
<td>500 clockwise</td>
<td></td>
</tr>
<tr>
<td>Le</td>
<td>6056 (2.56)</td>
<td>6056 (6.35)</td>
<td>2024</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Lf</td>
<td>AA</td>
<td>mm (min)</td>
<td>230</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Fig 2 – Joint configuration. Light microscope observation.

**Light microscope observation**

After welding photographs of the cross section and final hole for all joints were taken in order to evaluate the extent of the TMAZ and HAZ zones.

**Static mechanical tests**

Tests were carried out using an MTS Alliance RT/50 machine. Even though these tests don’t allow a mono-axial and plane tensional state (Figure 3), a comparison between weldments and a preliminary analysis is still possible. Three tests for each joint were considered.

**Microcell setup**

The set-up for electrochemical investigations based on the use of a microcapillary tip is shown, schematically, in Figure 4a. The entire set-up was mounted on a microscope allowing precise positioning of the capillary. The fully assembled microcell is shown in Figure 4b. It basically consists of a pulled microcapillary filled with electrolyte. The tip diameter of the capillary employed in this investigation was of about 500 µm. The microcell was fixed at the revolving nosepiece, replacing an objective, and the specimen was mounted on the microscope stage. This set-up enabled the search for a specific location on the sample before switching to the microcapillary. In this way, simple, precise, and fast positioning of the microcell was possible. A reference and counter-electrode was connected to the capillary to allow electrochemical control of the investigated surface. The apparatus was composed of a potentiostat/galvanostat at Solartron model 1286 controlled by CorrWare software.

**Optical Microscopy**

After polarisation, photographs of the anodised area were taken with a microscope ZEISS AXIOSKOP 40 using a NIKON COOLPIX 5000 digital camera. Photos were processed with the software Leica IM50 to calculate dimensions of pits. All photos were taken with a camera zoom of 3x at a microscope magnification of 10x.

**3. Results and Discussion**

**Light microscope observations**

Specimens have been taken from the welded area for each of the above described joints in order to carry out light microscope observations. As known the TMAZ decreases when the weld speed increase both for AA2024 and AA6056 as can be seen by comparing part (a) and (b) of the Figures 5, 6 and 7. The overall quality of welds is quite good, although serious defects begin to be evident as weld speeds increase for welding 6056 aluminium (Figure 7a).

**Anodic Polarization**

Potentiodynamic polarisation curves were carried out starting from 30mV below the OCP up to a final potential of around 2-300 mV above OCP. The scan rate was 0.5 mV/s [17].

**Results from the normalized loads show** that weldment is preferable at low speeds.
in order to give good mechanical behaviour of the weld, but while for joint in AA6056 we can find that the increasing speed load decrease. The same is not true when the material is AA2024. No comparison can be made between the two alloys here employed because of the differences between the thickness of the plates.

Failure modes

Photographs (Figure 9 and 10) taken at the end of the static mechanical tests for each of the joints examined reveal that the main rupture occurs in the lower plates in the case of AA2024, while in the case of AA6056 failure occurs along the weld. From these figures it is possible to study the main direction along which the crack progresses.

It is possible to observe that all the cracks in 2024 joint begin in the HAZ but that failure occurs in the lower plate demonstrating the effectiveness of the welding process. For AA6056 weld rupture is expected because of the significant difference in thickness of the plates welded.

Microcell technique

OCP and anodic polarisation were performed on the cross section of the Lap Joint as shown in Figure 14. No investigations were carried out on the HAZ because its dimension is of the order of few micrometers, i.e. less than the inner diameter of the capillary tip employed in this study.

The zones investigated in this work are (i) a, (ii) n and (iii) r, for upper areas; (iv) md-a, (v) md-n and (vi) md-r, in the mixing zone; (vii) deep in the lower plate.

OCP monitoring and polarization tests

As reported above, these tests were performed on each zone of the weld and the final values of corrosion potential obtained as reported in Figure 12 and Figures 13 to 18. The data reported are an indication of possible galvanic corrosion between the different areas in which the weld results and the base material. The black line in the graphs indicate corrosion potential of the Figure 15 - Range of Corrosion Potential for the zones of each weld Lc. base material, resulting in Ecorr(AA2024) =
-652mV, and Ecorr(AA6056) = -745mV, both measured vs Ag/AgCl electrode. As observed in mechanical tests the worst behaviour is shown by the intermediate speed in the case of welding 2024 (Figures 13, 14 and 15) alloy, and the best performance is obtained from the high temperature weld.

This behaviour from both a mechanical and electrochemical point of view can be explained by the complete recrystallization in the nugget zone and by a partial, heat-induced, modification of the grain, after the tool passes. Plots for the welded 6056 aluminium alloy are shown in Figures 16.

Figure 17 - Range of Corrosion Potential for the zones of each weld Le.

Figure 18 - Range of Corrosion Potential for the zones of each weld Lf.

17 and 18. Due to the presence of hole defects, measurements in md-n zone were not performed. The Ld joint performed best electrochemically while the other two joints showed little significant differences. Nevertheless all the 6056 joints present a significant passivity that increased their corrosion behaviour in every area tested. In this characterization it is possible to compare directly the two alloys for possible use in FSW applications. Both passivity and small differences in corrosion potential between the base material and modified zones indicate a great advantage in using AA6056 alloys for structural durability.

4. Conclusions

The main conclusions of this investigation are as follows: 1. Joints made in AA2024, La show the best mechanical performance when the weld speed is 115 mm/min, and temperatures reached are high. 2. Welding AA6056 joints using a slow speed produces the highest ultimate strength, and are preferable, from an electrochemical point of view than the 115 mm/min speed. 3. Finally, in comparing the corrosion potential of two joints AA 2024 performs better than AA 6056, this due mainly to the passive state. However attention must be paid for all cases because there is the possibility of crevice corrosion between the two plates, and adequate protection must to be provided.

5. Acknowledgements

This work was carried out in the frame of the L.297 FRICION STIR WELDING II National Research Project.

6. References


Pyeroy renews FMC paint shop contract

Protective coatings specialist Pyeroy Group has renewed its contract to manage the post-fabrication painting and finishing activities at a leading manufacturer of offshore engineering structures.

The new contract also includes the application of insulation materials by specialist mould and injection techniques used to keep the structure at specific temperatures and minimising heat loss. Considerable investment is currently underway in equipment and training.

The Gateshead-based firm has been operating the paint shop activities at the Dunfermline, Scotland engineering and manufacturing plant of FMC Kongsberg Subsea for the last three years. It will now continue to do so for a further two years after re-securing the contract.

Part of FMC Technologies, the Dunfermline plant designs and manufactures advanced technology oilfield products and systems for full field subsea development.

This equipment includes subsea trees, templates and manifold systems linking subsea production pipelines and flowlines with the well.

FMC has long outsourced the operation of its paint shop activities and Pyeroy has been responsible for managing its in-house painting and finishing operations since 2005.

This involves both shot and bead blast chambers, spray painting facilities and systems, a PTFE coatings facility and an insulation area. It also advises on paint shop equipment purchases, COSHH compliance and QA inspection. Pyeroy will continue to provide permanent on-site staff, supported by additional skilled resources for particular projects or production increases.

Since FMC’s products are destined for in the main for the Norwegian sector of the North Sea oilfield, all paintwork is undertaken in full compliance with NORSOK standards.

Brendan Fitzsimons, director of Pyeroy’s Infrastructure Services Division, said: “We’re delighted to have renewed this prestigious contract, which relies on the substantial technical expertise we provide.

“We now look forward to continuing to support FMC as it moves ahead in a competitive market and maintaining a high level of quality and service.”

The Pyeroy Group is based in Gateshead and employs 1,000 people working on industrial, construction and marine projects throughout the UK and Ireland.
Pyeroy painting a better future for Victoria Station

Industrial services group Pyeroy has been awarded a £2 million contract to provide specialist re-painting services as part of the refurbishment of London’s Victoria Railway Station.

Pyeroy will be responsible for the re-painting of the roof and lower level canopies for main contractor May Gurney on behalf of Network Rail.

The full programme will include the replacement of existing roof coverings, significant steelwork repairs and associated M&E system upgrades.

The area to be re-roofed covers eight platforms, major communication boards, an entrance to London Underground, and many concessionary outlets and major retail units.

The busy station will remain open during the work and Pyeroy’s involvement will see the Gateshead-based firm’s infrastructure services division providing encapsulation of the scaffold systems and abrasive blast cleaning of the arched roof trusses.

This will be followed by the application of a new coatings system comprising epoxy primer, glass flake epoxy hi-build and urethane acrylic topcoat. The new system will provide extended protection of the roof structure over a 25 year period.

The work is expected to begin soon with completion scheduled for February 2010.

Victoria Station is a Grade II listed hub railway station and has around 350,000 pedestrians passing through on a daily basis.

Created by the combination of two stations serving the former London Brighton South Coast (LBSCR) and South East and Chatham (SECR) railways it has undergone a number of extensions and modifications over the years.

The work to be carried out at Victoria by Pyeroy follows the company’s recent success in winning an extensive refurbishment contract on Blackfriars Bridge for Balfour Beatty and Network Rail, as well as undertaking considerable repainting works on Tower Bridge and Southwark Bridge for the City of London Corporation.

As well as the range of services provided by its infrastructure division, Pyeroy carries out work in a range of other sectors.

These include marine (painting and re-fit of naval and commercial ships), industrial (power stations, pharmaceutical plants, chemical plants, refineries) and construction (commercial, residential development and environmental services) sectors.

More at www.pyeroy.co.uk
Denso protection on Sterling’s Forthside bridge anchor bars

A new pedestrian bridge has been opened in Stirling which spans the railway at Stirling Station to link the city centre with the Forthside waterfront development. The £6m contract was completed by design and build contractors BAM Nuttall Ltd.

Anchor bars supplied by Macalloy Ltd. were used to secure the bridge’s main mast supports into the foundations. The anchor bars were protected by Macalloy at its Dinnington, Rotherham works with the application of Denso Paste, followed by Denso Tape and SA PVC.

Denso Paste is a high melting point petrolatum in a semi-solid state suitable for brush or hand application. Denso Tape is a non-woven synthetic fibre fabric impregnated and coated with an adhesive compound based on petrolatum.

The Battle of Stirling Bridge in 1297 is regarded as Scottish patriot William Wallace’s most famous victory. Stirling Council recruited six people called William Wallace, ranged in age from two to 65, to help open the new bridge at Forthside.

The new Stirling pedestrian bridge. The Macalloy rock anchor bars are protected with a Denso system.

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External Corrosion Management Ltd, Suites 5 & 6, 221-229 Union Street, Aberdeen AB10 6BQ
Tel: 00 44 1224 621915 (ext119) Fax: 00 44 1224 621215
Email: sales@metacor.co.uk Website: www.metacor.co.uk

**INSTITUTE OF METAL FINISHING**
Exeter House, 48 Holloway Head, Birmingham B1 1NQ
Tel: 0121 6227387 Fax: 0121 6666316
Email: exeterhouse@instituteofmetalfinishing.org Website: www.uk-finishing.org.uk

**PROTECTIVE COATINGS EUROPE**
15 West Street, Carshalton, Surrey SM5 2PT
Tel: 020 82880077 Fax: 020 82880078

**JETCHEM SYSTEMS LIMITED**
Cuba Industrial Estate, Stubbins, Ramsbottom, Lancashire BL0 0NE
Tel: 01706 828 888 Fax: 01706 828 000
Email: sales@jetchem.com Website: www.jetchem.com

**INTEGRITY INSPECTION CORROSION**
Greenbank Place, East Tullos, Aberdeen AB12 3BT
Tel: 01224 898282 Fax: 01224 898202
Email: info@iicorr.com Website: www.iicorr.com

**RA MATERIALS & FOUNDRIES**
Park Works, Newton Heath, Manchester M40 2BA
Tel: 0161 9544213 Fax: 0161 2054739

**JETCHEM SYSTEMS LIMITED**
Cuba Industrial Estate, Stubbins, Ramsbottom, Lancashire BL0 0NE
Tel: 01706 828 888 Fax: 01706 828 000
Email: sales@jetchem.com Website: www.jetchem.com

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Email: sales@metacor.co.uk Website: www.metacor.co.uk

**PAROC GROUP**
Technical Insulation Manufacturers of High Quality Mineral Wool Products
PO Box 294, FI-01301 Vantaa, Finland
UK Sales office Tel: 01942 814127 Fax: 0870 7628257

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Technical Insulation Manufacturers of High Quality Mineral Wool Products
PO Box 294, FI-01301 Vantaa, Finland
UK Sales office Tel: 01942 814127 Fax: 0870 7628257

**RA MATERIALS & FOUNDRIES**
Park Works, Newton Heath, Manchester M40 2BA
Tel: 0161 9544213 Fax: 0161 2054739

**SCANGRIT**
Eastfield Road, South Killingholme, Immingholme, Immingham, North Lincs DN40 3NF
Tel: 01469 574715 Fax: 01469 571644
Email: sales@scangrit.co.uk Website: www.scangrit.co.uk
ICATS REGISTERED COMPANIES

ICATS REGISTERED COMPANIES
WITH QUALIFIED APPLICATORS

APB Construction (UK)
Unit 3, Bramley Way, Hellaby Industrial Estate,
Hellaby, Rotherham, S. Yorkshire, S66 8QB
T: 01709 541000

Briton Fabricators Ltd
Watnall Road, Hucknall, Notts, NG15 6EP
T: 0115 963 2901

Cameron Limited
Queen Street, Stourton, Leeds, LS10 1SB, UK
T: 0113 276 4389

Cape Industrial Services
Cape House, 3 Red Hall Avenue,
Paragon Business Village, Wakefield, WF1 2UL
T: 01224 215800

Cleveland Bridge UK Ltd
Cleveland House, Yarn Road, Darlington, DL1 4DE
T: 01325 2052345

Concrete TS Ltd
Unit B2 (2), Moss Industrial Estate, Leigh, Lancs, WN7 3PT, UK
T: 01942 261909

Dyer & Butler Ltd (Rail)
Mead House, Station Road, Nursling, Southampton,
SO16 0AH, UK
T: 02380 667549

Fairfield Mabey Ltd
Station Road, Chesstow, Monmouthshire, NP16 SYL
T: 01291 623801

Hayes and Horne
Rear Barn, Wixenford Industrial, Plymouth, PL9 8AA
T: 01752 401234

Industrial Coating Services
5 Danesbury Crescent, Kingsstanding,
Birmingham, B44 0QO
T: 0121 384 2266

Jack Tighe Coatings
Sandall Lane, Kirk Sandall, Doncaster, DN3 1QR
T: 01302 880360

Jack Tighe Ltd
Redbourne Mere, Kirton Lindsey, Gainsborough,
Lincs, DN21 4NW, UK
T: 01652 640003

Merseyside Coatings Ltd
Pickerings Road, Hallebank Industrial Estate, Widnes,
Cheshire, WA8 8XW
T: 0151 423 6166

Paintel Ltd
26 St George’s Road, Saltash, Cornwall, PL12 6EJ
T: 01752 847220

Palmers Ltd
1120 Elliot Court, Herald Avenue, Coventry Business
Park, Coventry, CV6 6UB
T: 02476 710294

Supablast Nationwide
Jubilee Estate, Gorse Lane, Coleshill, Birmingham,
B46 1JU
T: 01675 464446

T 1 Protective Coatings
Unit 6, Lodge Bank, Crown Lane, Horwich, Bolton,
Lancs, BL6 5HY
T: 01204 468080

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

ICATS REGISTERED COMPANIES
WITH APPLICATIONS IN TRAINING

Alfred Bagnall & Sons
6 Manor Lane, Shipley, West Yorkshire, BD18 3RD
T: 01302 853259

Abrasion Ltd
Unit 1 B, OJ Industrial Park, Claybank Road,
Portsmouth, PO3 5XK, UK
T: 02392 661023

Altask Limited
Altact House, Commissioners Road, Strood,
Kent, ME2 4EJ
T: 01634 298000

Austen Hayes Ltd
Carlton Works, Cemetary Road, Yeadon, Leeds,
LS19 7BD, UK
T: 0113 250 2255

Community Clean
11 Old Forge Road, Ferndown Industrial Estate,
Ferndown, Wimborne, Dorset, BH21 7RR, UK
T: 0845 6850133

Corrocoat
Forster Street, Leeds, LS10 1PW
T: 01132760760

Dyer & Butler Ltd [Rail]
Mead House, Station Road, Nursling,
Southampton, SO16 0AH, UK
T: 02380 667549

Gemini Corrosion
Broomhill Road, Spurryhillock Industrial , Stonehaven,
Aberdeenshire, AB39 2NH
T: 01569 765488

Industrial Painting
4B-49 RCM Business Centres, Sandbeds Trading
Estate, Dewsbury Road, Ossett, WF5 9ND
T: 01924 272606

New Image Specialist
Paining Contractors
Asken House, High Street, Askern, Doncaster,
DN6 0AA
T: 01302 708081

Northern Protective
16 High Reach, Fairfield Industrial Estate, Bill Quay,
Gateshead, Tyne & Wear, NE10 0UR, UK
T: 0191 438 5555

P C Richardson & Co
Covurville House, Ellerbeck Court, Stokesley Business
Park, Stokesley, TS9 5PT, UK
T: 01642 714791

Rhinoceros Limited
Huntingdon Works, East Finchley, London, N2 9DX
T: 0208 444 6165

Rowecord Engineering
Neptune Works, Usk Way, Newport,
South Wales, NP20 2SS
T: 01633 250511

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

Strada Contractors ltd
Unit 9, Portsmouth Enterprise,
Quartremaine Road, Portsmouth, PO3 SQT
T: 02392 666109

ICATS REGISTERED COMPANIES

ICATS REGISTERED COMPANIES
APB Group Limited
Ryandra House, Ryandra Business Park,
Brookhouse Way, Cheadle, Staffs, ST10 1SR
T: 01538 755377
<table>
<thead>
<tr>
<th>Company Name</th>
<th>Address</th>
<th>Telephone Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Armourcote Surface Technology Plc</td>
<td>15/17 Colvilles Place, Kelvin Industrial Estate, East Kilbride, Scotland</td>
<td>+44 1355 248223</td>
</tr>
<tr>
<td>Barrier Ltd</td>
<td>Stephenson Street, Wallsend, Tyne &amp; Wear, NE28 6JE, UK</td>
<td>+44 191 262 0510</td>
</tr>
<tr>
<td>Beever Limited</td>
<td>Little Coldharbour farm, Tong Lane, Lamberton, Kent, TN3 8AD, UK</td>
<td>+44 1892 890045</td>
</tr>
<tr>
<td>Coastground Ltd</td>
<td>Morton Peto Road, Capton Hall Industrial, Great Yarmouth, Norfolk, NR31 OL</td>
<td>+44 1493 650455</td>
</tr>
<tr>
<td>Coating Services Ltd</td>
<td>Partington Street, Mumps Bridge, Oldham, OL1 3RU, UK</td>
<td>+44 161 665 1998</td>
</tr>
<tr>
<td>Collins Engineering Railway Contracts</td>
<td>Salcombe Road, Meadow Lane Industrial Estate, Alfreton, Derbyshire, DE55 7RG</td>
<td>+44 1773 833255</td>
</tr>
<tr>
<td>Denholm Industrial</td>
<td>King George ‘V’ Docks, Glasgow, G51 4SD</td>
<td>+44 141 445 3939</td>
</tr>
<tr>
<td>Fairhurst Ward Abbotts</td>
<td>225 London Road, Greenhithe, Kent, DA9 9RR</td>
<td>+44 1322 387000</td>
</tr>
<tr>
<td>F M Conway Limited</td>
<td>Conway House, Rochester Way, Dartford, Kent DA1 3QY, UK</td>
<td>+44 0208 636 8822</td>
</tr>
<tr>
<td>Forth Estuary Transport Authority</td>
<td>Conway House, Rochester Way, Dartford, Kent DA1 3QY, UK</td>
<td>+44 131 319 1699</td>
</tr>
<tr>
<td>G W Burton Ltd</td>
<td>New Court, Wooddalling, Norwich, Norfolk, NR11 6SA</td>
<td>+44 01263 584203</td>
</tr>
<tr>
<td>H &amp; S Decorating</td>
<td>Administration Building, Forth Road bridge, South Queensferry, Edinburgh</td>
<td>+44 1753 654123</td>
</tr>
<tr>
<td>Hempel UK Ltd</td>
<td>Llantarnam Park, Cwmbran, Gwent, NP44 3XF</td>
<td>+44 01633 874024</td>
</tr>
<tr>
<td>Hyspec Services Ltd</td>
<td>Unit 3 Meadowfield Industrial Estate, Cowdenbeath Road, Burntisland, Fife</td>
<td>+44 01592 874661</td>
</tr>
<tr>
<td>JPV (Painters) Ltd</td>
<td>Unit 8 Prospect Way, Hutton Industrial Estate, Brentwood, Essex, CM13 1XA</td>
<td>+44 01277 201515</td>
</tr>
<tr>
<td>Leiggs Paints</td>
<td>Tower Works, Kestor Street, Bolton, Lancs, BL2 2AL</td>
<td>+44 01698 264271</td>
</tr>
<tr>
<td>Lanarkshire Welding Co.</td>
<td>82 John Street, Wishaw, Lanarkshire, ML2 7TQ</td>
<td>+44 01698 264271</td>
</tr>
<tr>
<td>Maclean and Speirs</td>
<td>Unit D, East Fulton Farm, Darl Churchill Road, Linwood, PA3 3TP</td>
<td>+44 01505 324777</td>
</tr>
<tr>
<td>Malakoff Limited</td>
<td>North Ness, Lerwick, Shetland, ZE1 0LZ</td>
<td>+44 01955 695544</td>
</tr>
<tr>
<td>Metal Cleaning UK Ltd</td>
<td>Randles Road, Knowsley Business Park, Knowsley, Merseyside, L34 9HX</td>
<td>+44 0151 5492449</td>
</tr>
<tr>
<td>MIS Services Ltd</td>
<td>Unit 12 Laurence Industrial, Eastwoodbury Lane, Southend-On-Sea, Essex, S2 6RH</td>
<td>+44 01702 520400</td>
</tr>
<tr>
<td>Nusteel Structures</td>
<td>Lympe Industrial Estate, Lympe, Hythe, Kent, CT2 1LR</td>
<td>+44 01130 268112</td>
</tr>
<tr>
<td>Opus Industrial Services</td>
<td>Ethan House, Royce Avenue, Cowpen Industrial Estate, Billingham, TS23 4BX</td>
<td>+44 01642 371850</td>
</tr>
<tr>
<td>Ommaac Coatings Ltd</td>
<td>Newton Chambers Road, Thorncliffe Park Estate, Chapeltown, Sheffield, S35 2PH</td>
<td>+44 0114 246 1237</td>
</tr>
<tr>
<td>Peterborough Blasting</td>
<td>Oxney Road Industrial, Oxney Road, Peterborough, Cambs, PE1 5SD</td>
<td>+44 01733 312034</td>
</tr>
<tr>
<td>Radleigh Metal Coatings</td>
<td>Unit 30, Central Trading Estate, Cable Street, Wolverhampton, WV2 2H</td>
<td>+44 01902 870606</td>
</tr>
<tr>
<td>R.L.P. Painting</td>
<td>Heathfield House, Old Bawtry Road, Finningley, Doncaster, DN9 3DD, UK</td>
<td>+44 01302 772222</td>
</tr>
<tr>
<td>Severfield-Reeve</td>
<td>Dalton Airfield Industrial, Dalton, Thirsk, North Yorkshire, YO7 3JN</td>
<td>+44 01845 577896</td>
</tr>
<tr>
<td>South Staffs Protective Coatings Ltd</td>
<td>Bloomfield Road, tipoton, West Midlands DY4 9EE</td>
<td>+44 0121 522 2373</td>
</tr>
<tr>
<td>Southern Contracting</td>
<td>Unit 6, Trident Business Shore Road, NE28 6UE</td>
<td>+44 0191 262 0510</td>
</tr>
<tr>
<td>Standish Metal</td>
<td>Potter Place, West Pinbo, Skelmersdale, Lancs, WN8 9PW, UK</td>
<td>+44 01695 453977</td>
</tr>
<tr>
<td>Steel Protection Consultancy Ltd.</td>
<td>7a High Street, Mews, High Street, Leighton Buzzard, Beds, LUT 1EA, UK</td>
<td>+44 01525 852500</td>
</tr>
<tr>
<td>Sussex Blast Cleaning</td>
<td>Unit 35-37 Station Road, Hailsham, East Sussex, BN27 2ER</td>
<td>+44 01323 849229</td>
</tr>
<tr>
<td>TEMA Engineering Ltd</td>
<td>5-6 Curran Road, Cardiff, CF10 5DF, UK</td>
<td>+44 020920 344556</td>
</tr>
<tr>
<td>T&amp;T Coatings Ltd</td>
<td>Snowdown House, Snowdon Road, Middlesborough, TS2 1DY, UK</td>
<td>+44 01642 247972</td>
</tr>
<tr>
<td>Watson Steel Structures</td>
<td>Lostock Lane, Lostock, Bolton, BL6 4BL</td>
<td>+44 01204 699999</td>
</tr>
<tr>
<td>Weir Coating Systems</td>
<td>Unit 19, Heysham Business Park, Middleton Road, Heysham, Lancs, LA3 3PP</td>
<td>+44 01606 723426</td>
</tr>
<tr>
<td>W G Beaumont &amp; Son</td>
<td>Unit 1, Chadwell Heath Industrial, Kemp Road, Dagenham, RM8 1SL</td>
<td>+44 0208 590 8523</td>
</tr>
<tr>
<td>William Hare Ltd</td>
<td>Bradlesholme House, Bradlesholme Road, Bury, Lancs, BL8 1J, UK</td>
<td>+44 0161 609 0000</td>
</tr>
</tbody>
</table>
DIARY DATES 2009

16th September – 17th September
50th Corrosion Science Symposium
Venue: The University of Manchester
Running as a session of the RSC/SCI Electrochem 09 Conference.
Local organisers: Nicholas Stevens (ICorr) and Rob Dryfe (RSC).
Email: nicholas.stevens@manchester.ac.uk
Abstract Deadline: 31st May 2009

17th September
Strategic Refinery Management & Maintenance Optimisation Forum
Venue: Prague, Czech Republic
Enquiries: SumreenR@marcusevansuk.com

14th September – 18th September
Fifth International Conference - Advances in Corrosion Protection by Organic Coatings
Conference organiser: Professor David Scantlebury, The University of Manchester
Conference venue: Christ’s College, Cambridge
Contact: Fiona.Fraser@manchester.ac.uk
www.manchester.ac.uk/materials/events

17th, 28th & 29th October
Surface World with CORREX 2009
Venue: NEC, Birmingham
Enquiries & stand bookings:
Contact Nigel Bean, Sales Director on +44 (0)1442 826826,
email: nigelbean1@aol.com
www.surfaceworldshow.com
For conference enquiries please contact Denise on 01525 851771.

11th October
4th Annual Corrosion Management Summit
Venue: Abu Dhabi, United Arab Emirates
Contact: www.corrosionmanagementme.com
email: d.greenfield@shu.ac.uk

Institute of Materials, Minerals & Mining
Corrosion Committee Meeting
One Day Conference on: “Underground Corrosion”
DATE: TBC
Venue: The Health & Safety Laboratories, Buxton
Enquiries: john.thirkettle@thorcorrosion.co.uk
r.akid@shu.ac.uk

11th November
Back to Basics; The Essentials of Protecting Structural Steel by Protective Coatings and Paints
One Day Seminar
Venue: Cedar Court Hotel, Bradford
Enquiries: Mr. G. Manning, Tel. 07505111369
e-mail: graememanning@blueyonder.co.uk
Dr. D. Greenfield, Tel. 01142 252973

SHORT COURSES
9th–12th November
Corrosion Control in the Oil and Gas Industry
Amsterdam: - Further details contact Colin Britton, Tel: +44 (0)1480-860943 Email: cbrit79727@aol.com
or website at www.cfpa.com

Institute of Materials, Minerals & Mining
Corrosion Committee Meeting
One Day Conference on: “Underground Corrosion”
DATE: TBC
Venue: The Health & Safety Laboratories, Buxton
Enquiries: john.thirkettle@thorcorrosion.co.uk
r.akid@shu.ac.uk

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Tel: 0191 493 2600

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Jane Lomas,
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David Mobbs
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Graeme Manning
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Email: graememanning@blueyonder.co.uk

Young ICorr Chairman:
Oliver Lewis
Email: acesol@exchange.shu.ac.uk

CSD Division:
Nick Stevens
Tel: 0161 3063621

CED Division:
Nick Smart
Tel: 01635 280385

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