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Surface World 2011 & Correx 2011
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The President Writes

“The best-laid schemes o’ mice an’ men gang aft agley, an’ lea’e us nought but grief an’ pain.” I had not realised that Robbie Burns was a plumber! At least I have not had to deal with any “Wee, sleekit, cow’rin, tim’rous beasties” but the bathrooms are not finished and my name is mud in the Crundwell household.

Our meeting with visitors from Korea was very interesting; they want to work with ICorr on validation of their corrosion prevention courses, whether anything develops remains to be seen but the process has started. The Corrosion Science division contributed significantly to Electrochem 2011 in Bath and it was my pleasure to present the U R Evans award to Professor Gerald Frankel at that event. Professor Frankel’s Plenary lecture was a fascinating insight for me into modern research processes particularly in respect of aluminium alloys for aerospace applications which he punctuated by waving the UR Evans award sword as a pointer.

The BINDT Materials Testing Exhibition at Telford was a most enlightening personal experience as it is years since I attended anything like it but more of that elsewhere.

It was a particular pleasure to attend the dinner with my wife Marion as a guest of BINDT. Correx will soon be upon us and our stand is booked. Having set one up at Telford I think I know what will be needed but we will no doubt find everything different at the NEC. If you are able to help by manning the ICorr stand for a few hours please let Denise know at the ICorr office and she will pass your details on to me.

I recently used the Channel Tunnel shuttle to take the car on a quick trip to Belgium and found myself horrified at the corrosion on light fittings and similar appurtenances on the approach to the train. Unless I am very much mistaken the fixing screws are stainless but the fittings are coated steel and there is a lot of corrosion product and disbonded coating around the screws. And I do mean a lot. Some remedial maintenance needed I suspect.

At the end of November Marion and I are going on holiday to North India and early in the itinerary is a visit to the Delhi Pillar, something I have long wanted to see. Maybe there is something to pass on to the Channel Tunnel operators but I seem to recollect that the environmental conditions are a bit different in Delhi compared to Ramsgate.

MATERIALS TESTING

As part of the ongoing co-operation between BINDT and ICorr a reciprocal arrangement of having stands at one another’s exhibitions was agreed. The first was our stand at Materials Testing held at Telford in September with a similar arrangement for BINDT to be at CORREX in November. I collected three pull up displays and a lot of literature and conference proceedings from Northampton and together with Ross Fielding (Chair of Midlands branch) set the stand up in record time. Over the three days of the Exhibition and Conference the stand was manned mainly by volunteers from Midland Branch and NW Branch and a number of visitors were received. Interests included our training courses, membership and reciprocal events including ones in South Africa and Croatia.

I was invited with Marion to attend the Conference Dinner which was a special event marking this as the 50th Exhibition of BINDT and its predecessors and it was my especial pleasure to propose a toast to a number of members who have been members for 50 or more years several of whom were present. A thoroughly enjoyable event.
EXHIBITORS AT SURFACE WORLD & CORREX 2011 REFLECT THE WIDE INVOLVEMENT OF BUSINESSES IN PRODUCT FINISHING AND CORROSION CONTROL

The wide variety of exhibitors that have already booked their places at this year’s SURFACE WORLD & CORREX 2011 exhibition at the NEC in early November, indicate just how many different types of businesses and organisations have an interest in the evolving world of product finishing and corrosion control.

SURFACE WORLD & CORREX 2011 is the only international exhibition staged in the UK dedicated to product finishing, surface engineering, coatings and advanced surface treatments, together with corrosion management and control. It will run from November 1st to 3rd this year at the NEC Pavilion. A seminar, organised by the British Coatings Federation and focusing on training and skills, will run in tandem with the event.

Surface coatings and finishes are part of everyday life – virtually every product requires a functional or decorative surface – and the processes and products required to achieve the right surface finish play vital roles in the design, production and maintenance of countless components, products, fabrications and structures.

SURFACE WORLD & CORREX 2011 will showcase the latest technologies, products and services embracing protective, decorative and functional coatings of all kinds, component cleaning and degreasing, surface pretreatments, electroplating and allied processes, abrasive blasting and mechanical finishing, plus state-of-the-art techniques in the testing and measurement of coatings and surface integrity, advanced methods of corrosion control, environmental control and energy conservation.

Major players in the field such as AkzoNobel, DuPont Powder Coatings, ITW Industrial Finishing, MacDermid plc, Safecem Europe and Wagner Spraytech are just a few of the multi-national names exhibiting, along with nearly 100 other leading companies.

Many important new developments will be featured, which will be of major interest to design, production and maintenance specialists working in all sectors of industry – from construction engineering to aerospace.

SURFACE WORLD & CORREX 2011 is sponsored by Surface World & Product Finishing magazine, the leading UK publication in the surface engineering and finishing industry, and is organised by Hill Media Ltd.

A limited number of stands are still available at the exhibition – for exhibitor and visitor information, log onto www.surfaceworldshow.com or contact Nigel Bean at Hill Media Ltd,

Marash House, 2-5 Brook Street, Tring, Hertfordshire, HP23 5ED, UK.
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Surface World 2011 will run alongside Correx - the national corrosion conference and exhibition.

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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.

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E-mail: nigelbean1@aol.com
or visit the website at: www.surfaceworldshow.com

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Technical Topics No.33:

SCIENCE COUNCIL, BEACHED (AND OVERTURNED) SHIPS AND SEA WATER!

by Technical Secretary, Douglas J Mills

Starting with the Science Council again, all Fellows should by now have received information about how to apply to become a Chartered Scientist. Denise at the office is geared up to help (so if you are having difficulty or want to know more, please call her). The form is relatively simple to fill in and there is no extra annual cost associated with being a Chartered Scientist if you are already a Fellow. So if you are a Professional Member (as I was) and want to become a Chartered Scientist, then it is recommended that you first apply to become a Fellow. So let’s have a few more people applying to get our numbers of Chartered Scientists up to something reasonable (40 by the end of next year would be good!).

Moving onto the technical side, as we move into autumn, I thought I’d include a few pictures with a corrosion flavour taken during my summer travels. Most are at the seaside (we must be glad of sea water - without its aggressive nature the life of us corrosionists would be much less interesting!). Before we get onto those, an item from my visit to Stockholm (which although not at the conventional sea side is certainly quite watery) for Eurocorr 2011 (hopefully I will get a report on this meeting into the next CM). Anyway a highlight was a dinner in the City Hall provided by Sandvik who, to judge by what they laid on, have made a bob or two from distributing stainless steel! One of their latest projects involves the “Vasa”, a 17th C Swedish warship (it sank on its maiden voyage in Stockholm harbour in 1628, remained under the waves for some 333 years and was brought to the surface in 1961 and now sits splendidly in its own museum). It is remarkably well preserved although because most of the original bolts/nails in the oak structure had corroded, some thirty years ago they were replaced by low alloy steel bolts. But the continuing aggressive environment (salt and acid seeping out of the wood) caused the replacements to deteriorate. So the ongoing task is to replace them yet again, this time with stainless steel (supplied by ...guess who?). Anyway the museum is well worth a visit. It reminded me of a project I got involved with at the BNF in the 1970s examining metal artefacts brought up from the sea bottom in the mid 60s by Roland Morris from the fleet of ships that sank in 1707 off the Scilly Isles under Sir Cloudesly Shovell. Inter alia we were interested in the corrosion rate of lead musket balls. We contacted the museum in Stockholm to find the rate for the “Vasa”’s musket balls. Despite being different environments, the rate was similar. Now to a few holiday snaps. I was lucky enough to visit Australia this summer and spent two days on Frazer Island, a National Park 200km north of Brisbane and reputedly the largest sand island in the world. Back in 1936 a passenger liner called the “Maheno”, while under tow, broke away in a storm and landed up beached. The effort involved in refloating her was too great and so there she has remained. For many years she was relatively intact and became the venue for parties, even weddings. But the combined effects of sea water and sand have reduced her to something of a sorry sight (I suspect there is little chance of her being rescued and being transferred to a museum!) Nonetheless she is still something of a tourist attraction perhaps mainly as an example of the “art” that corrosion can create. (If you want to see her, go now because in another twenty years there will be almost nothing left!). As another aside the aggressive effects of sea water were also evident in the attack on that pier in Gdynia that was described in my last TT and illustrated on the front cover! Perhaps for that reason or perhaps because people have more time to read their CM in the summer, that particular TT generated a lot of interest with about half a dozen people contacting me about the article. Several solutions were suggested and I have passed them on to the people in Gdansk who are trying to deal with problem. Finally to another example from Rainbow Beach (the jumping off point for Frazer Island); this was where another ship named “Cherry Venture” who ploughed the waves from 1946 to 1973, got beached (although less dramatically than the “Maheno”). The interest here is in the remarkably well preserved propeller, made from stainless steel and cast by Lloyds in 1945, which stands as a landmark on the seafront. Almost no corrosion can be seen. Good old stainless steel!

Well that’s it for this month. As usual any comments please send to: Douglas@harrbridge.freeserve.co.uk
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The 52nd Corrosion Science Symposium was held at The University of Bath on the 5th and 6th of September in conjunction with the Royal Society of Chemistry Faraday Division Electrochem 2011 meeting. This is the third time we have held the annual conference in partnership with the RSC, after the successful meetings in Southampton in 2003, and Manchester in 2009. This year’s meeting was held with the theme ‘Electrochemical Horizons’ and featured no less than fifteen symposia attended by over 210 delegates over the two days. The meeting had a pronounced focus on green issues such as electrochemical conversion of CO₂ and the development of fuel cells.

The Evans Award for 2011 was presented to Professor Gerald Frankel, head of The Fontana Corrosion Center at Ohio State University, who gave his plenary address on ‘Localized Corrosion in Al Alloys and Its Prevention’.

Professor Frankel began by telling the audience how earlier in his career he had been invited to the home of Prof R A Rapp, who won the Evans Award in 1992. Professor Rapp had shown Professor Frankel the Evans Award Sword, and had joked with him about how he might never have one like it, a suggestion that Professor Frankel can now prove to be wrong.

The conference reception was held at the Roman Baths (after which the city is named), and was addressed by the Vice Chancellor of The University of Bath, Glynis M. Breakwell, who welcomed the contribution that scientists have to make to developing greener technologies to tackle problems such as CO₂ capture and solar power.

At the end of the conference, the Shreir Prize for the best student talk in the Corrosion Science Symposium was awarded to Stefano Neodo of Southampton for his talk on ‘Benzotriazole corrosion inhibition on nickel-aluminium bronzes’, and it was announced that the next CSD meeting will be held at the National Physical Laboratory in 2012. Since the meeting, the CSD committee have already been invited to start discussions with the RSC Faraday Division to hold another joint meeting in the future.

The U R Evans Award is presented as a prize to a scientist who through their work has made an outstanding contribution to the understanding of aspects of corrosion or its prevention, and takes the form of a Sword, with which the recipient is invited to fight corrosion. This was first awarded in 1976 to T P Hoar, and has since been awarded to a very distinguished list of recipients. The recipient of the Award is each year invited to give a talk on their work, and it is a tradition that no questions are asked of the recipient.

The 2011 Evans Award winner is a scientist who has worked in the field of corrosion for over 20 years, and in that time he has investigated many of the most important phenomena in the field, such as hydrogen transport in metals, localised corrosion and stress corrosion cracking, inhibition and coatings. As the Director of the Fontana Corrosion Centre at The Ohio State University, he is currently active in pursuing research on the corrosion behaviour of aluminium and its alloys (or should we say aluminum?) to reduce levels of environmentally harmful species such as chromate in corrosion prevention, and projects to advance understanding of atmospheric corrosion, as well as continuing to publish in many areas of corrosion science. In fact, the Evans award is not the first award that the Institute of Corrosion has presented to this highly prolific individual, he was also the winner of the T.P. Hoar Prize for a paper published in Corrosion Science in 2007, and in fact he had not one but two papers on the shortlist for that award! In all these areas, the constant thread connecting these papers in different areas has been the application of novel techniques to the problems at hand, such as the use of Scanning Kelvin Probe Force Microscopy to investigate processes under coatings, and the use of thin film techniques to allow localised corrosion processes to be imaged and measured accurately. For his many contributions to Corrosion Science the Corrosion Science Division of the Institute of Corrosion is therefore pleased to present the Evans Award for 2011 to Professor Gerald Frankel and to invite him to give us his plenary lecture on ‘Localized Corrosion in Aluminium Alloys and Its Prevention’.
Non-intrusive inspection (NII) offers a range of benefits compared to traditional internal visual inspection (IVI) approaches for pressure vessels. It allows effective inspection of equipment while in service which leads to an increase in plant availability. The costs and safety hazards of vessel entry are also avoided. There has been particular interest from the upstream oil and gas industry in the application of NII.

This paper aims to summarise some important aspects of that experience and identifies key elements that are essential to effective NII. In particular, it covers the need for a structured process, working within the context of industry recommended practice, the integration of which requires specific changes to existing integrity management systems. Examples of implementation of such a process covering initial assessment, workscope development, inspection implementation and post-inspection evaluation and analysis are provided. The importance of seamless integration of these steps is emphasised.

The impact of the approach to the inspection element on integrity decision making is also covered. Some common pitfalls and abuses of NII are identified. It is concluded that NII offers significant benefits to operators with no compromise on integrity provided a sound approach is adopted.

1. Introduction
The safe operation of equipment subject to degradation during service relies on inspection by which the degradation can be detected before it becomes a threat to integrity. Inspection is therefore an essential element of plant management. For pressure systems and/or plant containing hazardous material, minimum requirements for inspection are often the subject of legislation. In most countries, one of the requirements was, historically, to inspect the interior surfaces of vessels for degradation. The simplest way to assess the interior condition is by direct visual inspection. Consequently, internal visual inspection (IVI) has been the mainstay of inspection activity and remains the most widely applied technique today. A great deal of experience with IVI has been built up over the years and it has a clear track record of success in application. A wide range of defect types can readily be detected by IVI, and in most cases, a high proportion of the interior can be covered by the inspection.

IVI does have a number of drawbacks. For example, the fact that IVI requires vessel shut-down and entry often has significant cost implications, mostly through lost production and the need to prepare the vessel before entry. In addition, opening of vessels can have environmental effects through the release of undesirable substances and inspectors going into the vessel may be exposed to health and safety hazards (e.g., heat, oxygen deprivation, toxic fumes). The hazards of personnel entry are of growing concern in regulatory environments that are placing increased emphasis on workplace safety.

Given the above, inspections aimed at determining the condition of the vessel interior but performed entirely from the outside, i.e., Non-intrusive inspection (NII), can offer significant advantages. Non-destructive inspection techniques effective in identifying and, in many cases, sizing interior defects are becoming increasingly available. At the same time, regulations in many countries have become less prescriptive in specifying inspection requirements. This means that, in the countries concerned, plant operators are no longer required by legislation to do IVI, but are responsible for devising, implementing, and justifying inspection and maintenance strategies that aim to ensure safe operation. The drawbacks of IVI mentioned above mean that NII will be the preferred option for inspection in many cases.

While it may be the preferred option, NII represents a relatively new approach by comparison to IVI, and many engineers responsible for inspection planning have yet to build up experience with and confidence in its application. In addition, there are a wide variety of techniques available, each with its own specific capabilities and limitations. Consequently, the planning and justification of NII are often regarded as difficult and its benefits are not being as widely realised as could be the case.

There is also the potential that limited understanding of the requirements for NII can lead to inappropriate inspection approaches that do not provide the required level of assurance. There are, for example, situations in which a limited coverage manual ultrasonic inspection is referred to as NII and treated as a replacement for IVI. This may lead to short term cost savings for the operator but has longer term risk implications that responsible operators seek to avoid.

The above-mentioned limitations have been widely recognised in the Oil and Gas industry and a need for structured guidance in assisting plant operators plan and justify NII was identified in the early 2000s. This need was addressed by the development of a Recommended Practice (RP) for NII by the HOIS Joint Industry Project. This project was funded by many of the major international Oil and Gas operating companies and included input from the UK HSE. The objective was to put in place industry guidance that would ensure sound application of NII in a way that would maximise the benefits of NII without compromising safety. Consistency in application was a key objective, this being essential to limit the potential for abuse of NII.

The guidance document developed in HOIS was published by DNV as a Recommended Practice in 2007 and a revision to the RP was issued in early 2011 [1].

Having gained experience in NII assessment, planning, implementation, and evaluation for more than 300 major process vessels, it is now possible to develop and implement effective NII approaches in which the benefits to the operator are maximised.

This paper provides a summary of the approach to NII programmes and summarises some important aspects of how these programmes should be developed in practice. It identifies key elements that are essential to effective NII. In particular, it covers the need for a structured process, working within the context of industry recommended practice, the integration of which requires specific changes to existing integrity management systems. Examples of implementation of such a process covering initial assessment, workscope development, inspection implementation and post-inspection evaluation and analysis are provided. The importance of seamless integration of these steps is emphasised.

Synopsis
Non-intrusive inspection (NII) offers a range of benefits compared to traditional internal visual inspection (IVI) approaches for pressure vessels. It allows effective inspection of equipment while in service which leads to an increase in plant availability. The costs and safety hazards of vessel entry are also avoided. There has been particular interest from the upstream oil and gas industry in the application of NII.

This paper aims to summarise some important aspects of that experience and identifies key elements that are essential to effective NII. In particular, it covers the need for a structured process, working within the context of industry recommended practice, the integration of which requires specific changes to existing integrity management systems. Examples of implementation of such a process covering initial assessment, workscope development, inspection implementation and post-inspection evaluation and analysis are provided. The importance of seamless integration of these steps is emphasised.
The impact of the approach to the inspection element on integrity decision making is also covered. Some common pitfalls and abuses of NII are identified. It is concluded that NII offers significant benefits to operators with no compromise on integrity provided a sound approach is adopted.

2. Differences between NII and IVI

As background to understanding some of significant issues to be considered in the decision making process it is useful to consider, in broad terms, the conditions which best suit each of the two approaches and their respective benefits and limitations.

Conditions favourable to IVI
- Potential degradation mechanisms and rate are not well understood
- Sites of worst degradation are not easily predicted
- Different areas may have different degradation mechanisms
- Depth sizing of crack like defects is not needed
- Degradation is of a type that will be visible on exposed surfaces
- Interior readily accessed
- Cost of shut down is low or shut down is required anyway
- No health/safety/environmental risk from vessel entry
- Exterior access is not straightforward

Benefits of IVI
- Large scale coverage is rapidly achieved
- Lower cost of inspection activity itself
- Confidence based on extensive history of use

Limitations of IVI
- High cost of vessel preparation
- Hazards of personnel entry
- High cost of lost production associated with shut down
- Sub-surface defects can not be identified, e.g. laminations, hydrogen damage
- Data is not readily quantified due to limitations on what can be measured

Conditions favourable to NII
- All potential degradation mechanisms are well understood – i.e. one knows what to look for
- Sites of worst degradation are readily predicted – i.e. one knows where to look
- Degradation is not restricted to surface
- Exterior access exists
- Interior of vessel not readily accessed
- Cost of shut down is high
- Health/safety/environmental risk associated with vessel entry

Benefits of NII
- No hazard to inspectors
- Environmental implications of opening vessels avoided
- Can often be done on line hence no production loss associated with vessel shut down
- Bedspace requirements and flights are spread throughout the year
- Accurate sizing of defects is often possible
- Data can be quantified and recorded for future comparisons

Limitations of NII
- Inspection may be time consuming
- Coverage may be limited by cost/time considerations
- No single technique applicable across all potential defect types
- Limited operator experience may lead to reduced confidence

From a technical perspective the most important difference is that IVI will often have a high probability for identification of degradation without the need for an up-front expectation that such degradation may be present. The detection capability of NII is, on the other hand, very much technique specific. For example, Figure 1 shows an area of general corrosion containing isolated pits.

Figure 1. Area of general corrosion containing isolated pits

This difference between NII and IVI is one of several that mean that a different approach is needed for NII. In particular a greater emphasis is placed on confidence in understanding the type of degradation that may be present as this is a driver for assuring that the inspection approach is appropriate to the conditions in each case. There is no "one size fits all" solution in NII and this is recognised in the approach of the NII Recommended Practice as summarised in the sections that follow.

3. NII Assessment

Once a vessel has been identified as a candidate for NII (to act either as a replacement for IVI or to support deferment of IVI) the next step is to carry out an assessment to determine whether NII is appropriate. IVI has a long history of implementation and is widely accepted by operators and regulators alike. Hence the basis for the decision on whether NII is appropriate is to establish whether it is able to deliver a similar detection capability to IVI for any degradation that may be present and has potential to threaten vessel integrity. A key element to detection capability for NII is that the techniques and approach can be specified on the basis of a sound understanding of the potential types and locations of degradation.

The decision making process in [1] considers a range of issues but the most important factors are as follows.

Confidence in ability to predict types and locations of degradation

This is based on available inspection history and the type and nature of corrosion risk assessment carried out. Limited confidence makes it difficult to justify NII.
Previous inspection effectiveness

Inspection effectiveness is defined by comparison to IVI. A low previous effectiveness increases the potential that certain degradation mechanisms could have been overlooked historically.

Severity and rate of degradation

The severity and rate of degradation affects the inspection approach and IVI is often preferred when there is a high likelihood of severe damage being present.

The assessment process in [1] uses the above factors in leading to a decision on whether NII is appropriate and in what context, i.e. as a full replacement for IVI or only in support of deferment of IVI. When NII is appropriate the assessment then covers a definition of the appropriate inspection strategy and requirements.

There are three main strategies defined in [1], these being as follows.

Type A

Type A inspection applies in situations where there is a low probability of degradation and if degradation is present it will tend to be general or there is a high confidence that the most likely areas for degradation can be identified. The purpose of this type of inspection is primarily to confirm that there is no degradation active. This requires the use of techniques that are sensitive to early stage degradation. If degradation is found then further steps are taken. This Type normally applies to vessels fabricated in corrosion resistant alloy or carbon steel clad with corrosion resistant alloy.

Type B

Type B inspection applies when there is some degradation expected but it is not expected to be such as to threaten integrity in the short term. This inspection applies at a low/moderate coverage and its purpose is to provide sufficient information to allow demonstration of the required degree of assurance. If the results of the inspection do not allow this then further action is taken. This Type normally applies to carbon steel vessel exposed to hydrocarbon liquid/gas and water operating environments.

Type C

Type C inspection applies when there is a reasonably high probability of degradation being present and/or degradation may be severe and/or degradation has no preferred locations. This inspection will often apply at moderate/high coverage. Its purpose is to give a high probability that any defect with potential to threaten integrity is found directly. If such defects are found then further action is taken. This Type normally applies to carbon steel vessels that are lined internally with polymer coating, e.g. epoxy, glass flake vinyl ester.

The inspection requirements are also defined at the assessment stage. The requirements will typically include a definition of the following.

- Types of degradation for different locations
- Probability of detection requirements for each type of degradation
- Coverage requirements

Emphasis on the assessment phase of the work is essential to successful NII and longer term integration of NII in the integrity management process. Operators who adopt an ad-hoc/reactive approach to NII in which the assessment phase is by-passed often fail to realise the longer term benefits and may proceed to implementation of “NII” that fails to provide any real assurance but may be very expensive in enactment. Operators exposed to this situation often then revert back to IVI and will see NII as a costly failure. Carrying out an effective assessment is key to avoiding this problem. This includes recognising that the assessment requires in-depth knowledge and experience on the relevant corrosion, inspection and integrity issues. This is a key factor in ensuring effective NII, operators who make the assessment the responsibility of a routine NDT or integrity services contractor have ended up with expensive NII programmes that fail to deliver.

4. NII Planning

The NII planning phase defines the workscopes for the inspection, i.e. the techniques to be used, the key set up parameters, the locations for inspection and the inspection coverages.

The workscope defined must ensure that the primary objective of the inspection is met. This is to give a high degree of assurance that any degradation with potential to threaten integrity (before the next inspection) is detected. Definition of the workscope is based strongly on the information provided in the assessment and revolves around an understanding of the following.

- Degradation – the specific types of defect.
- Potential to threaten integrity – what nature/size/extent do we need to seek.
- NII inspection techniques that will deliver the required reliability, probability of detection and sizing capability for the different types of degradation.
The main requirements for techniques used in NII are as follows:

- High probability of detection
- High sizing accuracy and repeatability
- Detailed and complete records of inspection carried out

These requirements mean that automated techniques, in which a high volume of digital records is collected and stored, are typically used.

A wide range of readily deployable techniques are available for use but for NII for Oil and Gas process vessels the main techniques are normally as follows:

- Corrosion mapping
- Time of Flight Diffraction
- Angle pulse echo with automated data collection
- Grey-scale recording of 0deg pulse echo
- CHIME and Multiskip (long range techniques for wall loss)
- Saturated Low Frequency Eddy Current (SLOFEC)

The capability of the above techniques has been quantified for a wide range of typical in-service applications. When more complex inspection situations arise, e.g. a requirement for inspection for preferential corrosion at nozzle to shell weld roots, qualification of the techniques and approach is important prior to finalisation of the workscope. Qualification typically involves a combination of inspection modelling, using ultrasonic simulation software, and demonstration trials on test samples.

The workscopes provided include a series of work items that act as instructions for the teams doing the inspection. Accuracy of the workscopes is essential and it is important to ensure that each of the work items specified can be achieved given geometry/access considerations and surface conditions.

The workscope is a key element of the NII process and, in our experience, the following factors are important in ensuring workscopes that allow effective NII.

- Workscopes developed by a team with a sound understanding of degradation, integrity and inspection issues. Ideally this should be the same team that is responsible for the assessment but perhaps with additional inspection input. A multi-disciplinary approach, in which each of the team members has good working understanding of the other disciplines and appreciation of overall objective, is essential to ensuring workscopes that will meet the requirements. It should be noted that statistical methods are used at the planning stage and knowledge/experience with such methods is essential.

- Site survey to be carried out before the workscopes are developed. This should be performed by personnel with specialist NDT experience to ensure reliable identification of areas with limited access, areas of poor surface etc. The survey should be comprehensively documented and photographs/video taken whenever possible.

- Workscopes to include definition of specific reporting criteria and identification of conditions under which follow up is needed.

- Workscopes to clearly define actions for the operator before work commencement, i.e. scaffolding, surface preparation, insulation removal.

The timing for completion of the workscopes is also important. The NII implementation often depends on the erection of scaffolding or other preparation, e.g. surface preparation, insulation removal. Workscopes that are provided well in advance allow all site planning and preparation to be in place before implementation begins. This can result in significant savings to the operator through reducing delays on site.

A further important factor in ensuring effective NII is that the teams responsible for the inspection are fully briefed on the workscopes and requirements. A thorough briefing allows any queries about the approach to be dealt with and provides an opportunity for concerns to be raised and dealt with.

This briefing should cover more than just a functional description of the workscope but should aim to give the inspection team a good understanding of the objectives for each vessel. NII for each vessel benefits from treatment as a “science project” in the sense that there are specific objectives with respect to delivering a level of knowledge, and confidence therein, of vessel condition. An understanding of the objectives, approach and assessment criteria is therefore important in ensuring effective delivery of the inspection programme. Failure to recognise the significance of this leads to problems. We are aware of many cases where the NII is seen as merely requiring a set of procedures to be followed by the technicians doing the work and this has resulted in valueless data being collected on site when the situation is slightly different to that anticipated.

5. NII Implementation on site

The NII work carried out on site typically represents the most expensive and time consuming part of the process. It is therefore important to ensure that the work performed delivers to the requirements and will provide the necessary level of support to a case for replacement or deferment of IVI. Delivery to the requirements hinges very much on the inspection team and their experience with the techniques being used. This covers a wide range of factors, including the following:

- Understanding of equipment use, set up and optimisation for the different techniques
- Ability to deal with vessel specific difficulties, e.g. plate with inclusions and adjust the approaches accordingly
Judgement of data quality as it is being collected
Identification of anomalies and definition of suitable follow up work
Good communication with site personnel
In-depth understanding of the objectives of the NII
Good communication with the integrity team (who cover assessment, planning and evaluation)

The inspection team must aim to ensure that all aspects of the workscope are covered and the data collected meets the requirements. Communication with the integrity team is important in ensuring effective delivery. A working approach has been evolved, based on experience with several hundred vessels, in which there is daily feedback and review/analysis of site data. This allows review of work achieved against plan, in-depth evaluation of data quality, ongoing statistical analysis and revision of the approach where necessary, expert analysis of data, identification of early stage degradation, discussion and agreement on follow up activity etc.

The benefits of this approach are significant through reduced cost of delayed follow up, termination of NII at an early stage when its evident that IVI (and possible repair) will be necessary and a case for deferment will not be possible, identification of changes to the inspection approach to maximise data quality. The approach minimises the need for secondary mobilisations that may otherwise be needed as follow up to non-conformances or anomalies.

The daily feedback and communication also helps reinforce the objectives of the inspection for each vessel and establishes “NII thinking” in the teams doing the work. This is an important point – NII is used primarily as routine inspection and there is often little degradation active. It is essential to retain the emphasis on inspection quality in these situations despite there appearing to be little of “interest” in the data.

6. NII Reporting and Evaluation

The objective of the inspection is to provide justification for operation until the next scheduled inspection, i.e. typically over the interval specified in the RBI approach, or for a deferment interval. In following the approach of [1], this justification is, in part, made on the basis that the inspection meets the requirements set out at the assessment stage and included in the workscope. The approach in [1] includes consideration of non-conformances and their potential impact. The reporting process therefore includes most aspects of what would be covered in a specialist NDT report but has a significant emphasis on comparison of work achieved against the workscope. Effective delivery of this element of the report relies on communication between the inspection and integrity team as the latter are required to make an assessment of the extent to which each work item in the scope has been achieved on site.

The justification mentioned above also depends on analysis of the inspection data by the integrity team. This is particularly important for Type B inspection situations where a detailed statistical analysis is required to make estimates of condition in the areas which have not been inspected. This statistical analysis aims to show that the data is able to support a conclusion that the condition is acceptable and will remain so, with appropriate margins, until the next inspection. The requirements for effective analysis are not trivial and application should be the responsibility of suitably qualified individuals with a strong knowledge of statistical methods and application of such methods to integrity assessment. It should be noted that advanced statistical analysis is one of the cornerstones of effective NII [2], and the requirements for such analysis should be considered at an early stage in the planning process.

It is also important to note that the quality of the inspection data collected has a major influence on the ability to make the required justification. Impaired data quality (or reduced coverage) can mean it is not possible to make a justification and hence results in expenditure on further inspection (that should be correctly carried out) or in IVI being necessary.

Reporting and evaluation is an area that requires emphasis in effectively “closing the loop” and ensuring the benefits of the NII are realised. The requirements for NII go beyond what will be familiar to conventional services contractors and there is a need for a substantially different approach. There are numerous examples of NII programmes that are let down by an ineffective approach to evaluation such that a sound justification is never produced. This typically has expensive consequences when it comes to future requirements to address the shortcomings. An understanding on the part of operators of the specific skill set and experience required for effective delivery of this element of NII has a significant impact on the benefits achieved in any programme.

7. Summary & Conclusion

1. This paper provides an overview of the main elements of delivery of NII programmes for process pressure vessels.
2. Successful NII relies on a very different approach, in a number of areas, compared to IVI.
3. The main steps in an NII programme include Assessment, Planning, Implementation and Reporting/Evaluation. An outline of the significant elements of each of these steps is provided in the paper.
4. This paper outlines some of the key points of effective NII and highlights potential pitfalls when the specific requirements for effective NII are not recognised. It also considers the role experience of NII plays in a successful project outcome.
5. NII offers significant benefits to operators with no compromise on integrity provided a sound approach is adopted at each of the steps in the process.

8. References

TOP AWARD FOR INNOVATIVE CORROSION TREATMENT PROCESS

The innovative corrosion treatment system LATreat™ – developed and patented by BAC Corrosion Control and Mott MacDonald – has won the Research, Studies and Consulting Award at the Association for Consultancy and Engineering (ACE) Engineering Excellence Awards.

ACE represents the interests of the UK consultancy and engineering industry and is the leading business association in this sector, with around 650 members. Their Engineering Excellence Awards showcase the finest achievements of consultancy and engineering firms and the innovation that makes the industry crucial to local, national and global economies.

Winner of the Research, Studies and Consulting Award, LATreat™ is a highly innovative, environmentally friendly treatment that uses only the components of seawater to sterilise and then deposit a protective coating to marine steel structures affected by accelerated low water corrosion (ALWC). ALWC can cause premature perforation of unprotected steel and if untreated can lead to premature failure of a structure.

The LATreat™ process involves passing a phased electrical current through seawater. It takes about five days and does not require port closure. It requires no materials, creates no waste, and needs no costly ongoing maintenance. All equipment used is removed on completion of treatment with no requirement for permanent installation of expensive control equipment or long-term monitoring. LATreat™ is also significantly cheaper than cathodic protection systems, particularly when lifecycle costs are taken into account. Overall cost savings can be in the order of 50%.

In 2006 the Technology Strategy Board – the UK government’s national innovation agency – presented the project team with the opportunity to fully develop LATreat™ as a commercial product. Mott MacDonald put together a consortium comprising BAC Corrosion Control, Aberdeen Harbour Board, Port of London Authority, Shoreham Port Authority and Hutchison Ports to develop and test the effectiveness of LATreat™ under real conditions. Manchester University joined the team as its academic partner and carried out research to fully optimise the process. BAC Corrosion Control also developed and manufactured enhanced electrical current apparatus used during the process.

Full scale site trials have been carried out at UK ports over several years. These have demonstrated the effectiveness of LATreat™ in dealing with ALWC in operating port facilities and producing a sustainable, durable and cost-effective treatment.

The ACE Engineering Excellence Awards ceremony was held at the newly reopened St Pancras Renaissance Hotel in London. Mott MacDonald’s Group chairman Keith Howells and LATreat™ project director Neil Henderson were present to receive the award.

Doctor Henderson said, “We’re thrilled to have won this award, which recognises over a decade of research and development. The involvement of UK ports to undertake full-scale site trials has been a major step in demonstrating the effectiveness of the process under real conditions. We’re now looking forward to using LATreat™ as a commercial product. As ALWC has been identified at over 90% of UK ports and throughout Europe, the USA, Canada, the Caribbean and Japan, the potential benefits of LATreat™ to the global ports sector are huge.”

DENSO ULTRASEAL CHOSEN FOR ATLANTIC LIGHTHOUSE PROTECTION

Winn & Coales Denso Ultrasel Tape followed by Denso Acrylic Topcoat is now offering protection from an Atlantic Ocean environment plus attack by seagulls on the North Rona Lighthouse, 40 miles north of the Butt of Lewis. The Denso materials were applied to roofs of the engine room and accommodation block in a recent refurbishment of the North Rona Lighthouse by NG Bailey, who were appointed as contractors for this refurbishment following competitive tender by the Northern Lighthouse Board.

In 1983 Denso Flashing Tape had been used to seal the fibreglass base roof sections of the engine room and accommodation block. As well as being subject to the harsh environment, the Flashing Tape was also being attacked by seagulls who were attracted to the shiny surface of the tape.

Winn & Coales suggested to NG Bailey that the Ultrasel Tape would be a more suitable alternative to provide both the protection required in the North Atlantic environment and also be less visible to the seagulls. The Denso Acrylic Topcoat provided a matt finish to blend in with the colour of the roof to make it less attractive to the Seagulls.

For further information contact: BAC Corrosion Control tel: +44 (0) 1952 290321 fax: +44 (0) 1952 290325 e-mail: sales@bacgroup.com www.bacgroup.com

For further information contact: Winn & Coales (Denso) Ltd., Chapel Road, London SE27 OTR Tel: 020 8670 7511 Fax: 020 8761 2456 e-mail: mail@denso.net web: www.denso.net
DENSO PROTECTION FOR SELLAFIELD XOMOX ACTUATORS

Induchem UK, the exclusive distributor for all Crane Xomox valves and process products, has recently refurbished two sets of 180 degree actuators for processing plant at Sellafield. To meet the environmental conditions at Sellafield they are protected with several Winn & Coales (Denso) Ltd’s robust Denso coating systems.

The actuator housings are made from aluminium and also have steel drive shafts. Two actuators are mounted together with a mild steel box section support frame.

All the parts were shot blasted to remove the old paint coatings. They were then spray coated with Denso Galvprime, followed by a Denso Steelcoat system consisting of two coats of Denso ST Epoxy followed by two coats of a polyurethane-based top coat of Denso Weathershield. All parts were then rebuilt and witness tested to the satisfaction of Sellafield inspectors.

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

40 YEARS AND STILL GOING STRONG

Winn & Coales (Denso) Ltd are very proud to announce in 2011 that their Denso SeaShield marine pile protection systems have now been effectively working in some of the most harsh and demanding environments on the planet for over forty years.

This is no small achievement and Winn & Coales (Denso) Ltd can now officially rank these systems in the same league as other enduring Denso products, some of which have now been in service for over 80 years.

Anyone who has used Denso products will know that they are not in the business of supplying temporary fixes to corrosion prevention problems and pride themselves on providing long-term, cost effective solutions. The SeaShield range of systems have been developed with this purpose in mind to protect marine structures where corrosion is a major problem in splash zones, inter-tidal and sub-sea environments and the difficult area where the jetty pile meets the jetty platform. These areas are extremely vulnerable due to the constantly changing mixture of air, temperature and chloride laden water; all of which are the perfect mixture for severe corrosion. The result of this will cause structures to become unsafe over time and extremely costly to repair.

SeaShield Systems now have a 40 year proven track record, providing totally effective protection for steel, wood and concrete jetty piles in highly corrosive environments. This long term protection is achievable irrespective of cylindrical, hexagonal or square structure pile designs.

Winn & Coales (Denso) Ltd, originally established in 1883, are well known for the reliability, efficiency and longevity of their products and have built an enviable reputation based on problem solving for their customers. Apart from the UK, they also have subsidiaries in America, Canada, Australia, New Zealand and South Africa as well as a global network of over 70 agents making the products available virtually anywhere in the world. Just a Drop in the Ocean for Denso - 40 Years of Worldwide SeaShield Marine Pile Protection and Still Going Strong.
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<td>Beever Limited</td>
<td>Little Coldharbour farm, Tong Lane, Lamberhurst, Kent, TN3 BAD, UK</td>
<td>T: 01892 890045</td>
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<tr>
<td>Briton Fabricators Ltd</td>
<td>Watnall Road, Hucknall, Notts, NG15 6EP</td>
<td>T: 0115 963 2901</td>
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<tr>
<td>Cape Industrial Services</td>
<td>Cape House, 3 Red Hall Avenue, Paragon Business Village, Wakefield, WF1 2UL</td>
<td>T: 01224 215800</td>
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<tr>
<td>Cleveland Bridge UK Ltd</td>
<td>Cleveland House, Farm Road, Darlington, DL1 4DE</td>
<td>T: 01325 502345</td>
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<tr>
<td>Coating Services Ltd</td>
<td>Partington Street, Mumps Bridge, Oldham, OL1 3RU, UK</td>
<td>T: 0161 665 1998</td>
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<tr>
<td>Coastline Preservation Ltd</td>
<td>Tredegar Wharf, Marine Parade, Southampton, Hants, SO14 5JF</td>
<td>T: 02380 221480</td>
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<tr>
<td>Collins Engineering Railway Contracts</td>
<td>Salcombe Road, Meadow Lane Industrial Estate, Alfreton, Derbyshire, DE55 7RG</td>
<td>T: 01773 833255</td>
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<tr>
<td>Community Clean</td>
<td>11 Old Forge Road, Ferndown Industrial Estate, Ferndown, Wimborne, Dorset, BH21 1RR, UK</td>
<td>T: 0845 6850133</td>
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<tr>
<td>Corrocoat</td>
<td>Forster Street, Leeds, LS10 1PW</td>
<td>T: 01132760760</td>
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<tr>
<td>Denholm Industrial</td>
<td>21 Boden Street, Glasgow, G40 3PU</td>
<td>T: 0141 445 3939</td>
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<tr>
<td>Dyer &amp; Butler Ltd (Rail)</td>
<td>Mead House, Station Road, Nursling, Southampton, SO16 0AH, UK</td>
<td>T: 02380 667549</td>
</tr>
<tr>
<td>ENC (Yorkshire) Ltd</td>
<td>Unit 3B Rotherham Road, Dinnington Sheffield, S25 3RF</td>
<td>T: 01909 567860</td>
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<tr>
<td>F A Clover &amp; Son Ltd</td>
<td>Bardolph Road, Richmond Surrey, TW9 2LH</td>
<td>T: 0208 948 6321</td>
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<tr>
<td>Finclean SKJ Ltd</td>
<td>Waterloo Industrial Estate, Pembroke Dock, Pembroke, SA72 4RR</td>
<td>T: 01646 622407</td>
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<tr>
<td>Forth Estuary Transport Authority</td>
<td>Forth Road Bridge, Administration Office South Queensferry, EH30 9SF</td>
<td>T: 0131 319 1699</td>
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<tr>
<td>Harrisons Engineering Lancashire Ltd</td>
<td>Judge Wilmore Mill, Longworth Road, Billington, Clitheroe, Lancashire, BB7 9TP</td>
<td>T: 01254 823993</td>
</tr>
<tr>
<td>Herrington Industrial Services Ltd</td>
<td>Crown Works, Crown Road, Low Southwick, Sunderland SR5 2BS</td>
<td>T: 0191 5160634</td>
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<tr>
<td>H&amp;H Painting Contractors Ltd</td>
<td>4 Hamilton Gardens, Mutley, Plymouth, PL4 6PQ</td>
<td>T: 07837 382619</td>
</tr>
<tr>
<td>Hunter Steel Coatings Ltd</td>
<td>4Pinfold Lane, Alltami, Mold, Flintshire CH7 6NZ</td>
<td>T: 01244 541177</td>
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<tr>
<td>Hyspec Services Ltd</td>
<td>Unit 3 Meadowfield Industrial Estate, Cowdenbeath Road, Burntisland, Fife, KY3 0LH</td>
<td>T: 01592 874661</td>
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<tr>
<td>Industrial Coating Services</td>
<td>5 Danesbury Crescent, Kingstanding, Birmingham, B44 0QP</td>
<td>T: 0121 384 2266</td>
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<tr>
<td>Industrial Painting</td>
<td>48-49 RCM Business Centres, Sandbeds Trading Estate, Dewsbury Road, Ossett, WF5 9ND</td>
<td>T: 01924 272606</td>
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<tr>
<td>Interserve Industrial</td>
<td>Unit 2, Olympic Park, Poole Hall Road Ellesmere Port, Cheshire, CH66 1ST</td>
<td>T: 0151 3737660</td>
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<tr>
<td>Jack Tighe Coatings</td>
<td>Sandall Lane, Kirk Sandall, Doncaster, DN3 1QR</td>
<td>T: 01302 880360</td>
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<tr>
<td>Jack Tighe Ltd</td>
<td>Redbourne Mere, Kirton Lindsey, Gainsborough, Lincs, DN21 4NW, UK</td>
<td>T: 01652 640003</td>
</tr>
<tr>
<td>Company Name</td>
<td>Address</td>
<td>Telephone</td>
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<tr>
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<tr>
<td>JPV (Painters) Ltd</td>
<td>Unit 8 Prospect Way, Hutton Industrial Estate, Brentwood, Essex, CM13 1XA, UK</td>
<td>01277 201515</td>
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<tr>
<td>Lanarkshire Welding Co.</td>
<td>82 John Street, Wishaw, Lanarkshire, ML2 7TQ</td>
<td>01698 264271</td>
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<tr>
<td>Mabey Bridge Ltd</td>
<td>Station Road, Cheshtrrow, Monmouthshire NP16 SYL</td>
<td>01291 623801</td>
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<tr>
<td>Merseyside Coatings Ltd</td>
<td>Pickerings Road, Halebank Industrial Estate, Widnes, Cheshire, WA8 8XW</td>
<td>0151 423 6166</td>
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<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>
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<tr>
<td>Nusteel Structures</td>
<td>Lympe Industrial Estate, Lympe, Hythe, Kent, CT2 1 4LR</td>
<td>01303 268112</td>
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<tr>
<td>Ormca Coatings Ltd</td>
<td>Newton Chambers Road, Thorncliffe Park Estate, Chapeltown, Sheffield, S35 2PH</td>
<td>0114 246 1237</td>
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<tr>
<td>P&amp;R Engineering Ltd</td>
<td>Unit 50/51 Cable Street, Wolverhampton, WV2 2H</td>
<td>01902 870637</td>
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<tr>
<td>Paintel Ltd</td>
<td>26 St George’s Road, Saltash, Cornwall, PL12 6EH</td>
<td>07730 691227</td>
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<tr>
<td>ThyssenKrupp Palmers Ltd</td>
<td>1120 Elliot Court, Herald Avenue, Coventry Business Park, Coventry, CV5 6UB</td>
<td>02476 710294</td>
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<tr>
<td>Port Painters Limited</td>
<td>Unit 3, Ringside Business, Hoel-Y-Rhosog Cardiff, CF3 2EWx</td>
<td>02920 777070</td>
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<td>Pyeroy Limited</td>
<td>Kirkstone House, St Ormers Road, Western Riverside Route, Gateshead, Wear, NE11 9E2</td>
<td>01911 4932600</td>
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<tr>
<td>Roy Hankinson Limited</td>
<td>Alexander House, Monks Ferry, Birkenhead Wirral, CH41 5LH</td>
<td>0870 7892020</td>
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<tr>
<td>Rowecord Engineering</td>
<td>Neptune Works, Lsk Way, Newport, South Wales, NP20 2SS</td>
<td>01633 250511</td>
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<tr>
<td>Shutdown Maintenance Services Ltd</td>
<td>Kingsnorth Industrial, Hoo, Rochester, Kent, ME3 9ND</td>
<td>01634 256969</td>
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<tr>
<td>South Staffs Protective Coatings Ltd</td>
<td>Bloomfield Road, Tipton, West Midlands, DY4 9EE</td>
<td>0121 522 2373</td>
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<td>Supablast (1984) Ltd</td>
<td>Jubilee Estate, Gorsey Lane, Coleshill, Birmingham, B46 1JU</td>
<td>01675 464446</td>
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<tr>
<td>T I Protective Coatings</td>
<td>Unit 6, Lodge Bank, Crown Lane, Horwich, Bolton, Lancs, BL6 5HU</td>
<td>01204 468080</td>
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<tr>
<td>TEMA Engineering Ltd</td>
<td>5-6 Curran Road, Cardiff, CF10 5DF, UK</td>
<td>020920 344556</td>
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<tr>
<td>Walker Construction</td>
<td>Park Farm Road, Folkestone, DA9 9RR</td>
<td>01322 387000</td>
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<tr>
<td>Wardle Painters Ltd</td>
<td>Unit 5, Wimborne Building, Atlantic Way, Barry Docks, Glamorgan, CF63 3RA, UK</td>
<td>01446 748620</td>
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<tr>
<td>W G Beaumont &amp; Son</td>
<td>Beaumont House, 8 Bernard Road, Romford RM7 0HX</td>
<td>01708 749202</td>
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<tr>
<td>William Hare Ltd</td>
<td>Brandleholme House, Brandleholme Road, Bury, Lancs, BL8 1J, UK</td>
<td>0161 609 0000</td>
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<tr>
<td>Abrasion Ltd</td>
<td>1 Montague House, 74 Bryantwood Road, London, N77BB</td>
<td>07949 130168</td>
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<tr>
<td>E &amp; P Painting Contractors</td>
<td>Rosswell Road, Rossmore Trading Estate, Ellesmere Port, Cheshire, CH65 3AW</td>
<td>0151 9558141</td>
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<tr>
<td>Fairhurst Ward Abbotts</td>
<td>225 London Road, Greenhithe, Kent, DA9 9RR</td>
<td>01322 387000</td>
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<tr>
<td>Gemini Corrosion Services</td>
<td>Brent Avenue, Forties Road, Montrose, Angus, DD10 9PB</td>
<td>01674 672 678</td>
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<tr>
<td>HBS Protective Coatings Ltd</td>
<td>40 Manse Road, Belfast BT8 6SA</td>
<td>028 90708280</td>
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<tr>
<td>Offshore Marine Services Ltd</td>
<td>Brumby House, Jalan Bahasa, PO Box 80148, 87011 Lubuan F.T. Malaysia</td>
<td>+356214244410</td>
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<tr>
<td>Opus Industrial Services</td>
<td>Ethan House, Royce Avenue, Cowpen Industrial, Estate, Billingham, TS23 4BX, UK</td>
<td>01642 371850</td>
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<tr>
<td>P C Richardson &amp; Co</td>
<td>Courville House, Ellerbeck Court, Stokesley Business Park, Stokesley, T9 5FT, UK</td>
<td>01642 714791</td>
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</table>
### ICATS REGISTERED COMPANIES

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<thead>
<tr>
<th>Company Name</th>
<th>Address</th>
<th>Telephone Number</th>
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<tbody>
<tr>
<td>Solent Protective Coatings Ltd</td>
<td>Tredegar Wharf, Marine Parade, Southampton, SO14 5JF</td>
<td>023 80221480</td>
</tr>
<tr>
<td>Standish Metal</td>
<td>Potter Place, West Pimbo, Skelmersdale, Lancs, WN8 9PW, UK</td>
<td>01695 455977</td>
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<tr>
<td>Tees Valley Coatings</td>
<td>Riverside Park Road, Middlesborough, Cleveland TS2 1UT</td>
<td>01642 228141</td>
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<tr>
<td>Coastground Ltd</td>
<td>Morton Peto Road, Capton Hall Industrial, Great Yarmouth, Norfolk, NR31 0LT</td>
<td>01493 650455</td>
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<tr>
<td>Forward Protective</td>
<td>Vernon Street, Shirebrook, Mansfield Notts, NG20 8SS</td>
<td>01623 748323</td>
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<tr>
<td>GABRE (UK) LTD</td>
<td>9 Holme Road, Dromore, Omagh Co Tyne, BT78 3BX</td>
<td>02882 897950</td>
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<tr>
<td>G W Burton Ltd</td>
<td>New Court, Wooddalling, Norwich, Norfolk, NR11 6SA</td>
<td>01263 584203</td>
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<tr>
<td>Harsco Infrastructure Services Ltd</td>
<td>Unit 3 Manby Road, South Killingholme, Immingham, North Lincolnshire, DN40 3DX</td>
<td>01469 553800</td>
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<tr>
<td>Hi-Tech Surface Treatment Ltd</td>
<td>Unit B, Deacon Trading Estate, Chickenhall Lane, Eastleigh, Hants SOS0 6RP</td>
<td>023 80611789</td>
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<tr>
<td>H &amp; S Decorating</td>
<td>Ammination Building, Forth Road bridge, South Queensferry, Edinburgh, EH30 9SF</td>
<td>01753 654123</td>
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<tr>
<td>Hempel UK Ltd</td>
<td>Llantarnam Park, Cwmbran, Gwent, NP44 3XF</td>
<td>01633 874024</td>
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<tr>
<td>Leighs Paints</td>
<td>Tower Works, Kestor Street, Bolton, Lancs, BL2 2AL</td>
<td>01698 264271</td>
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<tr>
<td>Malakoff Limited</td>
<td>North Ness, Lerwick, Shetland, ZE1 0LZ, UK</td>
<td>01595 695544</td>
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<tr>
<td>Matthew James Services</td>
<td>Unit 4, Shibden Business, Cowen Road Blaydon, Newcastle—Upon-Tyne, NE21 5TX</td>
<td>01911 414 5700</td>
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<tr>
<td>N L Williams Group Ltd</td>
<td>Westside Industrial Estate, Jackson Street, St. Helens, Merseyside WA9 3AT</td>
<td>01744 26526</td>
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<tr>
<td>NSG UK Ltd</td>
<td>Fourth Avenue, Deeside Industrial Park, Deeside, Flintshire CH5 2NR</td>
<td>01244 833138</td>
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<tr>
<td>Paint Inspection Ltd</td>
<td>Trafalgar House, 223 Southampton Road, Portchester, PO6 4PY</td>
<td>0845 4638680</td>
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<tr>
<td>Possilpark Shotblasting Co Ltd</td>
<td>Dalmarnock Works, 73 Dunn Street, Glasgow, G40 3PE</td>
<td>0141 556 6221</td>
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<tr>
<td>R.L.P. Painting</td>
<td>Heathfield House, Old Bawtry Road, Finningley, Doncaster, DN9 3SD, UK</td>
<td>01302 772222</td>
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<tr>
<td>Specialist Blasting Services Ltd</td>
<td>Smiths Quay, Hazel Road, Woolston, SO19 7CB</td>
<td>023 80438901</td>
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<tr>
<td>Sussex Blast Cleaning</td>
<td>Unit 35–37 Station Road, Hailsham, East Sussex, BN27 2ER</td>
<td>01323 849229</td>
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<tr>
<td>Tinsley Special Products</td>
<td>Enterprise House, Durham Lane, Eaglescliffe, Stockton-on-Tees TS16 0PS</td>
<td>01642 784279</td>
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</table>

### Additional Information

- Visit the Icorr website: [www.icorr.org](http://www.icorr.org)
DIARY DATES 2011/2012

10th-14th October 2011
NACE Basic Corrosion Course: A route to NACE certification
Aberdeen
contact p.sidky@cmc.ltd.uk

13th October 2011
London Branch joint meeting with London Materials Society
Dr. Alex Parfitt on 'Corrosion protection and monitoring for defence equipment.'
Naval Club, 38 Hill Street, London W1
17.30 for 18.15 start.

18th-20th October 2011
RadTech Europe Conference & Exhibition 2011 Europe’s Event for UV/EB Curing
Basel, Switzerland
www.european-coatings.com/radtech

10th November 2011
London Branch joint meeting with Joining and Welding Society
Speaker: Steve Hawes of Winn and Coales on 'Tape selection – getting the full picture'
Naval Club, 38 Hill Street, London W1
17.30 for 18.15 start.

15th November 2011
Corrosion of Infrastructure "Present Knowledge and Future Solutions”
Conference Themes:
- Keynote: Longevity & reliability of infrastructure
- Expert systems for assessing transport infrastructure
- Ensuring the life of power generation facilities
- Condition monitoring of buildings
Contact: IOM3 : Prof. Robert Akid: r.akid@shu.ac.uk
ICorr: Prof. Paul Lambert: paul.lambert@mottmac.com

15th-16th November 2011
EC Seminars on
- Rheology Workshop
- Dispersing pigments and fillers
- Understanding easy-to-clean
- Anticorrosive coatings
- Polyurethane coatings
Amsterdam / the Netherlands
www.european-coatings.com/events/ec-seminars

20th-24th November 2011
International Corrosion Congress
Perth Convention Exhibition Centre, Perth, Australia
The 18th International Corrosion Congress is a four-day gathering including leading international corrosion experts with premium networking opportunities and sources of the latest information about corrosion and its mitigation. The congress will comprise learned plenary lectures, renowned keynote speakers, a detailed programme of oral and poster presentations, social functions and an unsurpassed exhibition showcasing the latest products and services.
For more details visit: www.18iccpperth2011.com

12th January 2012
London Branch Meeting, Speaker: Dr. Raouf Kattan on 'Marine Coatings'.
Meet at Naval Club, 38 Hill Street, London W1
Contact: Derek Hoskins: dhoskins@waitrose.com
17.30 for 18.15 start.

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