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EFC NEWSLETTER

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EUROPEAN FEDERATION OF CORROSION
EUROPÄISCHE FÖDERATION KORROSION

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FORTHCOMING EVENTS
EUROCORR 2003

EUROCORR 2003, organised by the Hungarian Corrosion Society (HUNKOR), will take place in Budapest on September 28 - October 2 2003 as EFC Event No. 261. The theme of the conference will be "Bridge between Academy and Industry" and it will cover all of the major topics of corrosion and corrosion protection being dealt with by the sixteen EFC Working Parties listed overleaf. In addition, the hosts are arranging special sessions on two very "hot" topics: "Nanostructured Functionalised Coatings"; and "Role of the Internet in the Dissemination of Corrosion Research Results".

Budapest is an excellent venue for Eurocorr. Buda and Pest, the two parts of the city, are connected by nine bridges across the River Danube. The Liberty Bridge, inaugurated in 1896 and illustrated above, provides a very appropriate symbol for the forthcoming event.

Contents

The venue for EUROCORR 2003 is the Budapest Congress Centre, which is the largest congress and convention facility in the country. Located in the green belt of Buda, a few minutes from the city centre, it forms an integral unit with the totally renovated Hotel Novotel.

An International Scientific Committee is planning the programme. This is co-chaired by Prof. Dr. Erika Kálmán, of the Hungarian Academy of Sciences, who is a member of the EFC Board of Administrators (BoA) and Dr. Jörg Vogelsang of Sika Schweiz AG, Switzerland, who is Chairman of the EFC Science and Technology Advisory Committee (STAC). It will consist of oral and poster presentations in sessions on the following subjects:

- Corrosion and Scale inhibition
- Corrosion and Protection of Steel Structures
- Corrosion by Hot Gases and Combustion Products
- Nuclear Corrosion
- Environment Sensitive Fracture
- Surface Science and Mechanisms of Corrosion
- Corrosion Education and Computer Applications
- Corrosion Testing
- Marine Corrosion
- Microbial Corrosion
- Corrosion of Steel in Concrete
- Corrosion in Oil and Gas Production
- Coatings
- Corrosion in the Refinery Industry
- Cathodic Protection
- Automotive Corrosion
- Nanostructured Functionalised Coatings
- Role of the Internet in Dissemination of Research Results

EUROCORR 2003 Call for Papers

Authors wishing to present a contribution should submit a 1-page abstract no later than 20 January 2003 to the following address:

Prof. Dr. Erika K Kálmán
Chemical Research Centre
Hungarian Academy of Sciences
H-1525 Budapest, P.O. Box 17, Hungary
Tel: +36 1 325 7548
Fax: +36 1 325 7509
E-mail: eurocorr@chemres.hu

Abstracts may include tables, figures and references. They should be prepared in electronic form as a word processor file, e.g. MS Word. Margins should be 30 mm wide on each side of A4 size paper. The text should be single-spaced and justified using Times New Roman 12 pt font. The title should be typed centred in bold 14 pt letters, followed by the author(s)' name(s) (centred 12 pt), and affiliations (centred, italic, 12 pt). Please leave a blank line between title and authors, authors and affiliations, and two blank lines between affiliations and the body of text. Please state the preferred mode of presentation (oral or poster) and the preferred allocation of the paper to a scientific session.

A Technical Exhibition will take place during EUROCORR 2003. Companies wishing to exhibit should contact the organisers.

The Social Programme for registered guests and accompanying persons will include a welcome reception, cultural evening and conference dinner. Various sightseeing tours will also be available.

Registration fees are expected to be €490 for delegates to the conference and €160 + 25 % VAT per sq. m for exhibitors.

Registration Enquiries should be addressed to:

Diamond Congress Ltd.
H-1255 Budapest, P.O. Box 48, Hungary
Tel: +36 1 214 7701 or +36 1 214 7698
Fax: +36 1 201 2680
E-mail: diamond@diamond-congress.hu
Website: www. diamond-congress.hu/eurocorr

EUROCORR 2004 will take place in Nice, France on 12-18 September 2004 as EFC Event No. 266. It is being organised by CEFRACOR and SCI, the EFC Member Societies in France. The venue will be the world-famous Acropolis Convention and Exhibition Centre which, since its construction in 1984, has hosted more than 3000 events, including EUROCORR '96 which attracted over 700 delegates.

The emphasis at EUROCORR 2004 will be "Long Term Prediction and Modelling of the Corrosion Behaviour of Metallic Materials", a crucially important subject to which every EFC Working Party should be able to contribute.

The new EFC Working Party on Tribo-Corrosion is expected to organise its first technical session at EUROCORR 2004. In addition to this and technical sessions organised by the other EFC Working Parties, the organisers are planning to hold special Workshops on the following topics:

- Enzymes and corrosion
- Cu and Al alloys in marine environments
- Developments in corrosion protection of Mg alloys
- Conservation/corrosion of archaeological objects
- Nuclear waste storage
- Local probe techniques for corrosion research
- Non-Destructive/corrosion monitoring techniques

The scientific and technical programme is being planned by an International Scientific Committee co-chaired by Dr. Philippe Marcus of Ecole Nationale Superieure de Chimie de Paris, Chairman of EFC WP6 on Surface Science and Mechanisms of Corrosion. It will consist of plenary and keynote lectures, oral presentations in parallel sessions and poster contributions.

Anyone wishing to present a paper at EUROCORR 2004 should submit a 1-page abstract before the deadline of 16 January 2004 to the following E-mail address: "eurocorr2004@scifrance.org".

A large technical exhibition will be held simultaneously with the Conference. Those requiring information about the exhibition, or who would like to receive the second announcement and call for papers should contact the organisers at the following address:

CEFRACOR
28, rue Saint-Dominique
F-75007 Paris, France
Tel: +33 (0)1 47 05 39 26
Fax: +33 (0)1 45 55 90 74
E-mail: eurocorr2004@scifrance.org

EUROCORR 2005 TO TAKE PLACE IN LISBON

At a meeting of the EFC Board of Administrators in London on April 26 2002, Lisbon was selected as the venue for EUROCORR 2005. This will be the first time that EUROCORR has taken place in Portugal.

Professor Mario Ferreira of the Technical University of Lisbon is helping to organise the event on behalf of INETI, the Portuguese Member Society of the EFC. The planned dates for the conference are 9-13 October 2005.

The exact venue for EUROCORR 2005 has still to be decided but will be announced soon.

LETTER FROM THE PRESIDENT

Don Harrop

During my first year as President of the EFC the findings of two important reviews on the cost of corrosion have again thrown into stark relief why we are here.

Both reviews, looking at US and UK industry, make very interesting reading and arrive at significant bottom line figures which provide powerful statements and statistics in support of the time, effort and priority we all give to advancing the understanding, awareness, and cost effective management of corrosion.

Past reviews have resulted in the much-cited national cost of corrosion as 2% – 4% of GDP for the developed world. Is, therefore, the situation improving or worsening? Does this simple GDP measure, and the reviews themselves, perhaps give some insight into the impact the many national and international corrosion societies and organisations such as the EFC are having on corrosion?

Well, looking at the findings of these two reviews the high level message is certainly one of 'no room for complacency'. Direct corrosion costs don't appear to be changing much based on the US review – 3.1% of US GDP – whereas the UK review shows a significant decrease of corrosion costs in critical industrial sectors by 50% over the past 30 years. Whether the two figures are strictly comparable from the methods used to determine them I leave for others to debate. However, interestingly the US review also refers separately to indirect costs – eg. lost productivity because of outages, delays, failures, and litigation – and puts these conservatively as equal to the direct costs. The collective US costs then represent 6% of GDP! Clearly indirect costs should not be forgotten.

Should we expect to see a downward trend in the cost of corrosion? The speed of change in industry is relentless with a need to be quick footed to maintain profitability yet meet changing societal acceptance and expectations. This need for constant change together with financial pressures can sometimes get in the way of best practice and certainly throw up new problems and untested and/or untried solutions.

A vicious circle can result if care is not taken. Available time and/or funds to properly research and review become constrained especially if the importance of the corrosion engineer is undervalued or is brought in too late. An undervaluing of this role makes it less attractive as a career for new graduates and so the available human resource and its expertise become seriously compromised. I would contend that textbook engineering only gets you past first base.

The other factors having growing influence are health, safety and the environment, and the need for demonstrable compliance with regulatory HSE requirements. Corrosion can affect all three elements.

Defining and managing risk is a key element of doing business today, and certainly corrosion can be a primary contributor here. Often the corrosion process involved has a relatively long half-life, may be stochastic in nature and detected only after significant damage has occurred: there is plenty of time for complacency to set in or for corrosion control to slip down the priority list and off the radar screen.

It is clear that the war on corrosion continues, and that the EFC has a continuing key and influential role to play in promoting the sharing of best practice in corrosion control and management, and in raising the understanding, awareness and predictive capability of the many forms of corrosion. The EFC's Working Parties sit at the vanguard of fulfilling this role. It is therefore important to keep their activities fresh, engaging, focussed and aligned with today's issues but also thinking about tomorrow – prevention is the best cure!

Pace of delivery and being proactive are paramount to the actual value and impact resulting. Will always being reactive have any effect on reducing the cost of corrosion as measured by retrospective reviews?

There is a need to balance the pursuit of a strategic direction against possession of the agility to react tactically to new and breaking corrosion problems. The way we conduct our business is important here and embracing today's information technology has much to offer.

A principal output of the EFC's Working Parties is publications. Publications provide an international window on the work and standing of the EFC. Their relevance, quality, style and timeliness are crucial to enhancing the wider influential role of the EFC. Examples here are EFC publications #16 and #17, which are now regularly cited worldwide when specifying materials for sour service and have been instrumental in shaping ISO 15156. Around this is the provision of training and that of certification to raise individual competence in recognising and effectively managing specific corrosion problems affecting their industry and business.

The heart of the EFC beats strong. There are currently 15 active WPs with two more looking to spread their wings. The quality of the EFC's publications remains very high, with the total number sitting currently at 35.

Whilst there is no EUROCORR this year, it is good to see that many of the EFC Working Parties will be meeting at Granada during the 15th International Corrosion Congress reflecting their high level of activity.

I would encourage all to consider participating in one or more Working Party. This is where you can get your voice heard and make a difference. I know that the new STAC chairman, Jörg Vogelsang, is looking to move up a gear the activities and influence of the Working Parties. A strong Working Party infrastructure provides a sound base for a strong EUROCORR, the structure and future strategic direction of which is something BoA is currently wrestling with.

So the business of the EFC continues to move on a pace even though we will not meet as a EUROCORR this year. However, I hope to see many of you at the 15th International Corrosion Congress, where STAC, BoA and the EFC General Assembly will meet. Our EFC colleagues in Spain are hosting the ICC and we should give them all our support for a successful congress.

Don Harrop,
EFC President

NEW EFC WORKING PARTY ON TRIBO-CORROSION

Dr Pierre Ponthiaux of Ecole Centrale Paris, Chairman of the CEFRACOR Commission on Tribo-corrosion, has proposed the formation of a new EFC WP on Tribo-corrosion (to become EFC WP18).

Tribo-corrosion is a complex degradation process that results from the combined effects of mechanical and environmental influences occurring on the surfaces of metallic, ceramic and composite materials.

Many aspects of tribo-corrosion have not yet been elucidated because of the complexity of the individual mechanical and environmental processes involved, and because synergy between these processes has to be considered. The new WP18 will facilitate joint research and the exchange of knowledge between interested parties from both industrial and research backgrounds in Europe. Bio-tribological processes, occuring in the presence of biological species, will be included within the remit of WP18.

Strong support for the new WP has already been received from over thirty individuals in 13 different EFC member countries and from Member Societies in Belgium, Norway, Portugal, Sweden, UK, and Yugoslavia. The inaugural meeting is taking place in conjunction with the 15th International Corrosion Congress in Granada on Monday 23rd September at 10.30 am (Seminar Room 1+2 at the Congress Hall). Subject to approval by the EFC Science and Technology Advisory Committee (STAC), final approval for EFC WP18 "Tribo-Corrosion" will be given at the EFC General Assembly on 28th September.

Further information about WP18 is available from either Dr Ponthiaux (pponthia@ecp.fr) or Prof. Jean-Pierre Celis at the Catholic University of Leuven, Belgium (Jean-Pierre.Celis@mtm.kuleuven.ac.be).

OBITUARY

It is with sadness that we record the death of Dr Jos Weber at the age of 67 on 16 August 2002.

Jos Weber was born in Differdingen, Luxembourg, in 1934. He qualified as a chemical engineer at the Swiss Institute of Technology, ETH Zurich, and went on to obtain his PhD there in 1966 for a thesis concerned with hydrogen in cast iron.

His career with Sultzer-Innotec began in 1964 where, starting from almost nothing, he established an internationally recognised corrosion laboratory. Over the years he published many papers in the scientific and technical literature. Among his numerous interests were corrosion and materials selection in the nuclear and chemical industries, in connection with which he and his group were extensively involved in the development of duplex stainless steels for specific applications.

Jos Weber (right) at work in the laboratory

Dr Weber's laboratory also played a leading role in the evaluation of container materials for nuclear waste disposal and in the development of the Swiss concept based on the use of carbon steel. Well known for his expertise in the field of inhibitors, further contributions from Dr Weber and his colleagues concerned the development of inhibitors for the cooling systems of diesel engines and of our understanding of their reaction mechanisms. They were also active in the development of new experimental devices for the investigation of erosion and cavitation corrosion in flowing media. Their scientific investigations of inhibitors and materials did much to improve the lifetime of pumps.

For many years, Jos Weber was closely involved with the EFC, belonging to both the Corrosion Inhibitors and Nuclear Corrosion Working Parties. In 1973 he became a member of the EFC Board of Administrators and he was also the first permanent chairman of the Science and Technology Advisory Committee.

Dr. F. Hasko (left) presenting the European Corrosion Medal to Dr Weber in 1991

In 1991, his outstanding contributions to industrial corrosion science and the technology of metallic materials, leading to significant improvements in the life expectancy and reliability of installations and machines, were recognised by the award to Jos Weber of the European Corrosion Medal at a ceremony during EUROCORR '91 in Budapest.

Since then, many people have worked with Dr Weber in connection with various COST activities. In particular, during the late 1990s he was Chairman of both COST 511(f) on the interaction of microbial systems with industrial materials, and of COST 520(p) on biofouling and materials.

In Jos Weber, the world has lost an innovative corrosion engineer who contributed to a number of important areas of corrosion technology.

CONFERENCE REPORTS

CORROSION CERTIFICATION: THE EUROPEAN SCHEME

A colloquium entitled "Corrosion Certification: the European Scheme" took place on 4-5 June 2002 at the "Palais des Congrès" in Aix-en-Provence as EFC Event No. 253. This highly acclaimed event, organised by CEFRACOR, attracted approximately 100 delegates. The programme included over 20 presentations from nine different countries (Belgium, France, Germany, Italy, Norway, Poland, Sweden, UK and USA). About half of the presentations were given in French, but excellent simultaneous translation into English was available for those who needed it. As well as presentations that reviewed the general approaches to certification in different European countries and a Workshop aimed at identifying ways to rationalise and reduce the number of accelerated test methods, there were several round table discussions with associated presentations on key subjects including:

- The opinion of end-users and suppliers on qualification and certification in the anti-corrosion field
- The qualification and certification of coating products
- The certification of coating inspectors
- The certification of personnel and companies for coating applications
- The certification of personnel and companies for cathodic protection

Several papers discussed the different approaches to corrosion certification that have evolved in different countries, with different numbers of levels and varying degrees of bureaucracy. This was the most comprehensive review of the topic yet to have taken place and the published proceedings, when they appear, will provide an excellent basis for the eventual achievement of equivalence of certification throughout Europe. This will allow those obtaining their qualifications in one country the freedom to practise without hindrance throughout Europe and, perhaps, even further afield.

During the Opening Ceremony of the Colloquium, Professor Zucchi of the Aldo Dacco Corrosion Centre at the University of Ferrara presented the Cavallaro Medal for 2002 to Dr Alan Turnbull of NPL for his outstanding contribution to our understanding of localised corrosion and environmentally assisted cracking processes.

Professor Zucchi Presenting the Cavallaro Medal to Dr Alan Turnbull (right)

The Official Reception at the City Hall in Aix on 5 June was another splendid occasion, at which Gérard Pinard-Legry, the President of CEFRACOR, presented "la grande médaille du CEFRACOR" for 2001 to Pier-Luigi Bonora. This prestigious award is presented every fourth year to a non-French scientist with an international reputation in the fields of corrosion and corrosion protection.

Professor Pier-Luigi Bonora (2nd from right) following his presentation with the CEFRACOR Medal by Dr Pinard Legry (3rd from right)

CATHODIC PROTECTION AND ASSOCIATED COATINGS
Buried Structures and Structures Exposed to Marine Environments

A second major event, this time a Seminar on Cathodic Protection and Associated Coatings, took place in Aix-en-Provence as EFC Event No. 254 on 6-7 June 2002, immediately following the colloquium on Corrosion Certification.

About 150 professionals took part in the meeting, which had been organised by a Scientific Committee chaired by Marcel Roche, President of the CEFRACOR Commission on Cathodic Protection and Associated Coatings and Chairman of EFC Working Party 16 on Cathodic Protection.

Twenty-seven papers were presented orally during the two-day meeting and there were nine posters. There were five main topic areas, as follows:

- Buried structures
- Measurements on buried structures
- Associated coatings
- Fundamental aspects and various applications
- Marine structures

The Seminar highlighted the rapid development of techniques and standardisation that is taking place in this field. For example, The first paper, by E. Bini and L. Di Biase of Snam Rete Gas S.p.A., Italy, discussed innovative techniques being developed for the remote control of CP systems and coating condition in a large gas pipeline network. The adoption of these technologies will have a strong positive impact in terms of increased safety and reliability of gas pipeline networks.

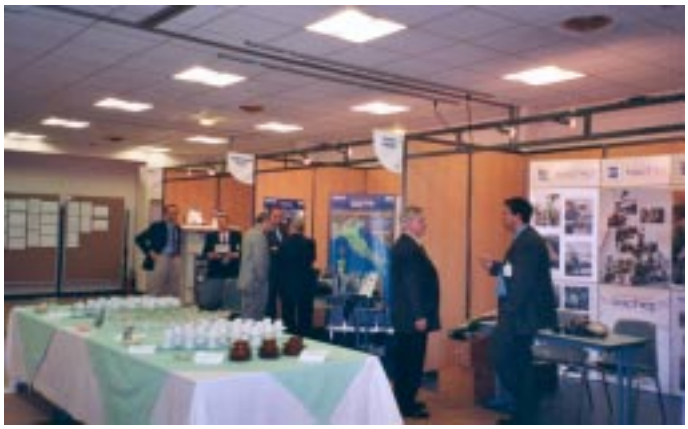
In early 1997, two failures in France highlighted the risks associated with hydrogen cracking due to over-protection by CP. A paper by D. Le Friant and C. Adam of SPMR emphasised that in addition to the classical criterion of -850 $mV/_{Cu/CuSO4}$ a lower limit of -1150 $mV/_{Cu/CuSO4}$ is desirable to suppress the possibility of hyldrogen uptake.

Several presentations concerned the organic coatings used in conjunction with cathodic protection to prevent the external corrosion of pipelines. As asphalt and coal tar coatings age, the development of micro-cracks, porosity and disbonding may adversely affect their protectiveness. The latest generations of polyurethane coatings are solvent and coal tar free and environmentally friendly.

A talk by Antoine Pourbaix of CEBELCOR focussed on the undetected cases of corrosion that occur at coating defects. Such defects are often due to lack of adhesion and mechanical breakdown. Measurements were made of potential and pH beneath coatings because of concern about the existence of a corrosion domain for carbon steel in very alkaline environments (pH ≈ 14). Such measurements are not easy but will provide a good basis for the specification of appropriate coatings.

Antoine Pourbaix speaking about chemical and electrochemical conditions beneath coatings

An International Exhibition was held in conjunction with the Seminar at which seventeen companies from Belgium, France, Italy and UK displayed their products.



One Corner of the Exhibition in Aix-en-Provence

EUROCORR 2001 "THE EUROPEAN CORROSION CONGRESS"

EUROCORR 2001, took place in Riva del Garda, Italy, on 30th September - 4th October 2001. This was less than three weeks after the terrorist attacks on the World Trade Centre in New York and the Pentagon in Washington. Without doubt the impact on international travel of these terrible atrocities took a tremendous toll on the attendance level, which was well down on previous events in the EUROCORR series in recent years.

The event had been organised by "Associazione Italiana di Metallurgia" (AIM) which had chosen a marvellous venue with excellent facilities at the Palazzo dei Congressi in Riva del Garda. Located at the northern tip of Lake Garda in Trentino, the Italian sector of the Dolomites, Riva is surrounded by magnificent mountains.

The Palazzo dei Congressi in Riva del Garda

The final programme listed a total of 263 items, 201 of which were for oral presentation and 62 for presentation as posters. All sixteen of the EFC's Working Parties had contributed to the technical programme. However, in two cases working parties had collaborated to produce joint sessions (on Corrosion education and Computer information systems, and Physico-chemical methods of testing and Coatings) giving a total of fourteen topic areas. Between three and five parallel sessions took place during the rest of the conference.

The Opening Ceremony

The conference began with a warm welcome to delegates from Professor Franco Mazza of the University of Milan, the Congress Chairman, who stressed the need for scientists and engineers to work together to improve the quality of products, so reducing both the impact of corrosion on society and its financial cost.

Professor F. Mazza

Next, Professor W. Nicodemi, the President of AIM, extended his thanks to those who had come from over forty different countries to participate in EUROCORR. This, he said, would help AIM to achieve its goal of enabling the exchange of experience between many countries in order to speed up the rate of progress in many fields of interest, including corrosion. He reported that over 260 delegates, including 30 students, would be attending the conference.

Dr J. P. Berge, the President of the EFC, then drew delegates' attention to the latest issue of the EFC Newsletter which contained over 60 references to EUROCORR, a major showcase of the EFC. He emphasised the high technical quality of the conference, despite the difficulties of organising such a major event each year. Thanking all concerned for their efforts, he urged everyone to encourage their

colleagues in industry and research to be sure to attend future events in the series.

Professor Pier-Luigi Bonora of the University of Trento, Past-President of the EFC and co-chairman of the International Scientific Committee which had planned the Technical Programme, completed the welcomes by wishing everyone a successful meeting, a pleasant stay in Riva del Garda, and sunny weather.

Presentation of EFC Awards

One of Philippe Berge's last duties as EFC President, and a very pleasant one, was to make two presentations. The first of these, the European Corrosion Medal, recognises achievements in the application of corrosion science in its widest sense and consists of a bronze medal, a diploma and the sum of €1000. The President presented this to Professor E. Bardal of the Norwegian University of Science and Technology (NTNU).

Philippe Berge (left) presents the European Corrosion Medal to Einar Bardal

Einar Bardal founded the SINTEF Corrosion Centre in Trondheim, Norway, in 1975 and was its head from 1975 to 1994. Under his direction, the Centre soon established an international reputation for excellence in the fields of corrosion fatigue of steel in sea-water, cathodic properties and crevice corrosion of stainless steels in sea-water, mathematical modelling of crevice corrosion, erosion and corrosion of ceramic-metallic materials and coatings, electrochemical testing of paint coatings, and test methods related to the above topics. In the field of education, Prof. Bardal's ethos has always been to simplify theoretical tools so that they can be understood and used by engineering students with limited background in chemistry, such as students of mechanical, marine and civil engineering. His publications number over 160, including a highly regarded textbook on corrosion and corrosion control which is widely used in Scandinavian educational institutions and is to be published in English.

The second presentation, of Honorary Membership of the EFC, was made to Professor H. J. Grabke of the Max-Planck-Institut für Eisenforschung in Dusseldorf, Germany. This rarely granted honour can be conferred on any individual having made, in the opinion of the EFC Board of Administrators, a particular contribution to the achievement of the aims of the Federation to promote cooperation within Europe to advance the science of corrosion and the protection of materials. Hans Grabke was Chairman of EFC Working Party 3 on Corrosion in Hot Gases and Combustion Products for thirteen years up to 1998. During this period, he organised seven very successful workshops on various aspects of high temperature corrosion, the proceedings of which have all been published. Even in retirement, Prof. Grabke remains active on behalf of the EFC and is helping to organise an EFC Workshop on "Metal Dusting, Carburisation and Nitridation", which will take place on 30-31 January next year in Frankfurt.

Hans Grabke (left) receives Honorary Membership of the EFC from Philippe Berge

Professor Grabke, clearly appreciative of the honour, insisted that he is only one of many EFC Working Party Chairmen who have done a good job and are very dedicated in their work for the Federation. He paid tribute to the collaboration that he had enjoyed with others such as Mike Bennett of UKAEA, Harwell, and the late Barry Meadowcroft of the CEGB, Leatherhead. He also acknowledged his very efficient successor as chairman of WP3, Prof. Michael Schütze of the Karl Winnacker Institute of DECHEMA e.V. in Frankfurt, who has already organised two workshops and edited two books.

Plenary Lecture

The plenary lecturer, R. Cigna, is chairman of the COST 521 collaborative project on the corrosion of steel in reinforced concrete structures. The title of his lecture was "Prevention, monitoring and maintenance in major reinforced concrete structures". Mr Cigna began by relating that on his arrival in the Dolomites in 1964 he found that a reinforced concrete bridge had just been rebuilt, even though it had not been in a terribly bad condition. There had been no means to monitor corrosion which, if available could have saved much money.

The plenary speaker, Mr R. Cigna

Some engineers swear that concrete structures can last forever because the steel reinforcement is protected by its surroundings at a pH of 12-13. However, in practice the pH can decrease to 8.0-8.5 due to the effects of CO_2 from the atmosphere and steel starts to corrode. Matters are made worse by the presence of chlorides from de-icing salts since these promote pitting attack and crevice corrosion.

Early cases of corrosion included a pre-stressed concrete pipeline, which suffered serious damage before start up in Regina, Canada, in 1951. Then in Germany in 1959 polarisation studies showed that chloride makes steel less passive in CaOH solution (similar to concrete). Cracks can eventually form in concrete due to the wedging effect of corrosion products. This means that in practice the highest corrosion rate that can be tolerated is only 2-5 μm per year.

Preventative measures which have been considered by COST 521 include:

- Cathodic prevention, where holding the potential at - 400 mV can prevent the formation of corrosion pits even in the presence of chloride. This is used for pipelines, but not often for steel in concrete (one exception being the Frejus viaduct);

- Controlled permeability formwork, which can be used to assist the egress of water while the concrete sets;

- Electrochemical monitoring by sensors to measure corrosion rates and establish what chloride level can be tolerated without corrosion;

- The installation of arrays of macrocouple sensors (electrodes which become galvanic anodes as soon as chloride reaches them) at various depths beneath the surface to monitor the ingress of chlorides;

- Potential mapping of bridge decks to monitor variations of potential from -100 mV to - 600 mV and show which areas are corroding and which are passive. To attain complete passivation in service takes 12-18 months during which time the corrosion rate falls from up to 50 μm per year initially to below 10 μm per year.

For maintenance purposes cathodic protection is widely used after damaged concrete has been removed and new concrete has been applied. Buildings that are

40-50 years old made of concrete that contains $CaCl_2$ are specially prone to damage. Cathodic protection reduces the potential from about 0 mV (where pits form) to -700 mV (where there is perfect passivity). However, potentials much lower than this must be avoided since at below -900 mV there is a high risk of hydrogen embrittlement. Inhibitors sometimes are ineffective or have only a small effect.

Mr Cigna ended by saying that COST 521 had been in progress for 5 years and that the final workshop (for end users) would be held in Luxembourg.

Technical Sessions

The 15 technical sessions which followed had been organised by the EFC Working Parties and varied in size from between half-a-dozen presentations over the course of an afternoon (for Nuclear Corrosion and Automotive Corrosion) to twenty-eight over two full days (in the case of Corrosion of Reinforcement in Concrete). Some sessions suffered from the absence of one or more speakers due to concerns over air travel in the aftermath of September 11th. Nevertheless, many favourable comments were received from delegates about the high technical quality of the conference. In addition to the oral presentations, poster presentations were on display throughout the conference and there was also a small exhibition. The proceedings of the conference were distributed to delegates on a CD-ROM, which included about 75 % of the papers. Detailed reports on the sessions can be found in *British Corrosion Journal*, Vol. 36 (2001) Numbers 3 and 4 and Vol. 37 (2002) Number 1.

Prof. I. Esih, Prof. P-L. Bonora and Dr L. Vehovar at the Reception in Riva del Garda

Social Events

EUROCORR has become recognised for the quality of its social events and the conference in Riva del Garda was no exception.

The welcoming reception on 30th September took place in the Congress Centre and provided a pleasant opportunity for delegates to meet each other and renew acquaintances.

The Conference Dinner took place on the evening of 2nd October at the Lido Palace Hotel, which was only a short walk away and featured lovely gardens and a very attractive view over the lake. The meal will be remembered as one of the most sumptuous on record, with a huge number of different courses and quality wines, ensuring that it went on late into the night and was well enjoyed by all.

The Conference Dinner

There was also a comprehensive accompanying persons programme of selected tours to the Dolomites, Lake Garda, Verona and the 6000 year old villages of Tenno and Ledro. Very complimentary reports were also received about these trips.

Professor Mazza the President of the Congress, Professor Bonora, the Chairman of the International Scientific Committee, Dr Madaschi of AIM and his staff, and everyone else involved in the organisation of EUROCORR 2001, are to be congratulated for making it such a success.

EU-SUPPORTED PROJECTS

MENTOR-C "VOCATIONAL TRAINING IN CORROSION ENGINEERING"

Two years ago, Professor Walter Bogaerts of the Electrochemistry and Engineering Laboratory at the Katholieke Universieit of Leuven (K.U. Leuven), Belgium, devised an ambitious project to develop modern distance learning materials for use in connection with vocational training in corrosion engineering. Summary proposals for a project with a total budget of € 820,000 were submitted to the European Commission (EC) for support amounting to €600,000 under the second phase of its Leonardo da Vinci Community Vocational Training Action Programme which runs from 2000-2006. The project was well received but its acceptance was delayed because of the priority then being given to language-related projects. However, it was finally approved late last year with a modest reduction of funding, of which €31,270 is for EFC, and an official start date of 1st December 2001. It is scheduled to run for three years until December 2004.

Mentor-C is the acronym for Materials engineering training tools: on-line tutoring, international recognition and certification of Corrosion expertise. The goal of Mentor-C is to produce better systems for vocational training in corrosion (i.e. for technicians and engineers rather than scientists). These will be web-based or CD-ROM-based to facilitate use in distance learning courses. K.U. Leuven is the promoting organisation but there is also an industrial users group and six other partners, including:

- CoRI - Coatings Research Institute, Limelette, Belgium
- Corrosion and Protection Centre, UMIST, Manchester, UK
- DECHEMA, e.V. - Frankfurt, Germany
- EFC - European Federation of Corrosion, London Office, UK
- ISQ - Instituto de Soldaradura e Qualidade, Oeiras, Portugal
- NACE International - European Region, Dudley, UK

The kick-off meeting for the project took place in Leuven on 27-28 March 2002 when Professor Bogaerts was appointed as Project Manager and pro tem. Chairman of the Steering Committee. Many administrative matters were discussed, including the intellectual property rights of those contributing existing materials to the development of new learning aids.

Prof. Bogaerts (2nd from right) and delegates at the kick-off meeting for MENTOR-C

Most of the meeting was devoted to discussion of the six main work packages (WP 1 - 6).

WP 1 (months 1-15) concerns the development, adaptation and testing of software shells and will be led by K.U. Leuven. This will review available software platforms for the delivery of learning materials to the web or on CD-ROM/DVD, identify the most suitable option and adapt it for use with multi-level, multi-module, multi-lingual course materials. The aim is to produce working software including sample course material by the mid-term review after 18 months.

WP 2 (months 3-24) relates to the development of the basic Mentor-C course modules and will again be led by K.U. Leuven. These modules will be developed from common input materials including, for example, the UMIST ECorr software and the EFC corrosion films, but at two different levels: for

technicians and engineers. Further materials will be made available to those wishing to pursue the science of corrosion to a greater depth. The basic modules will appear in several languages e.g. English, French, German and Spanish. Emphasis will be placed on the use of a problem-oriented approach to learning. This will ensure that everything is learnt in the correct context.

WP 3 (months 6-30) will provide at least three specialist modules for those familiar with corrosion basics who wish to receive training either in a particular aspect of corrosion technology (e.g. protective coatings or the corrosion of welds) or for work in a specific industry (such as oil and gas production). These modules could eventually provide the basis for a European certification scheme at one or more levels. WP 3 begins shortly and will be led by UMIST. Final decisions on the topics of the specialist modules will be made within the next six months.

WP 4 (months 6-33) covers the digitisation of the printed and film materials and the mastering of CD-ROMs, DVDs and web materials. This activity will be led by K.U. Leuven.

WP 5 (months 31-36) will expose the teaching materials produced during the project to rigorous testing and evaluation. It will be led by the EFC whose Working Party on Corrosion Education and Computer Applications will organise trial sessions involving members of the industrial users group and other typical end users at all relevant levels.

WP 6 (months 24-36) on dissemination will also be led by the EFC and will publicise the project to make potential end users aware of what is to become available by means of announcements, press releases and demonstration workshops. This work package will also include considerations relating to intellectual property rights, copyright issues and commercial exploitation of the products. In addition, consideration will be given to the eventual use of the Mentor-C learning materials in a European certification scheme for corrosion technicians and engineers.

Within three years, Mentor-C will provide vocational training resources of high quality for use in distance learning courses, both supervised and unsupervised, for technicians and engineers throughout Europe wishing to increase their working knowledge of corrosion. The Mentor-C content and approach will be unique and will not compete with the more advanced course materials currently on offer from academic establishments.

MATNET — PROGRESS REPORT

In the last issue of the Newsletter, it was reported that MatNet, the EU-supported project to form a network of European materials societies, was suffering delays. The second meeting of the Steering Committee had been cancelled and the EFC had not received written approval to commence its work.

The aim of MatNet is to establish a lively network to promote and facilitate communication and cooperation between the ten participating societies, of which the EFC is one. To do so, two main Work Packages have been established: Work Package A concerned with structural materials, and Work Package B on functional materials. The EFC is involved in Work Package A and it has emerged that the delays arose because the Co-ordinator of the work package, Prof. Y. Bréchet, had resigned. He has now been succeeded by Prof. H.-P. Degischer of the Technical University of Vienna and progress is being made once more. At a meeting in Vienna on 21 June 2002, it was decided to establish Topical Groups on Complex Damage Mechanisms, Design and Composites, and High Temperature and Reactive Environments.

It has been confirmed that the EFC project, to establish a network on materials problems in waste

incineration, which was proposed by Professor H. J. Grabke, will form the cornerstone of the latter group.

Prof. Grabke has decided to hold a preliminary meeting during November in Belgium in conjunction with the current EU-sponsored PREWIN project on waste incineration problems. At that meeting plans will be made to hold a MatNet project workshop in April or May next year.

Professor Degischer (left) and the Coordination Committee for MatNet Work Package A

RECENT AND FORTHCOMING EFC PUBLICATIONS

Two of the best-selling books in the EFC Series, both from EFC WP13 (Corrosion in Oil and Gas Production) sold out recently so have been re-published in second editions, as follows:

EFC 16 (2nd Edition, 2002): "Guidelines on Materials Requirements for Carbon and Low Alloy Steels for H_2S-Containing Environments in Oil and Gas Production"

This guideline document is specifically concerned with the material requirements for carbon and low alloy steel for H_2S-containing oil and gasfield services. It considers types of cracking, conditions under which these may occur in H_2S service, as well as requirements to prevent cracking. Test methods are recommended for evaluating materials performance and particularly focus on a fitness-for-purpose approach whereby the test conditions are selected to reflect the realistic service conditions. Notable changes to the hardness guidelines have been made in this second edition.

EFC 17 (2nd Edition, 2002): "Corrosion Resistant Alloys for Oil and Gas Production: Guidance on General Requirements and Test Methods for H_2S Service"

This publication aims to establish a common understanding of the requirements for the testing and qualification of corrosion resistant alloys (CRAs) for use in oil and gasfield production facilities. The general criteria for selection and requirements for testing of CRAs are stated in the context of a detailed understanding of the corrosive conditions in oilfield facilities. Test procedures are proposed for evaluation of the resistance of CRAs to in-service cracking (by SSC and SCC) in H_2S service. Since the first edition was published in 1996, research has shown that some test solutions can influence test results, particularly with martensitic stainless steels. This has led to a major revision of EFC 17. There are now three test solution options listed in the document. They are also consistent with those to be published in ISO 15156-3: Petroleum and natural gas industries -- Materials for use in H_2S-containing environments in oil and gas production -- Part 3: Cracking-resistant CRAs (corrosion-resistant alloys) and other alloys. There are also several other sections of EFC 17 that have been revised, and more recent information on titanium has been included.

The following new additions to the EFC Series are in preparation and will be published later this year:

EFC 36: "Prediction of Long Term Corrosion Behaviour in Nuclear Waste Systems", edited by D. Féron (EFC WP 4 on Nuclear Corrosion);

EFC 37: "Test Methods for Assessing the Susceptibility of Prestressing Steels to Hydrogen Induced Stress Corrosion Cracking" by B. Isecke (EFC WP11 on Corrosion in Concrete).

APPOINTMENTS TO THE EFC BOA AND STAC

The hierarchy of the EFC includes the Board of Administrators (BoA) and the Science and Technology Advisory Committee (STAC). As a general rule, all administrative and managerial matters are considered by the BoA while all matters of a scientific and technical nature are considered by STAC. Both of these bodies are responsible to the General Assembly, which is composed of delegates from each of the Member Societies. Thus, it is the General Assembly which takes decisions on all matters of principle concerning the work of the EFC, approves reports received from BoA and STAC, makes decisions on applications to join the EFC, approves the EFC budget each year and approves the appointments of all EFC officers and all members of BoA and STAC.

In addition, a Task Force which includes the EFC President, Vice-President and Past President as well as other EFC officials meets as-required to discuss matters for consideration by the BoA.

Delegates at a recent EFC Task Force Meeting in Paris included (left to right) Don Harrop (President), Björn Linder (Vice-President) Philippe Berge (Past-President), Pier-Luigi Bonora (Former President) and Pascale Bridou (Paris Office)

The BoA is chaired by the EFC President and meets on two occasions yearly. The STAC is chaired by an elected Chairman (currently Dr Jörg Vogelsang, Germany), and meets annually.

At the General Assembly in Riva del Garda on 1st October 2001, the following appointments to the Board of Administrators for the next three years were approved:

Membership of BoA

Representatives of Founder Member Countries

Belgium	Mr A. Pourbaix
France	Dr Ph. Berge
Germany	Prof. B.Isecke
UK	Mr D. Harrop

Elected Members

Hungary	Prof. E. Kálmán
Italy	Prof. P. L. Bonora
Netherlands	Prof. J. H. W. de Wit
Russia	Dr. A. V. Muradov
Spain	Prof. J. M. Costa
Sweden	Prof B. Linder

Also at the General Assembly in Riva del Garda, the following appointments to the STAC were confirmed for the next three years:

Membership of STAC

Belgium	Prof. J. Vereecken
France	Dr. Ph. Marcus
Germany	Dr J. Vogelsang
Italy	Prof. F. Mazza
Norway	Mr. B. Espelid
Romania	Prof. M. O. Radovici
Russia	Dr. A. V. Muradov
Spain	Prof. J. M. Costa
UK	Mr D. Harrop

EFC President and Vice-President

The term of office for the EFC President and Vice-President is two years. The General Assembly in Riva del Garda approved the appointment of Don Harrop of BP, who succeeded Philippe Berge, as the EFC President for the next two years. At the same time, it approved the appointment of Björn Linder of the Swedish Corrosion Institute as the EFC Vice-President, also for the next two years.

EFC WP CHAIRMANSHIP CHANGES

During the past year, the following changes of WP chairmen have taken place:

WP 1 - Inhibitors
Günter Schmitt of Iserlohn University of Applied Sciences has succeeded Giordano Trabanelli;

WP 5 - Environment Sensitive Fracture
Jean-Marc Olive of Bordeaux University has succeeded Thierry Magnin;

WP10 - Microbial Corrosion
Rolf Gubner of the Swedish Corrosion Institute has succeeded Dominique Thierry;

WP13 - Corrosion in Oil and Gas Production
Stein Olsen of Statoil, Norway, has succeeded Phil Jackman;

WP14 - Coatings
Lorenzo Fedrizzi of the University of Rome "La Sapienza" has succeeded Jörg Vogelsang;

WP15 - Corrosion in the Refinery Industry
François Ropital of the Institut Français du Pétrole has succeeded John Harston.

The EFC President, Don Harrop, has expressed the Federation's gratitude to the retiring chairmen for their magnificent contributions to the EFC

REACTIVATION OF WP2

It was announced in the last issue of the newsletter that Prof. K. Darowicki of the Technical University of Gdańsk had proposed the reactivation of EFC WP2 on "Corrosion and Protection of Steel Structures". This WP has been moribund since 1985 when it was disbanded because of difficulties associated with different rules of practice, regulations and standards between different countries.

The new proposals were submitted for endorsement by the EFC Member Societies, and five different countries (France, Italy, Turkey, UK and Ukraine) nominated official delegates to participate in the work of WP2. However, the EFC Science and Technology Advisory Committee and Board of Administrators suggested that the proposed objectives were too broad and that the terms of reference should be more precise so as to avoid the risk of overlap with the other WPs.

Prof. Darowicki is now planning hold a meeting of Polish construction engineers and industrial designers to discuss the questions at issue. He wants to focus on the design, construction and renovation of metal structures and has suggested 11 possible topics of interest:

1. performance of material combinations (e.g. composites) under actual service conditions;
2. usage of combinations of corrosion preventive measures to obtain optimum durability of composite structures;
3. joining technologies: welding, mechanical fastening, structural adhesive bonding;
4. problems connected with flow-affected corrosion that lead to premature damage of pipelines, reactors, heat exchangers, and other equipment;
5. design of tanks to avoid stress corrosion cracking, and numerous other problems;
6. design of monitoring systems for various types of corrosion;
7. corrosion failure analyses, case histories of catastrophic failures of steel constructions (masts, halls, bridges, tanks, pipelines etc.);
8. fatigue analyses;
9. construction defect measurements (corrosion metallurgy etc.);
10. corrosion and safety (secondary containment etc.);
11. corrosion due to attached materials (gaskets, etc).

A revised proposal will be circulated to the EFC Member Societies with a view towards soliciting broader support for the reactivation of WP2. It is anticipated that the inaugural meeting of the reactivated WP will take place in Poland some time next year.

EFC WORKING PARTY NEWS

There are currently fifteen active working parties (WPs), each concerned with a different aspect of the corrosion of metals and alloys. Their work is overseen by the Science and Technology Advisory Committee which meets annually, usually in conjunction with EUROCORR, to review progress in each WP against its rolling three-year programme and to endorse plans for the future. Meetings of the working parties themselves usually take place in conjunction with EUROCORR, and elsewhere as the need arises. The WPs undertake many interesting activities within their own fields, such as: collaborative research and testing programmes; the organisation of workshops, seminars, discussion groups and conferences; the preparation of state-of-the-art reports, guidelines and proceedings for publication as books in the EFC Series; and the organisation of sessions at the annual EUROCORR conferences.

Membership of the EFC Working Parties is freely available to those belonging to the EFC Member Societies. Others may participate at the discretion of the WP Chasirman.. Anyone wishing to join a particular WP should apply to the appropriate Chairman, details of whom are given below, or to the EFC Scientific Secretary c/o The Institute of Materials, Minerals and Mining, 1 Carlton House Terrace, London SW1Y 5DB (paul.mcintyre@iom3.org).

WORKING PARTY ACTIVITIES

WP1: Corrosion and Scale Inhibition

Chairman: Prof. Dr. Günter Schmitt, Iserlohn University of Applied Sciences, Fachhochschule Südwestfalen, Frauenstuhlweg 31, D-58644 Iserlohn, Germany, Tel: 0049 2371 566160, Fax: 0049 2371 566190, e-mail: Schmitt.g@fh-swf.de

At the meeting of WP1 in Riva del Garda the resignation of Giordano Trabanelli as Chairman of the Working Party was announced by Dr. Vogelsang who paid tribute to Prof. Trabanelli, particularly for the organisation of 9 highly successful European Symposia on Corrosion Inhibitors at five yearly intervals between 1960 and 2000. The new Chairman, Günter Schmitt, pledged to continue his series of Intensive Courses on Corrosion Inhibitors, of which five have taken place so far at DECHEMA in Frankfurt. However, he proposed that future courses could take place in different countries. Other items in the three-year plan of WP1 include:

- Development of systems for monitoring the performance of corrosion and scale inhibitors;
- Collaboration to develop standards for inhibitor testing;
- Integration of European research activities in the field of scale inhibition;
- Critical survey of existing knowledge on inhibition.

WP3: Corrosion by Hot Gases and Combustion Products

Chairman: Prof.-Ing M. Schütze, Karl-Winnacker-Institut der DECHEMA e.V., Theodor-Heuss-Allee 25, 60486 Frankfurt am Main, Germany; Tel: 0049 697 564 361; Fax: 0049 697 564 388; e-mail: schuetze@dechema.de

WP3 is organising an EFC Workshop on Corrosion by Carbon and Nitrogen - Metal Dusting, Carburisation and Nitriding, which will take place as EFC Event No. 258 in Frankfurt on 30-31 January 2003.

The key elements of its future programme include:

- Development of tools for lifetime prediction in high tenmperature corrosion;
- Standardisation of high temperature corrosion testing. This includes its current participation in the EU sponsored programme “Cyclic oxidation testing - development of a code for practice for the characterisation of high temperature materials performance” (COTEST);
- Solution of current industrial high temperature corrosion problems.

WP4: Nuclear Corrosion

Chairman: Dr. Jacques Daret, Commissariat à l'Energie Atomique, DECM/SCECF, Laboratoire d'Essais Technologiques de Corrosion, 50444 Beaumont-Hague Cedex, France, Tel: +33 2 3301 8341 Fax: +33 2 3301 8350, e-mail: jacques.daret@cea.fr

WP4 sponsored an International Workshop on "Prediction of long term Corrosion Behaviour in Nuclear Waste Systems" which took place at Cadarache on 26-29 November 2001 as EFC Event No. 256. The selected proceedings of this event are currently being prepared for publication as No. 36 in the EFC Series. WP4 is also sponsoring "Fontevraud V: Contribution of Materials Investigation to the Resolution of Problems Encountered in Pressurised Water Reactors", which takes place in Fontevraud, France, on 23-27 September 2002 as EFC Event No. 259. The principal topics in its future programme are:

- Behaviour of materials (metallic and concrete) for waste containers;
- Assessment of corrosion threats posed by decontamination processes, both in-service and during decommissioning;
- Corrosion studies on materials for fusion and high temperature reactors.

WP5: Environment Sensitive Fracture

Chairman: Dr. Jean-Marc Olive, Université Bordeaux 1 - UHR CNRS 5469, Laboratoire de Mécanique Physique, 351, Cours de la Libération, 33405 Talence Cedex, France,Tel.: 33 5 56 84 62 19, Fax: 33 5 56 84 69 64, e-mail: olive@lmp.u-bordeaux.fr

Prof. Thierry Magnin has recently been succeeded as Chairman of WP5 by Dr Jean-Marc Olive (see above), and Dr Jean-Marie Boursier of EdF R&D has been appointed as Secretary.

WP5 is organising the 2nd International Conference on Environmental Degradation of Engineering Materials, EDEM 2003 to be held in Bordeaux, France, on June 29 - July 3 2003 as EFC Event No. 264, and a workshop on "Stress corrosion cracking (SCC) and corrosion fatigue (CF) fractography" to be held on July 4 2003, also in Bordeaux. A one-day meeting of WP5 will be held in Paris during the winter of 2002 to discuss future work. Provisional plans include:

- Development of new tests for SCC and CF of engineering materials and of methods of presenting the results by means of iso-damage maps;
- Development of quantitative models of the damage process to predict crack velocities;
- Introduction of SCC and CF considerations into the materials selection process.

WP6: Surface Science and Mechanisms of Corrosion and Protection

Chairman: Dr. Philippe Marcus, Ecole Nationale Superieure de Chimie de Paris, 11, rue Pierre et Marie Curie, F-75231 Paris Cedex 05, France; Tel: 0033 144 276 738; Fax: 0033 146 340 753; e-mail: pmarcus@ext.jussieu.fr.

WP6 cooperated with Division 6 of ISE to organise Symposium 5, on "Molecular and Microscopic Aspects of Corrosion and Corrosion Protection" at the 53rd Annual Meeting of ISE, in Düsseldorf, Germany, on 17-20 September 2002.

Philippe Marcus and his colleague Isabelle Frateur are heavily involved at present in organising the scientific programme for EUROCORR 2004, to be held in Nice. However, the working party's long-term collaborative research programme to develop a reference material and reference procedures to facilitate the use of STM and AFM in corrosion research is continuing.

WP7: Corrosion Education

Chairman: Prof. J. M. Costa, University of Barcelona, Faculty of Chemistry, Chemical Engineering Department, Av. Diagonal 647, E-08028 Barcelona, Spain; Tel: 0034 340 21243; Fax: 0034 341 11492; e-mail: jm.costa@dept.qf.ub.es.

WP7 now incorporates the EFC Task EFC Task Force on Computer Applications, chaired by Prof. Ir. Walter Bogaerts, Katholieke Universiteit Leuven, Dept. Metallurgy and Materials Engineering, De Croylaan 2, B-3001 Heverlee (Leuven), Belgium, Tel: 0032 163 21222, Fax: 0032 163 21991, e-mail: **Walter.Bogaerts@mtm.kuleuven.ac.be.** Professor Bogaerts is responsible for the EU-supported Mentor-C project to develop modern distance learning

materials for use in connection with vocational training in corrosion engineering which is discussed elsewhere in this issue. Other activities of WP7 include:

- Activities aimed at harmonisation of the certification of corrosion personnel in Europe (e.g. the Colloquium on Corrosion Certification in Aix-en-Provence on 4-5 June 2002, EFC Event No. 253);
- Maintenance of an inventory of European corrosion courses;
- The use of new technologies in corrosion education.

WP8: Corrosion Testing

Chairman: Prof. Dr. Hans de Wit, Raad van Bestuur TNO, Schoemakerstraat 97, Postbus 6090, 2600JA Delft, The Netherlands, e-mail: deWit@rvb.tno.nl.

WP8 has commenced work on an important new addition to the EFC Series of publications, provisionally entitled "Modern Scanning Electrochemical Methods for Localised Corrosion Testing". This will provide extensive information on a wide range of modern electrochemical techniques including:

- Scanning Reference Electrode Technique;
- Scanning Vibrating Electrode Technique;
- Scanning Kelvin Probe;
- Electrochemical Scanning Microcope;
- Scanning Droplet Cell;
- Localised Electrochemical Impedance Spectroscopy.

The book is being prepared by international experts in the field and is being edited by Dr. Robert Akid of the Centre for Corrosion Technology of the Materials Research Institute at Sheffield Hallam University, UK.

WP9: Marine Corrosion

Chairman: Mr. B. Espelid, Det Norske Veritas AS, Section for Materials and Inspection Technology, Johan Berentsensvei 109-111, P.O. Box 7400, 5020 Bergen, Norway, Tel: 0047 559 49610; Fax: 0047 559 49560; e-mail: bard.espelid@dnv.com.

WP9 is heavily involved in the EU - funded project "Development of new method to characterise the durability of stainless steels to crevice corrosion in natural and treated" (acronym: CREVCORR). The aim is to develop a crevice corrosion test to qualify different stainless steels to crevice attack in natural and simulated sea waters. The current state-of-the-art is being established and a new synthetic sea water is being developed to which bacteria can be added to reproduce field behaviour due to MIC in real marine conditions. A crevice corrosion test procedure is also being developed in which the biological activity and oxidation capacity of treated sea waters are simulated electrochemically. The reliability and reproducibility of the new approaches will then be verified by collaborative testing at a number of laboratories and the results will be compared with those of standard laboratory and sea water exposure tests. EFC WP9 is serving as a reference group to evaluate both test procedures and test results. Contact has been maintained with ISO/TC 156/WG11 on Electrochemical tests to facilitate the development of an International Standard based on the test once it has been fully proven.

Jerzy Birn of WP9 has recently drafted a literature survey on "Corrosion of copper and aluminium alloys in sea water" covering the period 1979-2001. This is intended for publication in the EFC Series of books and will be discussed during the WP meeting in Granada on 25 September.

Future WP9 activities will include:

- An overview of all standards relating to marine corrosion testing and corrosion control;
- NDE methods for localised corrosion in highly alloyed materials;
- Environmentally friendly anti-fouling paints.

WP10: Microbial Corrosion

Chairman: Dr. Rolf Gubner, Swedish Corrosion Institute, Kräftriket 23A, S-104 05 Stockhölm, Sweden, Tel: 0046 867 41746, Fax: 0046 816 7270, e-mail: Rolf.gubner@corr-institute.se

Rolf Gubner has recently succeeded Dominique Thierry as Chairman of WP10, and is holding his first meeting in Granada on 23 September 2003.

An ongoing task of WP10 is the compilation of a directory of MIC experts in Europe but this is still incomplete. In particular, names are being sought from the following countries: Belgium, Bulgaria,

Germany, Italy, Norway, Portugal and Switzerland. The WP has also been involved in COST 520, the Final Workshop of which was held in Stockhölm during May 2002. Future activities will include:

- Organisation of an EFC Workshop on MIC in 2004 or 2005;
- Preparation of an EFC publication on MIC case histories;
- Participation in EU-funded collaborative projects on MIC.

WP11: Corrosion in Concrete

Chairman Dr. J. Mietz, Bundesanstalt für Materialforschung u. Prüfung, Unter den Eichen 87, D-12203 Berlin, Germany; Tel: 0049 308 104 1142; Fax: 0049 308 104 1747; e-mail: juergen.mietz@bam.de.

On behalf of Task Group 4 of WP11 (Test Methods for Assessing the Susceptibility of Prestressing Steels), Bernd Isecke, the Chairman of the TG, has recently completed a new report on "Test Methods for Assessing the Susceptibility of Prestressing Steels to Hydrogen Induced Stress Corrosion Cracking". This is being prepared for publication shortly as No. 37 in the EFC Series. Future activities of WP11 will include:

- Participation in the COST 534 project on the Protection of Prestressed Concrete;
- Preparation of an EFC publication on reference electrodes for use in concrete (Task Group 5).
- Development of numerical modelling of corrosion of reinforcement in concrete (Task Group 6)

WP13: Corrosion in Oil and Gas Production

Chairman: Dr Stein Olsen, STATOIL Research Centre, Postuttak, N-7005 Trondheim, Norway, Tel: 0047 7358 4174, Fax: 0047 7358 4792, e-mail: stol@statoil.no

During the past year, updated second editions of EFC 16 (on carbon and low alloy steels for sour service); and EFC 17 (on corrosion resistant alloys (CRAs) for sour service) have been published.

Stein Olsen has recently succeeded Phil Jackman as the Chairman of WP13, and will be holding his first meeting in Granada on 24 September. Progress in WP13 Working Groups concerned with: the use of inhibitors in oil and gas production; case histories of corrosion in oil and gas production; carbon steel in H_2S service; and corrosion in CO_2 service; CRAs in H_2S service; corrosion aspects of CRAs in oil and gas production in the absence of H_2S.

Key aims of the future programme include:

- Preparation of an EFC Report on the use of inhibitors in oil and gas production;
- Publication of an EFC Handbook of case histories on corrosion in oil and gas production;
- Compilation of guidelines on the avoidance of corrosion of CRAs in oil and gas production environments free of H_2S.

WP14: Coatings

Chairman: Prof. L. Fedrizzi, ICMMPM Department, University of Rome "La Sapienza", Via Eudossiana 18, 00184 Rome, Italy, Tel: 0039 0 461 882425, Fax: 0039 0 461 881977, e-mail: lorenzo.fedrizzi@uif.unitn.it

Lorenzo Fedrizzi has recently succeeded Jörg Vogelsang as Chairman of WP14 and is holding his first meeting in Granada on 24 September 2002. Progress will be reviewed on the development of a standard for EIS measurements on barrier coatings in ISO/TC35/SC9/WG29 and on round robin testing in which WP14 is participating to underwrite the standard. Another discussion point will be an Expression of Interest entitled "New frontiers for organic coatings as multifunctional materials" submitted by WP14 to the EU's 6th Framework Programme. This proposes the formation of a network of excellence aimed at mobilising European scientific expertise to provide European industry and science with relevant, up to date information, methods and tools for environmentally friendly organic coatings. Opportunities for collaboration with other WPs in order to avoid duplication, maximize the success of the EFC and eliminate competition with other WPs having related interests will also be discussed. Key items of WP14's future programme include:

- Standardisation of electrochemical test methods for organic coatings;

- Organisation of Workshops on electrochemical methods applied to organic coatings;
- Organisation of sessions on coatings at EUROCORR and FATIPEC.

WP15: Corrosion in the Refinery Industry

Chairman: M. François Ropital, Ing. De Recherche, Dept. Corrosion, Institut Français du Pétrole, 1-4 Avenue Bois Préau, B.P. 311, 92852 Rueil-Malmaison Cedex, France, Tel: 0033 1 47 52 7156, Fax: 0033 1 47 52 7058, e-mail: francois.ropital@ifp.fr

François Ropital has recently taken over from John Harston as Chairman of WP15. His first meeting will be held in Paris on 15 November 2002. Since its formation, WP15 has provided a valuable forum for the exchange of information on problems with materials and corrosion in refineries. John Harston is currently preparing an EFC book about refinery problems based on papers presented at previous WP meetings and EUROCORR sessions, as well as invited contributions. Other planned publications include requirements for cooling water systems in refineries, and the results of a survey on amine unit corrosion. Key tasks for the immediate future include:

- Production of an EFC publication on Corrosion in Refineries;
- Maintaining and building up support for WP15;
- Development of innovative plans for the future.

WP16: Cathodic Protection

Chairman: Marcel Roche, Head of Technical Discipline Corrosion, TotalFinaElf Technology Division, Tour Michelet A, 1309, 24, Cours Michelet, 92069 Paris la Défense Cedex, France; Tel +33 141353006; Fax +33 141353696; e-mail: marcel.roche@total.com

WP16 participated with CEFRACOR in the organisation of the very successful Workshop on Cathodic Protection and Associated Coatings at Aix-en-Provence on 6-7 June 2002 (EFC Event No. 254).

At its meeting in Granada on 26 September it will be discussing the preparation of an EFC state-of-the-art report on "CP Measurements and Coating Surveys on Buried Pipelines". Other main elements of its future plans include:

- Promotion of the certification of CP personnel and companies (in conjunction with CEN/ TC219/WG5);
- Enhancement of communication in the CP field;
- Publication of further documents in the EFC Series.

WP17: Automotive Corrosion

Chairman: Frits Blekkenhorst, Corus Group Research, Development and Technology, PO Box 10000, 1970 CA IJmuiden, The Netherlands, Tel: 0031 251 493 195; Fax: 0031 251 470 432; e-mail: frits.blekkenhorst@corusgroup.com

WP17 is the newest EFC Working Party, having been officially approved by the General Assembly in London on 12th September 2000. It organised excellent sessions on Automotive Corrosion at EUROCORR 2000 in London and at EUROCORR 2001 in Riva del Garda. The next meeting of WP17 takes place in Granada on 27 September.

DEVELOPMENTS IN THE HIGH TEMPERATURE FIELD

SUNASPO: A European Research Training Network "Surface Engineering of New Alloys for Super High Efficiency Power Generation

Present developments for advanced fossil power stations aim at increased thermal efficiencies and a reduction in CO_2 emissions. In particular, with regard to the latter, ambitious goals have been established, e.g. a reduction in CO_2 emissions by 40% within the next 10 years (Germany). These goals cannot, however, be accomplished without significant developments in the field of new materials for application in these power stations. For reasons of its strategic importance, it is necessary to educate the next generation of researchers in the field. This can be done best by combining the development of new materials and of surface technologies in a joint effort by some of the key laboratories in high temperature materials research in Europe with the training of young researchers on the topic in the same labs. Therefore, a research programme has been established for materials of

the next generation of fossil power plants, with emphasis on increased high temperature corrosion, erosion-corrosion and creep-corrosion resistance properties in the environments produced in such plants. This innovative research and training programme is being undertaken by the following 8 partners from 6 European countries:

- Prof. Howard Stott, coordinator (UMIST, United Kingdom)
- Dr. W. J. Quadakkers (FZ Jülich, Germany)
- Dr. Michael Spiegel (Max-Planck-Institut für Eisenforschung, Germany)
- Dr. David Baxter (Joint Research Centre Petten, Netherlands)
- Dr. Michael Pomeroy (University of Limerick, Ireland)
- Prof. Dimitrios Tsipas (Aristoteles University Thessaloniki, Greece)
- Prof. Michael Schütze (KWI-DECHEMA, Germany)
- Prof. Francesco Pérez Trujillo (Universidad Complutense de Madrid, Spain)

The scientific and technological steps in the programme are

- development of detailed laboratory methodologies for evaluation of materials for advanced ultra-high efficiency power plants
- improved basic scientific and mechanistic understanding of the behaviour of new metallic heat-exchanger alloys in power plants operating under advanced steam conditions, at temperatures significantly higher than those used currently, and in environments produced by combustion of coal, biomass and waste including
  - mechanisms and rates of steamside and fireside corrosion and corrosion-erosion
  - the effects of corrosion on creep of ferritic and austenitic alloys
  - the corrosion characteristics of welds and the heat-affected zones, especially dissimilar welds and weld overlays
- formulation of more reliable models for structural materials behaviour on the atomic scale, leading to improved lifetime assessment
- development of novel coatings and surface engineering treatments for increased fireside corrosion resistance on an improved scientific basis
- incorporation of performance data in design concepts, modelling, fabrication, maintenance and lifetime prediction

This development work is being carried out in close cooperation with several industrial companies involved in the project who have also committed themselves to contribute to the training of the young researchers from a practical point of view, including work experience and on-site training. Furthermore, special training activities in the research labs will help the young researchers to develop an all-round appreciation of power generation and incineration systems, together with a detailed knowledge of corrosion test methods, corrosion mechanisms and corrosion protection/prevention. The programme started in Spring 2002 and has a duration of 4 years. The young researchers must be from a different country than the one in which they will be based; in some labs, positions are still available for this training programme.

Further information on the programme can be obtained from the coordinator:

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COTEST - A European Research Project to Provide the Basis for Standardisation of the Cyclic Oxidation Test

In modern high temperature technology, materials play a key role with respect to performance, reliability, safety, economic profit and ecological compatibility. The advances in the development of energy conversion systems (low CO_2 emission fossil fuel fired power stations, solid oxide fuel cells, waste and bio-mass combustion or gasification, coal conversion, etc.) and in engines for transportation (car engines, catalytic converters, advanced jet engines, etc.) are to the largest extent based on reliable long term performance of high temperature materials. During operation of such high temperature technologies these materials are subjected to a complex interaction of temperature changes, oxidative and corrosive high temperature attack and mechanical stresses. This interaction determines whether components exhibit premature failure or show reliable and safe long-term performance and it also limits the upper service temperature, which decides the degree of efficiency and hence the economical and ecological performance of such plants. This complex interaction cannot be simulated in the

laboratory on a one-to-one basis without extremely high cost and unjustified man-hours. Therefore, a number of tests have been developed which are used to characterise the high temperature materials behaviour under somewhat simplified conditions.

Among these tests, the cyclic oxidation test has become the most widely used in industry with regard to the number of specimens tested. However, each company and each research institute uses its own modification of this type of test, so that in the end no intercomparison of the results from different laboratories is possible. A set of standards or a code of practice which could be used by laboratories does not exist, so far. A recent workshop, which had been organized by Working Party 3 "Corrosion by Hot Gases and Combustion Products" (Chairman: Michael Schütze) of the European Federation of Corrosion, revealed that in particular industry has a strong interest in the development of such a standard in order to get reliable and intercomparable data from such tests for design as well as for new alloy development programmes. The results of this workshop have been published as EFC-Publication No. 27, entitled "Cyclic Oxidation of High Temperature Materials – Mechanisms, Testing Methods, Chracterisation and Life Time Estimation", by IoM-Publications, London 2000. Due to the number of parameters influencing materials behaviour under these conditions, the large number of users of this test and the different variants of tests used presently, it would be impossible for a small group to work on a solution of this problem. The expertise in this field is scattered in industrial and scientific research laboratories all over Europe. This was the reason why following this workshop, a **European Cyclic Oxidation Testing Initiative Group** was formed whose aim is to work towards the establishment of a respective European standard. It was, however, realised that due to the present situation pre-normative research was necessary in order to provide a basis for such a set of standards. Following the recommendations of the European Cyclic Oxidation Testing Initiative Group the European Commission issued a dedicated call on this specific problem. Based on this call a project was established which responds to Topic IV.1 of the GROWTH Dedicated Call Measurement and Testing – Methodologies to support standardisation and Community policies.

The main **technical and scientific objectives** of the project are:

- To quantify the role of the test parameters that lead to scatter between the results of different laboratories
- To develop a reliable and meaningful test procedure for the cyclic oxidation test with three variants, to account for the most common technical applications
- To draft a code of practice based on the results of the project for submission to CEN/TC 262 as part of work item 00262140 "High Temperature Corrosion Testing" via DIN committee NMP 171.

The **workplan** consists of two phases. In phase I an evaluation of the presently used test procedures and equipment as well as of the existing data is performed. Based on this the test procedures for three different common versions (ultra short dwell times, short dwell times and long dwell times) are developed and investigated with regard to the influence of changes in those test parameters which might potentially lead to data scatter. In phase II a draft code of practice will be developed. This will be evaluated in validation tests, prior to the final code of practice being submitted to the standardisation committee.

The **partnership** consists of 6 industrial partners directly involved in the project, 5 industrial laboratories involved via two national research centres, 4 national research centres, 3 departments from universities (among which one is a statistics unit while the others are materials departments), a national metrology institution and a Joint European Research Centre. This group which performs most of the tasks of the above mentioned workplan is supported by a group of subcontractors, who are experts in high temperature materials performance from universities, research centres and industry across 5 European countries including 2 pre-accession states. The whole consortium, thus, provides all the necessary key experts in the field from 11 European countries (Finland, France, Germany, Hungary, Italy, Netherlands, Poland, Spain, Sweden, Switzerland, United Kingdom).

International contacts exist with similar initiatives in the US and Japan.

Further information on the project can be obtained from the coordinator of the project:

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CALENDAR OF FORTHCOMING EFC AND OTHER MAJOR EVENTS

Date/venue	Conference	Contact
22-27 September 2002 Granada, Spain	15th International Corrosion Congress "Frontiers in Corrosion Science and Technology	Viajes Iberia Congresos San Bernardo, 20 - 6º planta 28015 Madrid, Spain Fax: +34 1 532 45 43 E-mail: congresos.madrid@viajesiberia.com
23-27 September 2002 Fontevraud France	Fontevraud V: Contribution of Materials Investigation to the Resolution of Problems Encountered in Pressurised Water Reactors (EFC Event No. 259)	SFEN - Fontevraud V 67 rue Blomet F-75015 Paris, France fax: +33 (0) 1 5358 3211
30 September – 2 October 2002 Munich Germany	Materials Week 2002 – European Congress on Advanced Materials, their Processes and Applications	Werkstoffwoche-Partnerschaft Hamburger Allee 26, 60486 Frankfurt Germany fax: +49 69 791 7733 e-mail: materialsweek@dgm.de
3-4 October 2002 Brussels Belgium	Supermartensitic Stainless Steels 2002	Prof. Ir. A. Dhooge, Belgian Welding Institute, Sint-Pietersnieuwstraat 41, B-9000 Gent, Belgium Fax: +32 (0) 9 223 73 26 E-mail: alfred.dhooge@rug.ac.be
7-9 October 2002 Volgograd Russia	International Conference on Building Structures – Durability – Theory and Practice of Corrosion Protection	NIIZhB 2nd Institutskaya str., 6, 109428 Moscow, Russia Fax: +095 174 7463 E-mail: orgcomitet@niizhb.ru
12-13 October 2002 Norfolk, Va., USA	Building Façade Maintenance, Repair and Inspection Operations (ASTM Symposium) PA 19428-2959, USA	Dorothy A. Fitzpatrick, Symposia ASTM, 100 Barr Harbor Dr. PO Box c700, W. Conshohocken, Fax: +1 610 832 9555
22-24 October 2002 Cardiff, Wales UK	UK Corrosion 2002 Incorporating the 43rd Corrosion Science Symposium (International Technical Conference and Exhibition)	The Institute of Corrosion 4 Vimy Court, Vimy Road, Leighton Buzzard, Bedfordshire LU7 1FG Fax: +44 (0) 1525 376 690 e-mail: admin@icorr.demon.co.uk
5-8 November 2002 Beijing China	CICCC 2002 2nd China International Corrosion Control Conference	Ren Zhendu/Xin Yingdi Preparatory Office of CICCC 2002 No. 1, Zhongjie District 1, Liupukang, Beijing 100011, P. R. China Fax: +86 10 6204 4373 Fangfu@mail.cncic.gov.cn
3-7 November 2002 Tampa, Florida	SSPC Annual Conference	Rose Mary Surgent The Society for Protective Coatings 40 24th Street 6th Floor, Pittsburgh, PA 15222-4656 USA Fax: +1 412 281 9993, E-mail: surgent@sspc.org

30-31 January 2003 Frankfurt, Germany	Corrosion by Carbon and Nitrogen - Metal Dusting, Carburisation and Nitridation (EFC Event No. 258)	Prof.-Ing M. Schütze Karl-Winnacker-Institut der DECHEMA Theodor-Heuss-Allee 25 60486 Frankfurt am Main Germany Fax: 0049 697 564 388 e-mail: schuetze@dechema.de
10-11 February 2003 Manchester UK	An International Conference on Cathodic Protection	David Scantlebury Corrosion and Protection Centre UMIST, P.O. Box 88, Manchester M60 1QD, UK fax: +44 (0) 161 200 4865 e-mail: scantlebury@umist.ac.uk
11-14 March 2003 Paris-Nord Villepinte France	The Surface Treatments and Coatings International Trade Exhibition	SITS 2003 1, rue du Parc, F-92593 Levallois Perret Cedex France fax: +33 (0) 1 4968 5484 e-mail: sits@exposium.fr
16-21 March San Diego California, USA	Corrosion NACExpo 2003 58th Annual Conference & Exposition	NACE International, 1440 South Creek Drive, Houston, TX 77084-4906, USA Fax: +1 281 228 6329 e-mail: msd@mail.nace.org
25-27 March 2003 Cranfield UK	1st IWA Conference on Scaling and Corrosion in Water and Wastewater Systems	Conference Secretary School of Water Sciences Cranfield University Cranfield, MK43 0AL, UK fax: +44 (0) 1234 751 671 e-mail: iwa@cranfield.ac.uk
4-9 May 2003 Nieuwpoort Belgium	Electrochemical Methods in Corrosion Research EMCR 2003 (EFC Event No. 263)	Mrs. Lieve Van Den Bossche Vrije Universiteit Brussel Dept. Metallurgy, Electrochemistry and Materials Science, Pleinlaan 2, 1050 Brussels, Belgium Fax: +32 2 629 32 00 e-mail: lievdbos@vub.ac.be
5-8 May 2003 Orlando, Florida USA	ITSC 2003 International Thermal Spray Conference and Exposition	Ms. Valerie Roberts ASM Thermal Spray Society 9639 Kinsman Road Materials Park, Ohio 44073-0002 Fax: +1 440 338 4634 E-mail: vroberts@asminternational.org
19-24 May 2003 Frankfurt am Main Germany	ACHEMA 2003 27th International Exhibition-Congress on Chemical Engineering, Environmental Protection and Biotechnology (EFC Event No. 265)	DECHEMA e.V. Ausstellungskongresse, Postfach 15 01 04 D-60061 Frankfurt am Main, Germany Fax: +49 (0) 69 7564 201 e-mail: helpline@dechema.de
18 June 2003 Denver Colorado USA	Electrochemical Techniques for Evaluating Corrosion Performance and Estimating Service-Life of Reinforced Concrete (ASTM Symposium)	Neal S. Burke, Symposium Chairman W. R. Grace & Co., 62 Whittemore Avenue, Cambridge, MA 02140, USA Fax: +1 617 498 4827 E-mail: neal.s.berke@grace.com

29 June–3 July 2003 Bordeaux France	EDEM 2003: 2nd International Conference on Environmental Degradation of (EFC Event No. 264) Universite Bordeaux 1,	Dr. Jean-Marc Olive, Laboratoire de Mecanique-Physique Engineering Materials 351 Cours de la Liberation, 33 405 Talence Cedex, France fax: +33 5 5684 6964 e-mail: olive@lmp.u-bordeaux.fr
6-11 July 2003 Manchester UK	Corrosion Science in the 21st Century (International Symposium)	Symposium Secretary Corrosion and Protection Centre UMIST, Sackville Street, P.O. Box 88 Manchester M60 1QD, UK Fax: +44 (0) 161 200 4865 e-mail: 21stcentury@umist.ac.uk
28 September- 2 October 2003 Budapest Hungary	EUROCORR 2003 The European Corrosion Congress (EFC Event No. 261)	Prof. Dr. Erika Kálmán Chemical Research Centre Hungarian Academy of Sciences H-1525 Budapest, P.O. Box 17, Hungary Fax: +36 1 325 7509 e-mail: eurocorr@chemres.hu
12-16 September 2004 Nice France	EUROCORR 2004 - Long Term Prediction and Modelling of the Corrosion Behaviour of Metallic Materials (EFC Event No. 266)	CEFRACOR 28 rue Saint-Dominique, 75007 Paris France Fax: +33 1 45 55 90 74 e-mail: cefracor@club-internet.fr

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