

2-Day New Materials Seminar aimed at industry

London, 20-21 June 2007



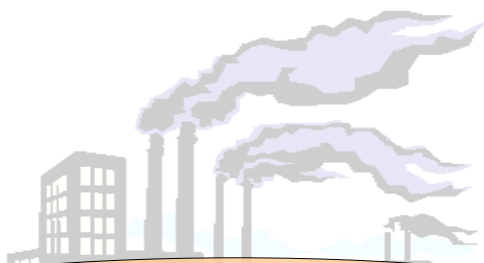
**INDUSTRY & RESEARCH EXPERIENCE IN THE USE OF
P/T 91, P/T92, P/T122, T23, T24 & OTHER NEW
STEELS IN HRSG & CONVENTIONAL BOILERS**



**FABRICATION, OPERATION, WELDING, CRACKING/
FAILURE, REPAIRS & INTEGRITY / LIFE ASSESSMENT**

*Aimed at exchanging information on **plant experience** and **related research**.*

*[The Seminar will be preceded by an optional 2-day Training Course on **P91** (18-19 June) and followed by an optional 1-day Training Course on **T23** (22 June). All at the same venue].*



Seminar Provisional Programme & *Registration Form*

Venue: Institute of Materials (IOM3), London
www.iom3.org.uk

Dates: **20- 21 JUNE 2007**

*Note: This initiative follows the recent publication of a critical **Review Report** by ETD of a number of failures worldwide (and related R&D) in thick and thin section P91 / T91 components - some after service durations of less than 20,000 hours.*

ORGANISED BY:

- P91 Users Group
- European Technology Development

Why This Seminar?

The pace of change in power and petrochemical plant sector has never been higher with a continuing move from the low alloy materials to higher strength higher alloy steels that can withstand higher temperatures and pressures in an effort to increase output, efficiency and flexibility and reduce pollution and associated penalties. The new high strength materials such as the now popular higher Cr martensitic steels (**P91, P92, E911, P122**) have another particular benefit in that due to their higher creep strength components can be manufactured in *smaller wall thickness* thus saving time and costs in manufacturing, welding, transportation, erection etc. The smaller wall thickness also means that the adverse thermal fatigue effect due to *plant cycling*, becoming a common mode of operation worldwide, will be less thus reducing the incidents of cracking and failures due to this mode of operation. However, the *drawbacks* can be the relative sensitivity of these steels to heat treatment details during steel production and component manufacture. This includes **forming/bending or welding**, the criticality of **pre- and post-weld heat treatment**, the resulting **micro-structural details** and the effect on material properties and behaviour. Some of these factors have led the alloy producers and plant manufacturers to look at alternative high strength materials such as **T/P23 and T/P24** for use as replacement materials at lower temperatures in more conventional plant.

The other factors that need special consideration are component monitoring and integrity/life assessment at the mid-life stage. The last factor can be particularly problematic as cavitation in these steels, which has been successfully used in the low alloy steels for creep **life exhaustion studies**, appears late in life and therefore new concepts/ technologies/ techniques are required to enable plant operators to predict damage/ failure and make 'run, repair or replace' decisions. Similarly a number of research studies have shown more recently that **steam side oxidation** of these new steels may not be as good as expected of higher Cr steels. This has implications on the use of very thin wall boiler tubing for superheaters made from these high strength steels.

A number of conferences based mainly on research experience have now been held on the properties and behaviour of these steels. However, enough *plant experience* has now been accumulated worldwide for the alloy producers, plant operators, manufacturers, service providers and researchers to come together to exchange this information and know-how.

What Do You Get ?

This is an industry oriented Seminar largely devoted to the understanding of the issues involved in the practical use of P/T91 based on plant experience and predictions made by the researchers. *Plant operators, manufacturers/ fabricators, materials suppliers and service providers will be encouraged to raise and discuss problems from their personal / company experience during the seminar.* The participants will also get the *Seminar notes / presentations* (and formal papers where these become available) on a CD.

Deadlines for the Submission of Presentations

As the Seminar is aimed more at bringing together industrial audience and related research the speakers are not expected to provide formal papers. Instead, the intention is to provide **Proceedings** on a CD consisting of presentations in the pdf format. However, if any of the presenters wish to offer formal papers these can also be included in the CD and can be published, after the seminar, in a refereed journal.

The deadline for the submission of presentations is: 8th June 07.

Time for Oral Presentations: 20 minutes. Keynote papers = 30 minutes.

Organising Committee

Dr A Shibli, ETD, UK (*Chairman*)
Dr D Robertson, ETD, UK
Dr T Itay, Israel Electric
Prof F Masuyama, Kyushu Institute of
Technology, Japan
Ms M Missaghi, Sask Power, Canada

Dr H Li, ANSTO, Australia
Dr N Komai, Mitsubishi Heavy Industry
(MH I), Japan
Mr P Ennis, Juelich Research Centre,
Germany
Dr P Billard, Electricite de France

Technical Enquiries to:

Dr A Shibli

Tel: + 44 (0)1372 802 555

ashibli@etd1.co.uk

Who Are The Organisers ?

International P91 Users Group

The P91 Users Group (P91UG) was formed at the beginning of 2006 in response to the need for the industry to discuss matters related to the fabrication, criticality of welding and heat treatment (both of the base metal and the weldments), high steam side oxidation, monitoring and inspection of components and their repair and replacement. In addition the group discusses the P91 microstructural deterioration with time, creep cavitation and micro-cracking due to creep and/or fatigue, Type IV cracking; the effect of chemical composition, hardness etc. on component integrity; and new research findings. A panel of experts is available on the Group to advice the members organisations on the problems facing them. Two levels of membership exist. Details on these and how to join the group can be found at: www.etd1.co.uk

European Technology Development

ETD is a UK based engineering advisory, consulting and R&D company specialising in high temperature plant life assessment/extension, maintenance, materials and engineering issues in all type of power generating and petrochemical/ process plant. ETD has, in the recent past, organised various international workshops/ courses/ conferences in Europe and Asia mainly on the issues such as: industrial plant life assessment/extension, high temperature plant materials, plant component safety and durability, performance of in-service welds, power plant cycling, risk based maintenance (RBM), probabilistic assessment, weld repairs etc. The company is leading and co-ordinating a number of large leading edge international industry initiatives (supported by the industry from North America, Japan, Europe and elsewhere or by government organisations such as the European Commission) on issues related to the assessment and improvement of high temperature plant performance, materials and design, and maintenance and inspection strategies. The company has carried out/ participated in leading edge projects on P91 weld repairs, crack assessment, integrity issues and has carried out studies of P91, P92, T23, T24 and P122 performance in plant worldwide. Further information about ETD, its projects, life assessment courses offered and other activities can be seen at: www.etd1.co.uk www.ommi.co.uk

DAY - 1

EXPERIENCE IN THE FABRICATION & OPERATION
OF HRSGs / BOILERS USING P/T91, P/T92, E911,
P122, T/P23, T/P24 ETC.

Registration and Welcome

0845 – 0930 hrs

**Session 1: Construction of HRSG and Conventional Boilers: Materials Development,
Production, Fabrication, Heat Treatment and Design Issues**

0930 – 1300 hrs

1. **Keynote:** A critical review of the creep rupture properties of P91 and P92 steels
J Hald, S R Holdsworth, European Creep Collaborative Committee (ECCC), Europe
2. **Keynote:** Creep strength evaluation of the high strength ferritic steels (P91, P92,
P122) in Japan using the new 'Region Splitting Analysis' method and the revised
strength values
K Kimura, National Institute for Materials Science, Tsukuba, Japan
3. ASME Code strength values for the new martensitic steels and the basis for the
recent modifications
ASME speaker, name to be confirmed

Coffee Break

1050 – 1120 hrs

4. **Keynote: New methodology for cost effective prediction of creep design and life assessment data for advanced high strength martensitic steels**
B Wilshire, University of Swansea, Wales, UK
5. **Design of welded P91 components – the weakest link**
D Allen, E.ON. UK
6. **Production experience of TenarisDalmine Grades 91 and 23: Microstructure, mechanical properties and creep behaviour**
*L Cipolla, A Di Gianfrancesco, Centro Sviluppo Materiali, Rome;
S Caminada, G Cumino, TenarisDalmine, Dalmine, Italy*
7. **Further development of high chromium steels for steam power plant**
P Ennis, W J Quadackers, Juelich Research Centre, Germany

Lunch

1250 – 1350 hrs

8. **Impact of improper process control on the properties of the high strength martensitic steels, in particular P91**
Jeff Henry, Associate, Structural Integrity Associates, Inc., Chatanooga, USA
9. **Evaluation of heat-treatment temperatures and corresponding properties of improperly heat-treated Grade 91**
John P Shingledecker, M L Santella, R L Klueh, Oak Ridge National Laboratory, TN, USA
10. **T/P23 and T/P24: Low alloy ferritic steels for application in high efficient power plant**
*W Bendick, SZMF - Salzgitter Mannesmann Research Institute, Germany
J Gabrel, CEV - Vallourec Research Center, France
B Hahn, V&M Deutschland, Germany
B Vandenberghe, V&M France, France*
11. **Experience with application of 9% chromium steels in Škoda Power**
Vratislav Polivka, Lubos Prchlik, Eva Folkova, Jiri Stumbauer, Skoda Power, Czech Republic

Coffee Break

1510 – 1540 hrs

Session 2: Plant Experience in the Use of Thick and Thin Section Components and Cracking / Failure

1540 – 1750 hrs

1. Some examples of worldwide experience in the use of P/T91 steel and component integrity issues

A Shibli, European Technology Development, Leatherhead, Surrey, UK

2. Early Type IV cracking on a retrofit modified 9Cr (Grade 91) header

S J Brett, Materials and Welding, RWE npower, UK

3. T/P92: A steel grade for use in high temperature supercritical boiler units - properties and experience

J Gabrel, CEV - Vallourec Research Center, France

B Vandenberghe, C Zakine, V&M France, France

4. Experience of the Electricity Supply Board of Ireland with the use of P/T91

S Scully, Electricity Supply Board, Dublin, Ireland

5. Monitoring trials of "soft bands" in HRSG components

T Itay, E Asulin, Israel Electric Corporation, Israel

6. *Short contributions:* Opportunity for the delegates to discuss their experience with the use of new steels in conventional and HRSG plants

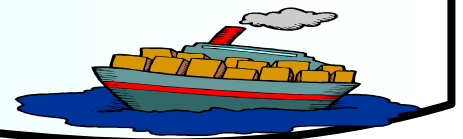
Note: An opportunity for the attendees to discuss their experience (2 to 3 minutes each) without making a formal presentation

***Invited Brief:* The role of the Materials Knowledge Transfer Network (Materials KTN) in bringing together UK industry and academia**

Robert Quarshie, Department of Trade & Industry, UK

Seminar Dinner & Boat Cruise on River Thames

1930 – 2230 hrs



DAY - 2

R&D, WELDING, REPAIRS & INTEGRITY / LIFE ASSESSMENT ISSUES

Session 3: R & D Issues and Field Tests

0900 – 1030 hrs

1. **Keynote: Steam oxidation of high chromium steels**
P Ennis, W J Quadackers, Juelich Research Centre, Germany
2. **Overview of the field test experience and creep failure tests in Japan**
F Masuyama, Kyushu Institute of Technology, Japan
3. **High temperature performance of the Gleeble simulated P91 HAZ**
H Li, ANSTO, Australia
4. **P91 longer term creep ductility issues and potential implications for defect tolerance in plant operating under steady and/or cyclic load conditions**
A Shibli, European Technology Development, Surrey, UK

Coffee Break

1030 – 1100 hrs

Session 4: Welding, Replacement and Repair Issues

1100 – 1230 hrs

1. **Welding and weld repair issues in P91 and T23 steels**
D Robertson, European Technology Development, Leatherhead, Surrey, UK
2. **Experience in the welding of P91 heavy wall piping using the gas tungsten arc welding process**
Luis D Yopez, Welding Services Inc., GA, USA
3. **Experience during welding of P91 at Tanjung Bin Power Plant project**
Noor Azam Md Saad PE, Section Head (Boiler Maintenance), Tanjung Bin Power Plant, Johor, Malaysia
4. **Quality problems in P91 steel manufacture and post weld heat treatment**
D Allen, C Mackie, E.ON., UK

Lunch

1230 – 1330 hrs

Session 5: Component Monitoring, Integrity and Life Assessment Issues

1330 – 1530 hrs

1. **Keynote: Transformation behaviour of creep-strength enhanced ferritic steels**
F Masuyama, Kyushu Institute of Technology, Japan
2. **Use of on-line software for estimating life consumption and for focussed maintenance of HRSG components including P91**
A Pasha, Vogt Power International, Louisville, KY., USA
3. **Creep, fatigue and creep-fatigue interaction in Mod.9Cr1Mo steel base metal and welded joints**
K Bhanu Sankara Rao and Baldev Raj, Mechanical Metallurgy Division, Indira Gandhi Centre for Atomic Research, Kalpakkam, Tamil Nadu, India
4. **Modelling creep rupture of P91 welds: application to life assessment of industrial components**
Charles Petry, EDF R&D, MMC department, EDF, France
5. **Microstructural evolution of 9%Cr steel grades during long term creep tests: TenarisDalmine Grades 91, 92, 911**
*L Cipolla, A Di Gianfrancesco, D Venditti, Centro Sviluppo Materiali, Rome
S Caminada, G Cumino, TenarisDalmine, Dalmine, Italy*

Panel Discussion

***Component Integrity & Life Assessment –
The way Forward***

1520 – 1540 hrs

REGISTRATION FORM (Please copy and e-mail / fax / post)

'New Materials Seminar', 20- 21 June 2007

REGISTRATION FEE: Amount payable is that shown in the 'Fee + VAT' column.

	Reduced Fee (until 18 th May)		Full Fee (from 19 th May)	
	Fee *	Fee +VAT @ 17.5% * (To Pay) – Pounds	Fee *	Fee +VAT @ 17.5% * (To Pay) – Pounds
Delegates <i>Attending Seminar only</i>	£400	470	450	528.75
Presenters <i>Attending Seminar only</i>	£350	411. 25	400	470
<i>P91 Course only**</i>	£700	822.50	750	881.25
<i>Attending 'Seminar' + 'P91 Course' **</i>	£900	1057. 50	£950	1116. 25
<i>Attending T23 Course #</i>	£400	470	450	528.75

Note: Please put X against the relevant 'Fee +VAT' box(es). Those attending T23 Course and other events will need to pay T23 Course fee + other relevant event(s) fee.

* Overseas delegates also pay VAT (Value Added Tax) for events held in the UK.

** P91 Course is being held at the same venue *before* the seminar on Mon. & Tues, 18-19 June.

T23 Course is being held at the same venue *after* the seminar on Friday, 22 June.

For details of the P91 and T23 optional courses please visit: www.etd1.co.uk and look under 'Training Courses'.

PAYMENT

By UK bank cheque, bankers draft, or bank to bank transfer to:

European Technology Development Ltd.

Nat West Bank, A/C No: 26096625, Sort Code: 60-12-36, UK. *Please quote reference 'New Materials Seminar 07' with the payment and state here how you paid / intend to pay.*

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By Credit Card: Major cards such as Visa/ Master Card/ JCB/ American Express/ Switch are accepted with the exception of Dinners Club. For security please only *fax or post* this information.

Name of Account Holder			
Card Type and No.		Expiry date	
Authorisation signature			

Venue: Institute of Materials, Minerals and Mining (IOM3) www.iom3.org

Accommodation: Information on local hotels will be supplied by ETD on request.

Delegate Details: *(Required for your badge)*

Your **title** and **name:**

Company:

Position (optional):

Address:

Phone:

Fax:

E-mail:

REGISTRATION ADDRESS: Please copy and post/ fax/ e-mail to address below:

Postal address: Registration Section, 'P/T91 Seminar', European Technology Development, 2 Warwick Gardens, Ashted, Surrey KT21 2HR, UK

Seminar Venue: 'Institute of Materials' (IOM3) - central London www.iom3.org.uk

Registration enquiries: registration@etd1.co.uk

Tel: + 44(0)1372 802 555 or + 44 (0)1372 229 162

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